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Editorial – Volume 14, Issue Number 3

Terry Anderson
Editor, IRRODL

This issue of *The International Review of Research in Open and Distance Learning* is memorable for two reasons. The first is that this is the largest issue (23 research articles and a book review) in the 13 years of IRRODL publication. We assume this increase is directly related to the growing reputation of IRRODL as being a journal that is widely read (averaging 84,000 full text downloads/month), cited (55% of articles are cited by authors in other Scopus indexed journals and an SSCI impact factor of .69 in 2011), and indexed by all the major citation indexing systems. In addition authors have come to expect timely and helpful reviews. We have been able to review, edit, and publish in efficient and timely fashion (averaging less than 6 months from submission to publication) with acceptance rates slightly less than 50%, and to my knowledge no other journal publishes in the four different formats in which we distribute each article.

None of these accomplishments could have been attained without the efforts of a network of very talented and hardworking volunteers reviewers and editors.   But journal production of the magnitude of IRRODL today could also not have happened without the leadership of our founding editor, Dr. Peter Cookson, nor without the full time work of our managing editors, first Jan Thiessen, then Paula Smith, and for the past five years Brigette McConkey. Finally IRRODL could not be distributed freely, and without author fees, without the sponsorship of Athabasca University and the funding we receive from the Social Sciences and Humanities Research Council of Canada. Thanks to all.

The second milestone marked by this issue, and the reason that I have cited the figures and noted the individuals above, is that with this issue I announce that after 10 years as the editor of IRRODL, I am passing the torch. I remain as a professor at Athabasca University and will continue to serve on the IRRODL editorial board. Two of my colleagues from Athabasca University will be editing IRRODL in the coming years.

The new IRRODL co-editors are Dr. Dianne Conrad, who many of you will recognize from her authorship of articles in IRRODL and other journals (including winner of the Wedemeyer Award for Outstanding Scholarship in Distance Education). Dianne is currently the director of the Centre for Learning Accreditation at Athabasca. The other co-editor will also be familiar to regular IRRODL readers. Dr. Rory McGreal is currently the UNESCO/COL Chair in Open Educational Resources, a faculty member in the Centre for Distance Education at Athabasca, and also a Wedemeyer Award winner for Outstanding Practitioner in Distance Education.

I personally want to thank Dianne and Rory for allowing me the opportunity to pass on this task, with confidence that my efforts and those of many others leave a continuing and improving legacy. I would also like to personally thank those hundreds of reviewers who, though they all are busy, have said yes, when my request for reviewing help arrived in their email, to those authors who graciously accepted our advice and suggestions, and to those who responded with thanks – even when we declined the offer to publish their work.

Now to a brief summary of what is in store for you in this issue, 14(3).

The first article, from the USA, is entitled « Journey to Textbook Affordability: An Investigation of Students' Use of eTextbooks at Multiple Campuses. » Although etexts have been just around the corner for some number of years, we are finally beginning to see extensive use and adoption in many online courses. The next article from Germany, « De-Gendering in the Use of E-Learning, » provides data suggesting the de-gendering associated with the routinization of technology use in e-learning. The next article, from Pakistan, « Development of Reflective Thinking through Distance Teacher Education Programs at AIOU Pakistan, » uses Kember's *Questionnaire of Reflective Thinking* to investigate the development of reflective thinking in education students studying at a distance. The next articles is a case study from South Africa entitled « Looking Out and Looking In: Exploring a Case of Faculty Perceptions During E-Learning Staff Development. » It focuses on the change process instigated through professional development as distance education teachers move from print to electronically delivered teaching. « Challenges for Successful Planning of Open and Distance Learning (ODL): A Template Analysis, » also originates from South Africa and provides a model for developing an open distance learning unit in a campus based institution.

Next from Estonia, we present « Sustaining Teacher Control in a Blog-Based Personal Learning Environment. » Web 2.0 tools afford new ways to teach and learn, but in the process they tend to reduce the control teachers and learners have become used to in both classroom and distance teaching. This article documents the development and testing of a tool for Word Press that helps teachers to monitor and assist distributed learners. We next turn to an article from Canada that looks at best practices for « Addressing the Needs of Diverse Distributed Students. » Certainly distance students both need and have a right to equivalent levels of support as campus students, but providing these services can be challenging.

We have all heard claims and counter claims of the differences of the so called net generation. In the next article from Catalonia, Spain, entitled « Do UOC Students Fit in the Net Generation Profile? An Approach to their Habits in ICT Use, » the authors use data from multi-national sources to explore the network use and competence of older students who typically enroll in distance education programming. Studying at a distance requires increased levels of self-regulation and motivation. In a study from France entitled « The Influence of the Openness of an E-Learning Situation on Adult Students' Self-Regulation, » the author analyses data using an actantial model of qualitative data to examine perceptions of openness of adult learners.

How could we publish an issue in this the « year to talk about MOOCs » without at least one article on this emergent model of distance education? In « MOOCs: A Systematic Study of the Published Literature 2008-2012, » the authors review five years of MOOC research. Next, the open and distance landscape demonstrates quite different modes of instructional design with varying amounts of individual, collaborative, instrumental, and interactive learning. In a study from Trinidad and Tobago, the author investigates « The Preferred Learning Modes of Online Graduate Students. »

Teachers must be constant learners and in this our record breaking second article from Estonia in one issue, the authors provide and analyze a model for « Promoting Teachers' Learning and Knowledge Building in a Socio-Technical System. » Distance education programs need to be continually evaluated to insure their effectiveness and efficiency. In a study from Turkey, « Applying the Context, Input, Process, Product Evaluation Model for Evaluation, Research, and Redesign of an Online Master's Program, » a model and a case study of effective program evaluation is presented.

Next from the USA, we present a study of K12 teachers, studying in an online course. « Interaction, Critical Thinking, and Social Network Analysis (SNA) in Online Courses » reveals the impact of teaching presence. Once again, but this time from Canada, we present an article dealing with professional development for K12 teachers. In « Synchronous Online Collaborative Professional Development for Elementary Mathematics Teachers, » the authors highlight the effect of programming delivered using synchronous online technologies. Next from Germany we present a more philosophical article that uses the idea of Bildung to help us in « Rethinking OER and their Use: Open Education as Bildung. » The next article, « An Explanation for Internet Use Obstacles Concerning E-Learning in Iran, » looks at barriers to the development of quality programming using internet delivery technologies. Although mobile devices have proliferated throughout the world, there is little empirical evidence of their impact on formal education. In a quasi-experimental study from Thailand, « Enhancing Motivation in Online Courses with Mobile Communication Tool Support: A Comparative Study, » the authors provide evidence of increased motivation in distance education programming associated with mobile phones.

Netx from Spain, « Virtual Attendance: Analysis of an Audiovisual over IP System for Distance Learning in the Spanish Open University (UNED) » shows the effect on

learning and attendance when high quality videoconferencing is used to supplement distance education deliver at learning centres. Our second paper using social network analysis also comes from the USA and is entitled « Online Learner Self-Regulation: Learning Presence Viewed Through Quantitative Content- And Social Network Analysis. » The article adds a new dimension of "learner presence" to the origional community of inquiry model. Finally our third article from Spain, « Pedagogical Roles and Competencies of University Teachers Practicing in the E-learning Environment, » presents data from a survey investigating teacher skills needed to promote e-learning.

This issue also contains two articles in our Research Notes section, which provide case studies of innovation in distance and open learning. The first, from Canada, details the challenges (and the innovative solutions developed) to provide « First Year Chemistry Laboratory Courses for Distance Learners: Development and Transfer Credit Acceptance. » The second is from Russia, « The Experience of a Distance Learning Organization in a Private Higher Educational Institution in the Republic of Tatarstan (Russia): From Idea to Realization. »

We also present Dr. Barbara Miller Hall's book review of the 2012 text *Student Participation in Online Discussions* by K. F. Hew and W. S. Cheung. Asynchronous online discussions remain the most extensively used teaching and learning tools for online learning. Dr Hall provides a critical review of this text, noting both its strengths and weaknesses.

I hope you enjoy this issue, tweet, reference, and pass along relevant links to colleagues who will benefit from our shared knowledge. The IRRODL network continues to make a difference for teachers, developers, institutions, and most importantly for learners.
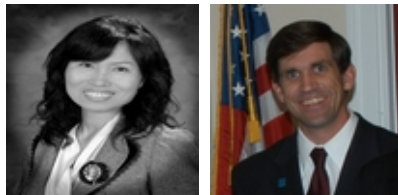
All the best and I hope to meet many of you face-to-face or online in the coming years.

Terry Anderson

Athabasca University

Journey to Textbook Affordability : An Investigation of Students' Use of eTextbooks at Multiple Campuses

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Abstract

eTextbooks have steadily and recently more rapidly penetrated the textbook market. In order to effectively support students' learning, it is important to comprehend students' experiences using eTextbooks. This survey study was designed to gain an understanding of students' experiences in using eTextbooks and variables that impact their experiences, perceptions, and attitudes towards eTextbooks. In a total of 33 courses, faculty members at five state university campuses in California participated in the eTextbook pilot project during the fall of 2010. Six hundred and sixty-two student questionnaires were returned from those courses. Key findings include: 1) More than one-third of the students were satisfied with the eTextbook; 2) more than half of the students felt that the eTextbook was easy-to-use; 3) older students (22 or older) tended to have more positive experiences with the eTextbook than younger students; and 4) students most liked the eTextbook's cost, accessibility, light weight, and keyword search features. This study implies that the eTextbook must be a high-quality, easy-to-use resource to serve as a viable textbook option for student learning.

Keywords: Affordable Learning Solutions (ALS); attitudes; digital textbooks; eTextbook; ebook; accessibility; textbook publisher; students' perceptions; survey; higher education; user satisfaction; ease of use

Introduction

Textbook Costs

Various US government reports clearly show that skyrocketing textbook costs threaten the accessibility and affordability of higher education in the United States (Advisory Committee on Student Financial Assistance, 2007; Federal Textbook Price Disclosure Law, 2010; US Government Accountability Office Report on College Textbooks Accountability, 2005). The US Government Accountability Office Report on College Textbooks Accountability (2005) stated that between 1986 and 2004, textbook prices nearly tripled in the United States, increasing at an average of 6% per year, for a total increase of 186%.

Also the Advisory Committee on Student Financial Assistance (2007) reported that textbook prices represent a significant barrier to students' accessibility to textbooks. The report concluded that textbooks cost between $700-$1000 per year; textbook prices have risen much faster than other commodities; and that college aid fails to cover textbook expenses. Textbook costs are equivalent to 26% of tuition costs for an average four-year public university student and 72% of tuition costs for an average community college student. In fact, the California State Auditor (2008) reported that textbook costs grew more rapidly than student fees in academic year 2007–08.

The federal textbook price disclosure law, issued on July 1, 2010, as a continuation of the Higher Education Opportunity Act of 2008, considers cost an integral part of textbook selection. According to this act, institutions will be required to disclose "to the maximum extent practicable," textbook information, including cost, in their course schedules during the registration process. Also, it requires the publisher to make available information about copyright dates for the three previous editions, whether or not the textbook is available in any other forms, and the price of the textbook with and without bundled materials (Student PIRG, 2010; US Department of Education, 2008).

Over 30 states introduced legislation related to the textbook issues addressed in the act (West Virginia Higher Education Policy Commission and Community and Technical College System, 2009). Many university systems have initiated projects to offer affordable textbook options such as eTextbooks, textbook rental models, and open textbooks (Hull & Lennie, 2010; Johnson, 2011; Maxwell, Little, & Stites-Doe, 2011; Young, 2010a; Young, 2010c). Issues related to the eTextbook option, the focus of this study, will be discussed in the following section.

eTextbook Markets and Student Perceptions of eTextbooks

eTextbooks became available in the late 1990s with the market gradually growing through 2007 and dramatically increasing since 2008 (Johnson, 2011). eTextbooks have disrupted the traditional higher education textbook market including other alternative

textbook options (e.g., textbook rental models and open textbooks) due to their competitive costs (Hull & Lennie, 2010; Johnson, 2011; Maxwell, Little, & Stites-Doe, 2011; Weisberg, 2011; Young, 2010a; Young, 2010c).

A growing number of students are more open to eTextbooks (Maxwell, Little, & Stites-Doe, 2011) for their accessibility, user-friendly interfaces, and cost-effectiveness. This, however, does not necessarily mean that students are ready to adopt eTextbooks. Many studies show that students simply prefer printed books to eTextbooks because of the look and feel (Book Industry Study Group, 2010; NACS, 2010; Young, 2010b) regardless of their gender (McGowan, Stephens, & West, 2009; Woody, Danel, & Baker, 2010), comfort level with computers (Woody et al., 2010), and prior experience using eTextbooks (McGowan et al., 2009; Shepperd, Grace, & Koch, 2008; Woody, Daniel, & Baker, 2010). Shepperd et al. (2008) presented data that indicated it was premature to entirely replace traditional textbooks.

In the Book Industry Study Group's report (2010), 75% of 1,428 student respondents from 10 colleges chose "regular print textbooks" as their favorite. Students liked print textbooks because they are familiar, easy to read and use for note taking, and convenient.

McGowan et al.'s 2009 study also attested to students' overwhelming preference for hardcopy textbooks. They found statistically significant differences among students who preferred eTextbooks based on their education level, age, and gender. More graduate students than undergraduate, more older students than younger students, and more male students than female students were in favor of the eTextbook option as measured by statistical analysis.

Interestingly, Weisberg (2011) found over a two-year longitudinal study that students become more receptive to using eTextbooks over time. During the first year, students were not comfortable with the eReaders and digital textbook readers and were very skeptical of the effectiveness of eTextbooks. At year's end, students remained cautious but enjoyed the advanced features of the eReaders or eTextbooks such as note taking, highlighting, and searching. In the final year, many students purchased eReader devices and considered eTextbooks their primary textbooks. Like other technologies, it seems to take time for students to become familiar with eTextbooks even though young college students may be considered tech savvy.

Students' mixed but still overwhelming uneasiness towards eTextbooks is somewhat alarming considering the great many universities in the process of adopting licensed eTextbooks (Young, 2010a; Young 2010c). In order to effectively support students' learning, it is important to comprehend students' experiences using eTextbooks.

Drawing on this literature, this study was designed to gain an understanding of students' eTextbook use experiences. This study sought to assess students' perceptions

of the eTextbook in terms of satisfaction, ease of use, willingness to recommend, and variables that impacted students' experiences and perceptions concerning eTextbooks. The section that follows outlines the methodology used in this study for addressing these research goals.

Methodology

Setting

This study was conducted as a part of the Affordable Learning Solutions (ALS) initiative led by the state university system in a West Coast state in the USA. The initiative was focused on providing effective location and distribution of digital instructional resources and materials for faculty and students. A series of research studies has been conducted to guide and support ALS's efforts to provide affordable textbooks for students (Baek & Monaghan, 2009, 2010a, 2010b).

Baek and Monaghan (2010a, 2010b) revealed students' high interest in a licensed eTextbook (78.46% students; 492 out of 627 returned questionnaires) at campus D, one of the campuses where this study was conducted.

This positive perception of eTextbooks served as an impetus for the ALS project team to implement an eTextbook pilot testing program at multiple university campuses in the fall of 2010. To support the pilot testing effort, this study was designed to gain an understanding of students' experiences using licensed eTextbooks.

Five four-year state university campuses participated in the eTextbook pilot project. These campuses were chosen based on the faculty's interests in participating in the eTextbook project by adopting an eTextbook in their courses. Each of the five campuses' student enrollment falls within the range of 13,000 to 31,000 students. eTextbooks were provided by two different vendors. Three of the campuses (B, C, and E) used eTextbooks from Provider A and the other two (A and D) used eTextbooks from Provider B.

eTextbook Provider A, the world's largest eTextbook provider, was founded by major textbook publishers in 2007 to sell electronic versions of current titles, and by 2009 offered 7,150 titles (Young, 2009). eTextbooks from Provider A's company Web site are available in two formats, online and downloadable versions. The online option requires internet access while the downloadable version can be viewed without internet access following the initial download. In addition, electronic resource packages that include online interactive learning experiences such as online homework, quizzes, simulations, videos, and links to other related Web sites are available. According to the company Web site, even after a student's subscription expires, eTextbooks can be accessed using

either option. In addition, the company released free applications allowing users to read textbooks on iPad, iPhone, or iPod devices.

eTextbook Provider B was launched in 2007 by Fourteen40, Inc. which was acquired by Follett Corporation in 2008, making it a part of Follett Digital Resources and resulting in a re-launch in the spring of 2009. After purchasing an eTextbook from Provider B, a student needs to download it to MyScribe (PC or Mac) to read and search the book. According to the company Web site, downloading the book grants a lifetime non-transferable license to that edition of the book on up to three computers.

Instrument Development and Data Collection

Guided by discussions with the ALS team, a survey research design and sampling methodology were selected to gain an understanding of students' experiences using licensed eTextbooks. The questionnaire was developed after referring to various journal and newspaper articles on the issue of eTextbooks. It was reviewed by an external research expert, the project team members, and two eTextbook publishers, and was pre-tested with four students for relevance and clarity of content, and revised accordingly.

The questionnaire was available electronically on the http://www.surveymonkey.com/ Web site. The questionnaire consisted of 30 questions including 12 questions addressing students' demographic/course information (yes/no and multiple choice) and 18 questions on students' experiences using the eTextbook license (Likert scale items, 1 being *strongly disagree* to 5 being *strongly agree* and open-ended questions). Students' demographic information included age, gender, year of study, the course for which the eTextbook was used (general education or upper division course), ownership of technology tools (e.g., desktop, laptop, smart phone, Internet), and whether or not they had purchased an eTextbook before this pilot testing. Questions addressing students' experiences/perceptions of the eTextbook included their perception of its price, purchasing process, ease of initial access, delivery of content, overall ease of use, overall satisfaction, interest in taking an eTextbook required course again and in recommending an eTextbook required course to their friends.

The questionnaire was administered between September 27 and November 9, 2010. It was available from the beginning through the midpoint of the semester/quarter. A total of 3,870 questionnaires were distributed and 662 questionnaires were collected, a return rate of 17%.

It is important to note that Question 12 asked participants to exit the questionnaire if they had not purchased the eTextbook. Therefore, after Question 12, the total number of responses calculated was 615. The number of questionnaires analyzed varies by item depending on the number of respondents for each item.

A total of 33 courses, faculty members from the five campuses agreed to participate in eTextbook pilot testing during the fall quarter/semester, 2010. The questionnaire was

sent to students in those courses. The courses included as a part of this study encompassed a wide range of disciplines: business (8), communication (7), information science (4), mathematics (2), finance (2), management (3), marketing (3), American government (1), biology (1), education (1), and social psychology (1). The majority of courses were from the field of business.

Data Analysis

The data from the Survey Monkey site were imported into Microsoft Excel then into SPSS version 19. Frequency was calculated for each of the questions. The non-parametric Kruskal-Wallis analysis of variance test and chi-square test were used to analyze inferentially the relationship between the nominal data and the ordinal data. Kendall tau-b was calculated, as well, to measure the strength of association of ordinal data.

The data from open-ended questions was categorized to find emerging themes using the content analysis method. Content analysis is one of the classical analysis procedures used to analyze various forms of textual data, such as interview data (Flick, 1998; Lincoln & Guba, 1985).

Findings and Discussion

Background information, students' perceptions of the eTextbook, and variables that strongly related to students perceptions are discussed. The background information summarizes the key features of the survey participants. The Students' Perceptions of the eTextbook section discusses a general picture of students' perceptions of the eTextbook in three areas, satisfaction, ease of use, and students' willingness to recommend courses which require eTextbooks, as well as some variables which influenced their perceptions. Open-ended survey data were used to assess what students most and least liked about the eTextbook.

Background Information

Six hundred and sixty-two participants completed the online questionnaire. Six hundred and sixty indicated their campus: A (98, 14.8%), B (171, 25.9%), C (194, 29.4%), D (108, 16.4%), or E (89, 13.5%). Six hundred and fifty-four students indicated their year: freshman (166, 25.4%), sophomore (107, 16.4%), junior (184, 28.1%), senior (165, 25.2%), or graduate (32, 4.9%).

Table 1 summarizes key background information from the respondents. The most noteworthy finding is that almost all of the student respondents are well equipped with regard to technology; 98% of students who answered have internet access at home. Over 80% of students have a notebook computer. Close to 60% of students have a desktop computer, and more than 41% of students have a smartphone. Another important point

is that the vast majority of students (over 91.4%) who responded had purchased the required eTextbook.

Table 1

Background Information for Student Questionnaire Respondents

Gender	Males (264, 40%)		Females (398, 60%)		662
Age	21 or younger (396, 60.7%)		22 or older (256, 39.3%)		652
Class (GE/UD)	General education courses (307, 43.7%)		Upper division courses (346, 49.3%)		653
Internet at home	Yes (643, 98%)		No (14, 2%)		657
Purchased some kind of e-books before	Yes (307, 46.4%)		No (355, 53.6%)		662
Purchased the eTextbook for the class	Yes (600, 91.4%): eTextbook provider A (423, 70.5%)* eTextbook provider B (177, 29.5%)*		No (57, 8.6%): eTextbook provider A (30, 52.6%)* eTextbook provider B (27, 47.4%)*		657
Reading device	Desktop (393, 59.4%)	Notebook (531, 80.2%)	Smartphone (276, 41.7%)	iPad (26, 3.9%	662**
	D & N*** (278, 41.99%)	D, N & S (147, 22.2%)	Kindle (8, 1.2%)	Other (25, 3.8%)	

*Percentage was calculated within each cell.

**Frequencies total more than 662 because students chose all the options that applied to them.

***D&N= desktop & notebook; D, N&S = desktop, notebook & smartphone

Students' General Perceptions of the eTextbook

Overall satisfaction.

Students' overall satisfaction regarding the eTextbook was evenly distributed into three groups, satisfied, neutral, and dissatisfied, following the combination of agree and strongly agree responses into one category and disagree and strongly disagree into another. Slightly more than one-third of students (208 of 598 respondents, 34.2%) said

A Journey to Textbook Affordability : An Investigation of Students' Use of
eTextbooks at Multiple Campuses
Baek and Monoghan

that they were satisfied with the eTextbook as compared to students who rated themselves dissatisfied (192, 31.6%) as shown in Figure 1.

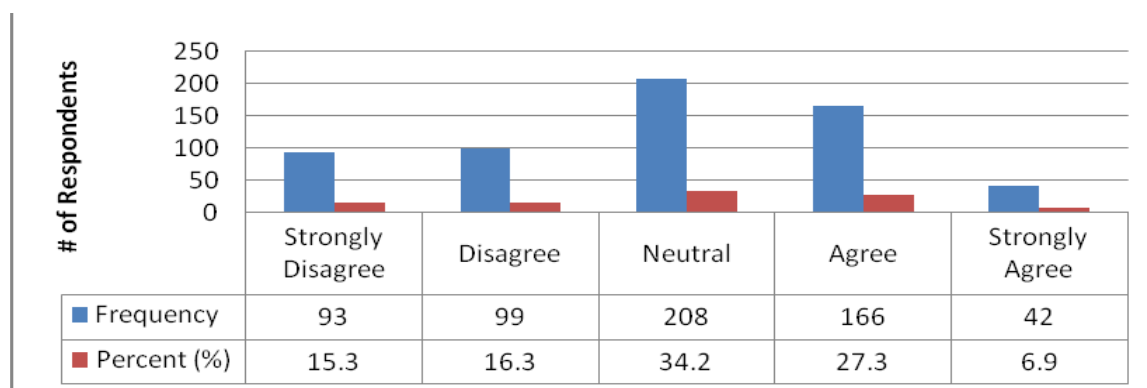| # of Respondents	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
■ Frequency	93	99	208	166	42
■ Percent (%)	15.3	16.3	34.2	27.3	6.9

Figure 1. Students' overall satisfaction with eTextbook.

This result is congruent with other studies (BISG, 2011; Student PIRGs 2008, 2010). The Book Industry Study Group's recent questionnaire study (January 6, 2011) revealed that nearly 75% of student respondents prefer print textbooks due to affection for their look and feel, permanent ownership, and the option to resell. Student PIRGs (2008, 2010) survey studies also mentioned that 75% of students prefer regular print textbooks for their readability, because they are used to them, and because of their convenience. In the National Association of College Stores' study (2010), 74% of students (627 participants) said that they would choose a printed book over an eTextbook if the choice were left entirely up to them for its permanent ownership and the option to resell. In these studies, only about 25% preferred eTextbooks.

This result is somewhat disappointing as compared to the results of a survey study conducted at campus D by the ALS project team in the spring of 2010 (Baek & Monoghan, 2010a, 2010b). In that questionnaire, 78.46% of students (492 out of 627 returned questionnaires) rated themselves likely to choose this new textbook option. This shows quite a high level of openness and a preference for the licensed eTextbook option, when less than half of the participants were familiar with this option.

One must exercise caution in directly comparing the data as the current data report "satisfaction" while the previous report "preferences." It is difficult to pinpoint one specific factor that would have influenced this phenomenon. The lower price of the eTextbook was a driving force behind the finding of high interest in eTextbooks (pilot testing results from the spring 2010 data). After using the eTextbook, only one-third of questionnaire respondents had a positive experience. This implies that the low price alone cannot bring students satisfaction with the eTextbook. A myriad of variables (e.g., student variables and eTextbook features) discussed here in the Findings section seem to contribute.

Students' perceptions of ease of using the eTextbook.

Over 53% (323 of 607) of students who responded to this question said that the
eTextbook was easy to use, while 22.1% (134) of students thought it was not easy to use
as shown in Figure 2. There was no statistically significant difference in the students'
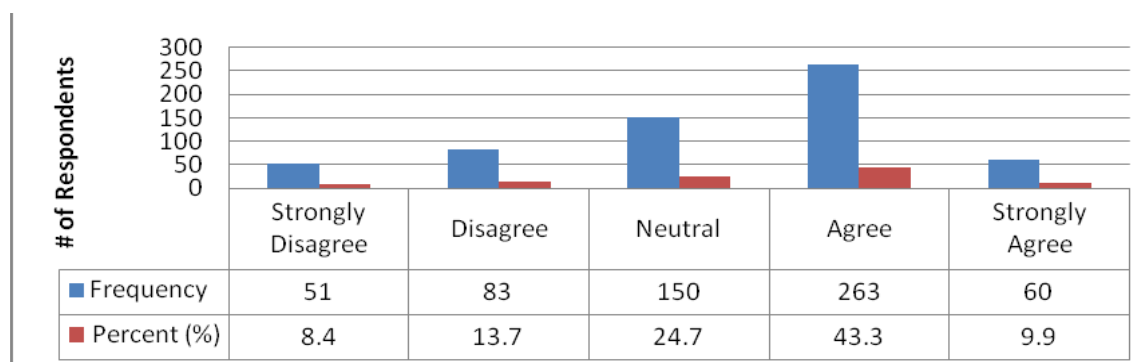perceptions toward ease of using the eTextbook between the two eTextbook providers.

# of Respondents	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
■ Frequency	51	83	150	263	60
■ Percent (%)	8.4	13.7	24.7	43.3	9.9

Figure 2. Students' perceptions of ease of using the eTextbook.

However, there was a statistically significant difference in students' perceptions of the
online version and the downloadable version. As shown in Table 2, students who used
an online version were more likely to perceive the process of initially accessing the
eTextbook as easy and overall were more likely to rate the eTextbook as easy to use than
students who used a downloadable version. In order to read the downloadable version,
students had to go through an additional initial step required to access and read the
downloadable version which required downloading the textbook company's application.

Table 2

Students Perceptions of eTextbook by Type of eTextbook Content Delivery

	Online		Downloadable		Statistically significant
	n	Mean rank	n	Mean rank	
Ease of initial access	214	156.95	79	120.04	$X^2(1, n = 291) = 11.99, p < .001$
Overall ease of use	213	154.33	78	123.24	$X^2(1, n = 291) = 8.64, p < .01$

Students' perception of recommending the eTextbook.

Students were unlikely to say they would use an eTextbook again or recommend one to a friend. However, those students who found the eTextbook easy to use were more likely to say they would use another or recommend one to a friend. Only about 16.7% of students agreed that they are likely to choose a class where the instructor requires them to buy an eTextbook license in the future. More than 49% of students did not agree with that statement.

	1	2	3	4	5
■ Frequency	171	129	206	75	27
■ Percent (%)	28.1	21.2	33.9	12.3	4.4

Figure 3. Likelihood students will return to an eTextbook course.

This sentiment was consistent when students were asked whether they would recommend a class that requires purchase of an eTextbook license to a friend. Students who strongly agreed or agreed accounted for 18% (108) of respondents while those who strongly disagreed or disagreed made up 45.6% (275) of 603 respondents as shown in Figure 3. Students' opinions did not vary significantly based on provider.

Variables that Are Related to Students' Perceptions of the eTextbook

This section discusses variables strongly related to students' perceptions of the eTextbook.

Students' comfort level reading a long text on a computer screen.

Students' comfort level reading a long text on a computer screen turned out to be a significant variable that statistically related to students' overall experience with the eTextbook they used. This variable was revealed as important in the questionnaire conducted in spring 2010 as well (Baek & Monaghan, 2010a, 2010b).

Crosstab (chi-square test) results and Kendall tau b (strength of association) will be discussed below. In the analysis, three categories were used instead of the original five Likert scale items, *agree* (*strongly agree* and *agree* were combined), *neutral*, and

disagree (*strongly disagree* and *disagree* were combined), to compare students'
comfort level as the independent variable.

As shown in Table 3, students' experiences with the eTextbook were significantly
different based on whether or not they felt comfortable reading a long text on a
computer screen. All of these comparisons were statistically significant at the $p < .001$
level. All of the relationships between students' opinions about the eTextbook and their
comfort level with reading a long text on a computer screen are positive and most of the
strengths of the associations between two variables were mid to large sizes. This means
that the more a student believes that s/he has a high level of comfort with reading a long
text on a computer screen, the more likely the student is to have favorable opinions
about experiences with the eTextbook. In other words, students' comfort level reading a
long text on a computer screen is one of the most important variables to consider in
eTextbook implementation as currently construed.

Table 3

*Students Perceptions of eTextbooks by Their Comfort Level Reading a Long Text on a
Computer Screen*

		Disagree		Neutral		Agree		Statistically significant	Relationship/ effect size (Kendall tau-b)
		n	%	*n*	%	*n*	%		
Price	Disagree	83	24.6	14	11.3	22	15.2	***	.16 (small)
	Neutral	75	22.3	31	25.0	16	11.0		
	Agree	179	53.1	79	63.7	107	73.8		
Ease of the purchasing process	Disagree	86	25.4	11	8.9	27	18.8	***	.16 (small)
	Neutral	89	26.3	33	26.6	20	13.9		
	Agree	163	48.2	80	64.5	97	67.4		
Ease of initial access	Disagree	172	50.9	14	11.4	16	11.0	***	.43 (medium to large)

	Neutral	88	26.0	48	39.0	21	14.5		
	Agree	78	23.1	61	49.6	108	74.5		
Satisfaction with the Internet delivery of the content	Disagree	250	74.0	36	29.0	31	21.4	***	.47 (medium to large)
	Neutral	76	22.5	77	62.1	73	50.3		
	Agree	12	3.6	11	8.9	41	28.3		
Understanding the content better	Disagree	286	85.4	66	53.2	48	33.1	***	.44(medium to large)
	Neutral	38	11.3	48	38.7	71	49.0		
	Agree	11	3.3	10	8.1	26	17.9		
Reading the content more	Disagree	181	53.9	44	35.5	43	29.7	***	.14(small)
	Neutral	78	23.2	63	50.8	69	47.6		
	Agree	77	22.9	17	13.7	33	22.8		
Changed study habits	Disagree	114	33.9	3	2.4	16	11.0	***	.34 (medium)
	Neutral	94	28.0	39	31.5	17	11.7		
	Agree	128	38.1	82	66.1	112	77.2		
Overall ease of use	Disagree	163	48.5	13	10.5	15	10.3	***	.41(medium to large)
	Neutral	1	32.4	57	46.0	41	28.3		

		09						
	Agree	64	19.0	54	43.5	89	61.4	
Overall satisfaction	Disagree	240	71.4	34	27.4	24	16.6	***	.47 (medium to large)
	Neutral	74	22.0	65	52.4	67	46.2		
	Agree	22	6.5	25	20.2	54	37.2		
Interest in taking an eTextbook required course again	Disagree	221	66.2	25	20.3	27	18.9	***	.45 (medium to large)
	Neutral	90	26.9	73	59.3	57	39.9		
	Agree	23	6.9	25	20.3	59	41.3		

*** $p < .001$

Students' comfort level using the Internet also statistically correlated to the students' experience with the eTextbook, however it had a much weaker relationship. Most of the strengths of the association of the variables were small, ranging from .09 to .21.

Individual eTextbook titles.

Students' perceptions of the eTextbook in the areas of ease of use and willingness to recommend were varied by the individual titles they used in the courses. Students' perceptions of ease of use were statistically different between individual eTextbooks chosen for each of the courses (X^2(21, n = 607) = 64.32, $p < .001$). There were 22 total textbooks used (each was assigned an individual number for purposes of calculation). As shown in Table 4, eTextbook #9 (*Human Resources Management*) had the highest mean rank (427.69) while eTextbook #6 (*Business Writing*) had the lowest mean rank (149.97). Students who used eTextbook #9 perceived the eTextbook as easier to use than the students who used eTextbook #6.

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Table 4

Students Perceptions of Ease of Use by Individual eTextbook Titles

	Top 3 mean ranks			Bottom 3 mean ranks		
	eTextbook	*n*	Mean rank	eTextbook	*n*	Mean rank
Overall ease of use	#9 Management course book	24	364.06	#6 Business writing course book	16	149.97
	#4 Communication course book	15	358.27	#14 Business statistics book	18	180.28
	#7 Financial management course book	15	350.83	#10 Mathematics book	10	192.50

This result seems to be aligned with students' comments in the open-ended questions, which suggested typing and calculating mathematical/statistical functions and formulae in the eTextbook was not as easy as in the printed book. A similar finding was noted in the Chen, Victorino, Birdsong, Menon, Tseng, and Smith study (2011). College students in a technical engineering course tended to be much less favorable toward the eTextbook than students in more theoretical engineering courses. The researchers inferred that technical difficulties with entering symbolic solutions and user interface influenced students' perception of the eTextbook they used.

In addition, students' perceptions about taking an eTextbook required course again ($X^2(21, n = 606) = 63.95, p < .001$) and recommending an eTextbook course to a friend differed depending on the individual eTextbook titles they used, and these results were statistically significant ($X^2(21, n = 601) = 81.37, p < .001$) as shown in Table 5.

Table 5

Students Perceptions of Retaking an eTextbook Required Course by Individual eTextbook Titles

	Top 3 mean ranks			Bottom 3 mean ranks		
	eTextbook	*n*	Mean ranks	eTextbook	*n*	Mean ranks
Interest in taking an eTextbook required course again	#7 Financial management	15	387.73	#6 Business writing	16	124.44
	#9 Management	24	364.06	#12 American government	38	207.55
	#8 Business calculus	18	355.94	#10 Mathematics	10	240.60
Recommending an eTextbook required course to a friend	#18 Business	8	407.38	#6 Business writing	16	107.03
	#9 Management	23	379.17	#12 American government	37	190.34
	#8 Business calculus	18	373.50	#20 Business	31	209.15

Perhaps most importantly, when students perceived the eTextbook as easy to use, they were more likely to take an eTextbook required course again and to recommend it to their friends. eTextbooks #7 and #9 were highly ranked in terms of ease of use and appeared again at high positions in the taking an eTextbook required course again question. The same principles apply to the lowest ranks; eTextbooks #6 and #10, which were ranked lowest in the category of ease of use, ranked lowest again in the taking an eTextbook required course again variable. eTextbook #6 was the lowest ranked in all three analyses. When students perceived the eTextbook as not easy to use, understandably, they were much less enthusiastic about future opportunities to use an eTextbook and about recommending it to their friends.

This finding is particularly significant and deserves our attention with regard to addressing the usability of eTextbooks including their interface/functional design. In order to increase students' adoption of an eTextbook and their subsequent positive attitudes toward that eTextbook, providing an eTextbook that is easy to use is crucial.

Students' ages and gender.

Most respondents were between 17 and 29 years old (93%, 603), but some were as old as 53. After dividing the students into two age groupings, 21 or younger (396, 60.7%) and 22 or older (256, 39.3%), a Kruskal-Wallis analysis of variance test was used to measure the relationship between students' experiences with the eTextbook as the dependent variable.

As shown in Table 6, overall, older students' opinions about, and experience with, the eTextbook were more positive than their younger counterparts'. Most of the differences between the two groups were statistically significant except the three that do not include X^2 values. This is similar to the finding that students in upper division courses tend to be more satisfied than students in general education courses with an eTextbook.

Table 6

Students Perceptions of eTextbooks by Age Group

	Age group				Statistically significant
	21 or younger		22 or older		
	n	Mean rank	n	Mean rank	
Price	371	284.73	228	324.84	$X^2(1, n = 599) = 8.04, p < .01$
Ease of the purchasing process	371	292.56	230	314.62	
Ease of initial access	370	284.59	229	324.91	$X^2(1, n = 599) = 8.39, p < .01$
Satisfaction with the Internet delivery of the content	370	286.09	229	322.48	$X^2(1, n = 599) = 6.64, p < .01$
Understanding the content better	371	292.98	229	312.69	
Reading the content more	371	283.39	226	324.63	$X^2 (1, n = 597) = 8.87, p < .01$
Changed study habits	370	290.50	228	314.11	
Overall ease of use	370	286.82	229	321.30	$X^2 (1, n = 598) = 6.24, p < .01$

Overall satisfaction	370	282.51	229	328.26	X^2 (1, n = 599) = 10.61, p < .001
Interest in taking an eTextbook required course again	370	283.88	229	326.04	X^2 (1, n = 599) = 9.05, p < .01
Recommending an eTextbook required course to a friend	367	280.53	227	324.93	X^2 (1, n = 594) = 10.15, p < .001

Even though a common general perception exists that younger generations use the Internet more, their focus on social networking and entertainment purposes may alter the impact of that more frequent use on the issues discussed in this study. As McGowan et al. (2009) found, students with more experience using electronic resources as academic resources may transfer their experience and skills to reading the eTextbook. In our study, students in the older group thought the eTextbook was easier to use than the younger group and had higher satisfaction and more positive attitudes toward the eTextbook and its use.

The type of course, general education course versus upper division, also impacted students' satisfaction with eTextbooks. Students who were enrolled in upper division courses in their majors were more satisfied than students in general education courses. In the Kruskal-Wallis analysis of variance test, there was a statistically significant difference in students' overall satisfaction depending on the nature of the courses (X^2(1, n = 605) = 3.84, p < .05) with a mean rank of 315.76 for the upper division courses and 288.86 for the general education courses. Some students may not be prepared to effectively utilize this technology and need to learn how to utilize the unique features of electronic textbooks before they can fully appreciate them (Petrides, Jimes, Middleton-Detzner, Walling, & Weiss, 2011).

Students' gender was correlated to students' willingness to take a course in which an eTextbook was required in the future, as shown in Table 7. This finding is consistent with McGowan et al.'s study (2009). Males were more likely to rate eTextbooks as highly preferred than females. They attributed this to males' tendency to be visual learners and eTextbooks' ability to provide a better visual sense than paper version textbooks (McGowan et al., 2009). This may also be related to males' greater interest in technology as compared to females.

Table 7

Students Perceptions of Retaking an eTextbook Required Course by Gender

	Male		Female		Statistically significant
	n	Mean rank	*n*	Mean rank	
Interest in taking an eTextbook required course again	239	320.53	366	291.56	$X^2(1, n = 605) = 4.23, p < .01$

Features students most and least like about eTextbooks.

The data on what students most and least liked about the eTextbooks were collected from the open-ended questions in the survey. As shown in Figure 4, 466 students answered questions regarding what they liked best (eTextbook Provider A: 323, 70%; eTextbook Provider B: 143, 30%). Students reported that they most liked the eTextbooks' price, accessibility/availability to read, light weight, and keyword search feature.
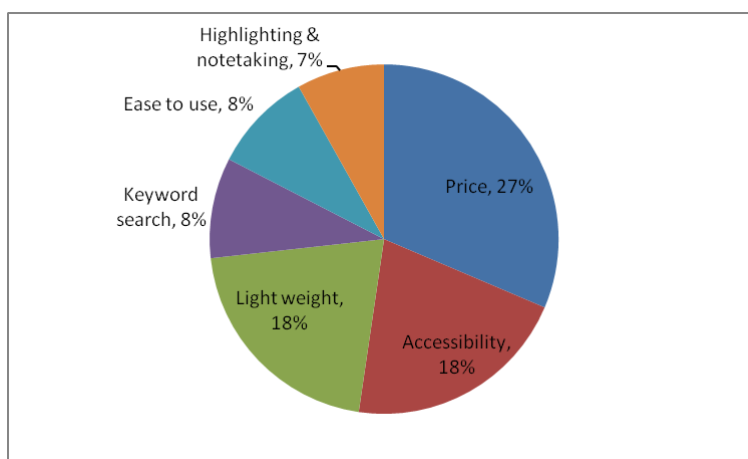
Figure 4. What students most like about the eTextbook.

Convincingly, the same results were shown (the exact same four features in almost identical proportions) in a separate analysis grouped by eTextbook provider as shown in Figure 5.
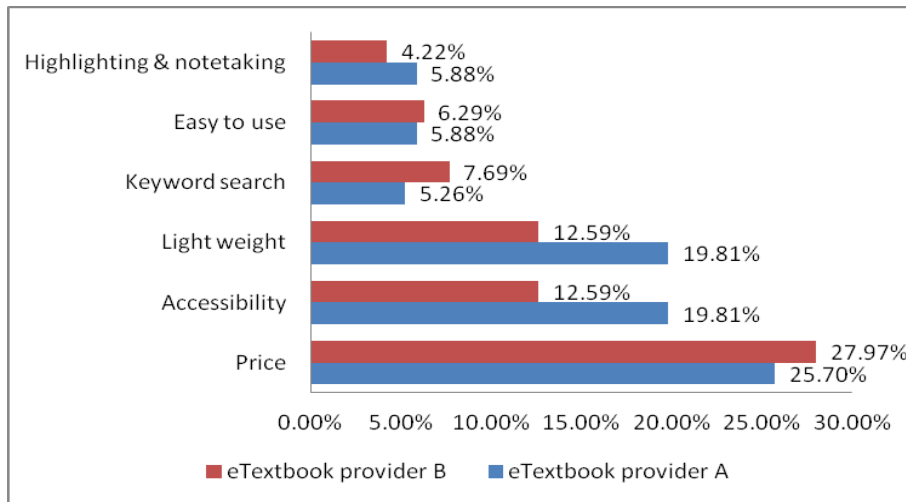
Figure 5. What students most like about the eTextbook by the eTextbook providers.

Four hundred and fifty students answered questions regarding the features they liked least about the eTextbook (eTextbook Provider A: 331, 74%, eTextbook Provider B: 119, 26%) as shown in Figure 6. What students least liked about the eTextbook was its low readability (relating to eye-strain and computer reading), limited accessibility, slow loading, lack of resale value, limited highlighting and note-taking features, limited downloading, and the purchasing process. Students chose accessibility/availability to read as their favorite and least favorite things about the eTextbook at the same time. They liked their ability to access the eTextbook anywhere and anytime, but disliked the fact that this is limited to places where the Internet is available.
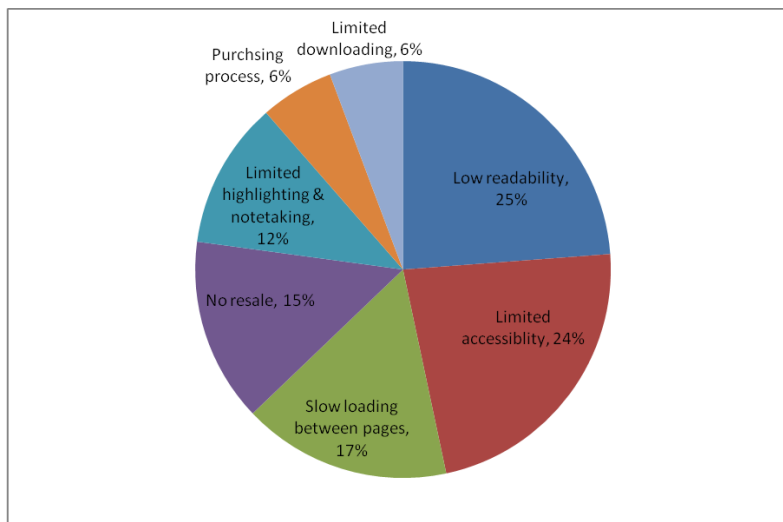
Figure 6. What students least like about the eTextbook.

As shown in Figure 7, the seven features students liked least were consistent between groups using eTextbooks from Provider A and Provider B, however the proportions differed. Campuses which used Provider A's eTextbooks reported greater dissatisfaction with slow loading and the purchasing process.
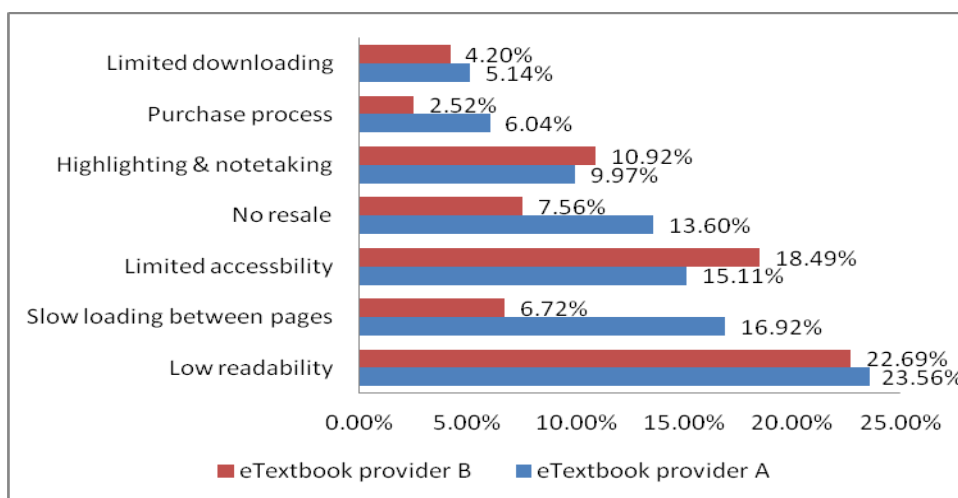

Figure 7. What students least like about the eTextbook by the eTextbook providers.

The students' satisfaction with the process of purchasing the eTextbook was described similarly by the statistical analysis as shown in Table 8. Students' experience of ease of purchasing the eTextbook did not differ statistically by campus, however it did vary by eTextbook provider.

Table 8

Students' Perceptions of Ease of the Process of Purchasing the eTextbook by Campus eTextbook Provider

	Campuses with eTextbook provider A		Campuses with eTextbook provider B		Statistically significant
	n	Mean rank	*n*	Mean rank	
Ease of the process of purchasing the eTextbook	422	294.95	185	324.63	$X^2(1, n = 607) = 4.04, p < .05$

Students at the campuses with eTextbooks from Provider B perceived the purchasing process to be easier than those students at the campuses with eTextbooks from Provider A. This requires cautious interpretation because this seemed to result from various issues related to the purchasing process, such as buying an access code at the bookstore, receiving incorrect codes and so not being able to access the book immediately, and so on, which may be campus specific, rather than issues directly linked to the eTextbook provider itself.

Conclusions and Recommendations

This study demonstrates that eTextbooks must be a high-quality, easy-to-use resource to serve as a viable textbook option for student learning. The easier students perceived the eTextbook was to use, the more willing they were to take a course in which an eTextbook is required in the future or to recommend one to a friend.

Overall student satisfaction with the eTextbook was 34%, a statistic which shows us that there is a long way to go to meet students' expectations. Even though students liked the eTextbook's price, price alone cannot be the driving impetus for, or a guarantee of, successful eTextbook implementation.

In order to make students' experiences more positive, quality material with a user-friendly design must be presented to the students. Several students made it abundantly clear in the open-response questions that having to read the textbook on a computer screen was their least favorite aspect of the eTextbook due to the potential strain on their eyes. Developing an easy-to-use interface may not be a direct answer, but it can definitely alleviate some of students' apprehensions. As many activity theorists (see Engeström [1987, 1993, 1999a, 1999b, 2000, 2005]; Leont'ev [1978]]; Nardi [1996]) have pointed out, if a new technology intervention fails to serve as a tool to naturally support users' work/performance it will become an additional object they have to learn.

While making eTextbooks as close to print books as possible in terms of their look and feel, eTextbooks need to differentiate themselves from their print counterparts by harnessing their strengths. For example, students liked the fast one-click keyword search feature that print books do not and cannot offer. Even though it was not included in the list of what students most liked about the eTextbook, many students mentioned in the open-response questions that they liked the extra learning resources the eTextbook offered, such as quizzes with instant feedback, music, video, narration, step-by-step homework guides with feedback, and web links related to the topic. This can help students better understand the content, which contributes to student learning and student satisfaction in positive ways.

Overall, older students were more satisfied with the eTextbook. Students with more experience using electronic resources as academic resources seem to be able to transfer

those skills to their interactions with the eTextbook. As result, older students think the eTextbook is easier to use than younger students; they have higher reported satisfaction and more positive attitudes toward use of the eTextbook. Younger students may benefit from a short instructional session with their faculty, discussing some strategies for the effective use of features and components available in the eTextbook. For example, this instruction may include information about how to use homework features and video/audio, how to use highlighting and note-taking features, how to plan ahead to read the eTextbook, how not to be distracted by other Web sites while online, and so on.

Many consider eTextbooks to be one of the most viable solutions to current issues involving college textbooks. In our study the students' satisfaction rate leaves us with many questions about how the eTextbook licensing option can be improved and what other ways students' needs can be better met. Instead of focusing on only one solution, other options such as print books (new, used, and rented) and open source textbooks (e.g., flatworldknowlege, http://www.flatworldknowledge.com/, DynamicBooks) as well as textbook financing programs and textbook swap programs need to be considered as well. A more affordable textbook option that allows faculty to customize the content of the book would be a great addition to any solution. eTextbook options may be workable solutions for high demand courses (Florida Department of Education, 2009). System-based educational institutions may consider working with individual campuses to secure a statewide purchasing agreement for eTextbooks, rather than having each campus pursue individual agreements, as a statewide purchasing agreement could result in greater cost-effectiveness.

Successful adoption of eTextbooks by large numbers of students requires a multifaceted approach. Students, faculty, staff, administrators, and eTextbook publishers/providers need to work together to develop high-quality eTextbooks (Student PIRGs, 2008, 2010; Young, 2009, 2010a, 2010b, 2010c). That combined effort will take us closer to an affordable textbook solution.

The current study has only examined the perceptions of students who participated in the survey. There was no mechanism applied to capture students' perceptions if they did not take part in the survey. Also, this study sampled students who used eTextbooks produced by only two eTextbook providers. Caution must be applied as the findings might not be transferable to students using other eTextbook providers.

Longitudinal studies of how eTextbooks impact students' perceptions and learning, especially cognitive processes that may be differently affected by textbook formats (print and eTextbooks), would meaningfully contribute to the knowledge base of eTextbooks. These studies may be focused on specific disciplines in conjunction with instructional strategies and different features of eTextbooks and eReader devices.

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De-Gendering in the Use of E-Learning

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Abstract

The starting point of the paper is the co-construction of gender and technology, that is, the theory that the usage of and the attitude to certain kinds of technology are a way to "do" one's gender. A survey is presented that supports the assumption that with the routinization of e-learning in higher education e-learning loses its character as a technology, which can be used for gender performance. With the routinization of its usage e-learning is becoming a gender-neutral tool with no outstanding technological appeal. However, though doing gender may disappear in certain fields the co-construction of gender and technology is still valid as basic structure. Furthermore, the results show that e-learning meanwhile supports the attitude we call *study as consumption*, that is, the expectation that the main e-learning features are usual services to be provided by the educational institution. This attitude is to be found among male and female students alike.

Keywords: Gender governance; e-learning; co-construction of technology; gender

Introduction

"Gender is a practice of improvisation within a scene of constraints. Moreover, one does not 'do' one's gender alone. One is always 'doing' with or for another, even if the other is only imaginary" (Butler 2004. p. 1). Technology is a major way of doing gender in Western countries and this is particularly true in Germany where the study described in this paper took place.[1] According to Wacjman (1991, p. 37) technology, that is particulary definitions of skill, guarantees a privileged position to men, so that it is rather a question of ideology and social constructions than of actual competencies possessed by men and women. Both dimensions (i.e,. technology and gender), or rather their relation to one another, are culturally determined. As can be seen for example from the gender relation in engineering courses, this relation is rather strong in cultures like Germany and much weaker in other cultures like Eastern Europe.

Hence the co-construction of gender and technology (Faulkner, 2001; Wajcman, 2004) is dynamic as it is based on the changing relation of these dimensions (cf. Gildemeister 2004; Lie, 2003; Schinzel, 1999). The point is that "doing gender" (West & Zimmerman 1987) is an on-going process that is based on the meaningful resources to be found within a certain social context. As a result, this co-construction can develop new forms while other forms disappear although this does not indicate that the co-construction is totally capricious. When a certain technology becomes part of everyday routine and does not possess outstanding tech-savvy features, it is inapt as a resource for gender differentiation even in a culture where there is usually a strong relation.[2] Such a technology has to have a more complex, more intricate appearance or image in order to demonstrate outstanding tech-savviness which, in itself, can be "loaded" with gender. Its usage must (seem to) imply specific expertise (which men like to claim they have) that is resistant to handling by novices (which women think they are). So, among other things, the gender potential of a certain technology is dependent on its routinization or general everyday usage (cf. Pasero, 1999, p. 13). Doing gender with technology thus means to use this (symbolic) field in order to perform one's identity, of which gender is a substantial part that therefore is to be performed.

E-learning is (or better was) to be considered the kind of technology by which gender can be done, and has been done. E-learning – also on the level of higher education, the level with which we are dealing here – looked like technology and there were pertinent discussions on how to deal with that technology from a gender or feminist perspective (e.g., Brunner 1992; Blum 1998). However, many e-learning features, like other ICT usages, which were considered gender-loaded some years ago, ceased to look like

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[1] The paper presents results of the project Das aufwändige Geschlecht (The arduous sex/gender) which was funded by the DFG (German Research Foundation) from 2007 to 2010.

[2] A study of Gunn (2003, p. 19) concluded: "The Web as a source of information and electronic mail as a medium of communication make these two emerging technologies increasingly practically relevant and interesting to women. It can then be argued that women's expressed interests in and judgments about computers are becoming more positive as a result of the technology's increasing pragmatic significance."

technology and are now taken for granted as being everyday routine. This gender gap is closing (Imhof et al., 2007). Accordingly, as e-learning ceases to be a specific technology it becomes less suitable for gender expression. Meanwhile the discussion on gender and e-learning in general seemed to have moved to regions or cultures where the implementation is more recent and e-learning is thus not yet routinized (e.g., Ong & Lai, 2006).

As a starting point for our analysis of higher education e-learning scenarios we assumed that the ever-increasing and necessary usage of e-learning would lead to a de-gendered routinization because it would lose its potential to express gender (for others and oneself). The effects of its all-pervasive influence in higher education – a consequence of the general necessity of having to use computers and the Internet for learning – resulted in a gradual disappearance of its potential for doing gender. With regard to e-learning, the possibilities to perform one's gender decreased where there was no potential to position oneself as being either tech-savvy or ICT averse.

So we did not look at gendering that is the reification of gender-related meaning within a certain context, but at the specific conditions for de-gendering due to routinization.

> Today, the difficulty of pinning down the arguments about gender and ICT can be exemplified by the way people often claim that boys/men are better at it, grasp it faster, etc. but then tend to add: 'maybe this is only a myth?' The point is that myths of this kind do exist and have effects. (Lie, 2003, p. 11)

Method

In order to afford manageable, methodological access to the relevant field, we focused on student self-estimation, for example with regard to intensity and competence of computer usage. These dimensions correlate with attitude to ICT as well as to gender. In particular, self-estimated ICT-competence, as control conviction, is able to express gender differences that may exist.

Due to the lack of resources for a long-term study, we had to generate a basis for comparison by carrying out analyses at four different German-speaking universities, each with differently developed e-learning scenarios. Those involved were the Albert-Ludwigs-University Freiburg, AKAD Hochschulen, Hochschule für Technik und Wirtschaft Berlin, and the University of Zurich.[3] At each of the universities, we

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[3] The project team consisted of researchers from the University of Freiburg and the Wissenschaftliche Hochschule Lahr, which is part of AKAD. Berlin and Zurich could be commited to support the project due to personal contacts. However Zurich was particularly asked to take part because of its advanced e-learning scenario.

questioned business students since business courses generally show an equal proportion of male and female students and also because the discipline in itself does not convey an inherent technology bias. (Within this sample group, age and income, which strongly influence ICT usage, are thus not so important.)

So the first of four project stages began with the analysis of the four different e-learning scenarios. In this context, the word scenario is used to express the learning-related computer and internet-based features, for example, the distribution of educational resources and study-related forms of communication as well as administrative and organisational processes implemented in online environments.

During the second stage, we developed and tested different questionnaires and an interview manual. This included a questionnaire for e-learning experts at the different universities relating to the application of e-learning implied in the four scenarios, a quantitative questionnaire, mainly for student self-estimation, and an interview manual for qualitative interviews with the students in regard to their understanding of e-learning.

The questionnaire on e-learning application was addressed to those persons who were responsible for the content and administration of e-learning at the four universities or the respective faculties. The questionnaire consisted of closed and open questions for example about the general online strategy of the university, possible off-line options available to the students in relation to particular issues, and the general acceptance shown by the students with regard to the e-learning scenario. There were further questions about the range of opportunities for e-learning in the given business courses. The main objective of this questionnaire was to determine the degree to which students are forced to use the administrative and educational e-learning components.

In the case of the student questionnaire, it consisted of 37 closed and open questions in six sections. In addition to relevant socio-demographic data, the instrument dealt with computer and internet habits, general and specific computer and internet competences, e-learning practices, the interaction between teachers and students, and how learning was organised at the student's university. The main objective of this questionnaire was to do a survey on the significance of self-estimated ICT-competence for e-learning practice and specifically to analyse these dimensions in relation to the different universities, that is, their development level of e-learning and the degree of usage necessity, and to gender.

The interview manual started off with an open request for a narrative about the interviewee's choice of study. From this initial question, the manual guided the course of the interview to touch on a series of specific topics: the organisation of everyday study-life, the choice of study subject(s), study motivation, experiences with e-learning both in general and with specific features, and habits dealing with internet surfing and new media. Up to this point, the interviewer had to avoid mentioning that the research project had a gender-related objective. This dimension was only disclosed in the final

part of the interview when the interviewee was asked for an opinion about different ICT-usage patterns in men and women.

During the third stage of the project, the various surveys were conducted at all four universities. In addition to the questionnaire on usage necessity, the project team also evaluated the structure of the e-learning scenarios so that in the fourth and final stage, the data could be analysed and documented as well as prepared for publication.

Questionnaire Results

The four universities differed horizontally, that is, concerning the variety of different e-learning features, as well as vertically, that is, concerning the depth of penetration of relevant tasks or the usage necessity of relevant features. Based on this differentiation, the four e-learning scenarios provided a basis for comparison.

The most elaborate scenario was to be found in Zurich where e-learning is a well-established and accepted component of teaching/learning in all departments. Both administrative and content-related digitalisation is far advanced often without an analogue alternative for the different tasks and features.

AKAD is built on a blended learning system with only block seminars for face-to-face teaching. Main administrative processes are organised online. However, due to the rather outdated e-learning environment and the strong focus on self-study using printed materials, content-related e-learning activities are limited.

In Berlin, a long-term e-learning strategy and relevant learning-related approaches did exist; however, a common e-learning environment, and thereby common usage necessities, were missing at the time of our study.

The e-learning scenario in Freiburg was the least developed in our comparison group. A clear overall strategy could not be identified so testing e-learning potentials was left up to individual initiative.

The further analysis was based on a sample of 530 completed student questionnaires which were distributed across the four participating universities to students from different business courses. The questionnaires were distributed in different ways to reach the students. The main way to gain questionnaires was by visiting lectures. In the introduction by the research staff the gender focus of the project was not mentioned to the students of these lectures. On these occasions the students were also invited to participate in interviews. Another way was a call for participation on the internet pages of the four universities. At the University of Zurich, there was, at the request of students, also an online questionnaire. In addition, students who volunteered for an interview were also asked to complete a questionnaire.

The questionnaires and interviews were equipped with an anonymous code, so it was possible to analyze the questionnaires of the 50 interviewed students separately. The data showed that these 50 students did not differ noticeably from the total of 530, as for example in the average time used for e-learning or in their self-estimated competence.

With regard to our initial hypothesis concerning de-gendering by routinization, we asked here, among other things, about the length of time the students spent on e-learning per week. The average value for all students was 2 hours and 46 minutes. Taken by gender, the average value for the female students was 2 h 57 min and for their male fellow students, 2 h 35 min. Differentiated by university, the average values were as follows: AKAD 3 h 8 min, Berlin 2 h 46 min, Zurich 2 h 38 min, and Freiburg 2 h and 32 min (Table 1). The fact that AKAD showed the highest average value is not surprising when one considers that AKAD offers blended learning courses. However, the differences between the other universities were minimal and after review with a *t*-test, the differences were not significant. Also the difference shown in the average value by sex was not significant. Even if the differences had been significant, as self-estimations of a rather abstract dimension (hours per week) the results would still not have been very conclusive.

Table 1

Length of Time Spent on E-Learning per Week

University	Average	*n*	Standard deviation
AKAD / WHL	3 h 8 min	122	3 h 1 min
HTW Berlin	2 h 46 min	115	2 h 30 min
Uni Freiburg	2 h 32 min	110	2 h 26 min
Uni Zürich	2 h 38 min	161	2 h 6 min
For all universities	2 h 46 min	509	2 h 31 min

The answers to our question, For what purposes (private and professional) do you use computers or the Internet?, proved more conclusive for our problem. The diversity of computer and internet usage was represented in 23 issues (22 given ones, plus one open response option). The items referred to relevant current tasks and applications in relation to general professional study and/or private activities, for example, from e-mail and video gaming, via downloading music and using social networks, to blogging and working on wikis. The focus here could not be on the differences pertaining to the single items because they were too specific. We were, however, interested in the sums of the

ticked issues. Differentiated by gender, the results were 12.47 out of 23 on average for the male students and 10.65 for the female students. This difference was significant by a *t*-test at a level of 95%. So the surveyed male students considered themselves to be more active than female students, that is, they ascribed a more varied ICT usage or more experience to themselves.

The results were also conclusive regarding the usage of various e-learning services at the universities. Here we asked questions on 15 services, such as *literature search, downloading seminar documentation, seminar registration, e-mail communication with fellow students, tutors, and lecturers,* and also on *online lectures* and *online lessons for home study*. The students could answer from 1 *(I do this regularly and often)* over 2 (*I do this regularly but not often*) and 3 (*I have done this before*) to 4 *(I have never done this)*. The resulting averages[4] provided the following results: Differentiated by universities, the differences between the smallest and largest means of the items were greater than the differences by gender.

This result could be confirmed for single items, for example, concerning literature search which showed results from the different universities as ranging from 1.99 (Zurich) to 2.82 (Berlin) (Table 2). With regard to sex, the range only extended between 2.27 (female) to 2.57 (male) (Table 3). For downloading seminar documentation the range was spread between 1.14 (Zurich) and 1.92 (AKAD). Differentiated by sex, the range was 1.35 (female) to 1.61 (male). Similarly for 'online lectures, by university, the span went from 1.96 (Zurich) to 3.61 (Freiburg) and by sex only from 2.77 (female) to 3.07 (male). As a last example concerning 'online lessons for home study the range by university extended from 2.11 (Zurich) to 3.22 (Freiburg) and by sex from 2.56 (female) to 2.71 (male). In the majority of the items used, the distribution was similar. We thus concluded that the differences found in the e-learning scenarios of the examined universities were much more characterized by the intensity of use of the available e-learning technologies than by gender. In addition, Zurich showed almost the lowest all round average values and thus the highest total usage. This goes hand in hand with the advanced digital supply structure and the lack of "off-line alternatives" available at the University of Zurich.

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[4] From a methodologically rigorous point of view it is not allowed to calculate an average of ordinally scaled data (though when summing up a set of items, it is quite common). Nevertheless, we took averages because the values show interesting trends.

Table 2

Use of E-Learning-Tools for Different Activities Separately for University

Use of e-learning-tools for ...	AKAD	HTW Berlin	Uni Freiburg	Uni Zürich	All universities
Literature search	2.8 sg F Z	2.82 sg F Z	2.18	1.99	2.41
Query the library account / Mark of books	3.25 sg B F Z	2.87 sg F Z	2.43	2.43	2.72
Access to online information tools (e.g., online journals)	2.86 sg Z	2.85 sg Z	2.64 sg Z	2.17	2.59
Download of event materials	1.92 sg F Z	1.72 sg F Z	1.2	1.14	1.48
Register to events	1.32 sg B F	1.81 sg F Z	1.56 sg Z	1.24	1.46
Access to the lecture directory	1.95 sg F Z	1.81 sg F Z	1.4 sg Z	1.25	1.57
Chats to communicate with students	2.69 sg B F	3.08 sg F Z	3.35 sg Z	2.54	2.88
Chats to communicate with lecturers / tutors	2.97 sg B F	3.37 sg F Z	3.56 sg Z	3.1	3.23
E-mail communication with fellow students, tutors, and lecturers	2.33 sg F	2.55 sg F Z	2.9 sg Z	2.31	2.5
Online lectures	3.59 sg B Z	2.9 sg F Z	3.61 sg Z	1.96	2.91
Online educational offers for self-studies	2.74 sg F Z	2.69 sg F Z	3.22 sg Z	2.11	2.63
Online seminars	3.36 sg F Z	3.42 sg F	3.8 sg Z	3.57	3.54
Formation of working groups	3.4 sg F Z	3.41 sg F Z	3.82 sg Z	3.08	3.39
Access to student-organized platforms	3.08	3.06	3.24	3.14	3.13
Online solving tasks	2.73 sg F Z	2.9 sg Z	3.05 sg Z	2.3	2.71
Average of all services	2.73	2.75	2.8	2.29	

Note: Self-disclosures from 1 = *I use regularly and often* to 4 = *I have never done*. The differences in the average were tested on a 97.5 percent-interval for significance; "sg" means differences are significant in the average to B = HTW Berlin; F = Uni Freiburg; Z = Uni Zurich.

Table 3

Use of E-Learning-Tools for Different Activities Separately by Sex

Use of e-learning-tools for ...	Female	Male	All students
Literature search	2.27 sg	2.57	2.41
Query the library account / mark of books	2.53 sg	2.93	2.72
Access to online information tools (e.g. online journals)	2.53	2.65	2.59
Download of event materials	1.35 sg	1.61	1.48
Register to events	1.37 sg	1.55	1.46
Access to the lecture directory	1.47 sg	1.68	1.57
Chats to communicate with students	2.8 sg	2.96	2.88
Chats to communicate with lecturers / tutors	3.16 sg	3.31	3.23
E-mail communication with fellow students, tutors and lecturers	2.43	2.57	2.5
Online lectures	2.77 sg	3.07	2.91
Online educational offers for self-studies	2.56	2.71	2.63
Online seminars	3.57	3.5	3.54
Formation of working groups	3.37	3.41	3.39
Access to student-organized platforms	3.14	3.13	3.13
Online solving tasks	2.56 sg	2.87	2.71
Average of all services	2.53	2.7	

Note: Self-disclosures from 1 = *I use regularly and often* to 4 = *I have never done*. The differences in the average were tested on a 97.5 percent-interval for significance; "'sg'" means differences by female / male are significant in the average.

It was also remarkable that on average the female students assessed themselves as being more active in the usage of e-learning than their male counterparts. Based on our general hypothesis, this may be explained by the fact that e-learning in higher education is understood as learning rather than technology, thus fitting even more easily into female self-concepts.

In a further part of the questionnaire, students had to answer questions concerning their computer skills. Using Cronbach's alpha for these questions, we developed 21 items which we divided into the three variables: *competency in standard software, competency in media design,* and *computer skills mastery.*[5] The given items were for example: I have a good overview of the data on my computer; I am able to arrange documents and essays in an attractive way by using a word processor; I find it easy to solve computer problems. The students were able to respond with 1 *(is not the case)*, 2 (*is rather not the case*), 3 (*is rather the case*), and 4 *(is the case),* so that conformity in the general format signified relevantly high self-confidence. The three clusters extracted from the results showed the following summary results: Concerning competency in

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5 The competency in standard software was determined by the following items:
- I have a good overview of the data on my computer.
- I am able to effectively protect my computer from viruses and hackers.
- I am able to create essays by using attractive and convenient word processing programmes.
- I am able to make a well-prepared, computer-based presentation of attractive design.
- I am able to process and visualize by using spreadsheet numerical data.
- I am able to send e-mails with attached files to one or more persons using an e-mail programme.
- I am able to find the information I am searching for quickly by using the internet.
- I am able to further process by using image-processing programme, existing images or photos.

The *competency in media design* was determined by the following items:
- I am able to create by using graphics programmes, clear diagrams, attractive invitations or posters.
- I am able to take, cut and edit by using audio software sounds, language or music, so as to create an attractive audio track.
- I am able to cut and edit by using video editing software digital videos, so as to create an attractive video track.
- I am able to burn CDs and DVDs by using burning software and to create matching cover and stickers.
- I am able to create web pages attractively and clearly and to publish the pages in the internet.
- I am able to write smaller programmes in at least one programming language.

And the variable *computer skills mastery* was determined by the following items:
- I find it easy to understand new working methods with the computer, and to understand new programmes.
- I think I can solve problems that might arise while working with the computer.
- I still believe I have a good competence level of computer usage even after experiencing a time of failure during usage.
- I have a good feeling when it comes to my computer skills.
- I can change settings (for example system settings) on the computer by myself and also customize, without having to consult anyone.
- I find it easy to solve computer problems.
- I think that I am good at explaining a computer programme to others.

standard software there was no significant difference between the sexes. Around 98% of male students and around 96% of their female fellow students thought that they were (rather) competent in this field. Regarding the variable competency in media design, students' answers aggregated as follows: More than 50% of male students but only 27% of their female fellow students considered themselves (rather) competent. Finally, concerning computer skills mastery, 87% of male students assumed themselves to be (rather) competent but only 66% of female students did so.

These results can be interpreted in line with our hypothesis as follows: In everyday routinized activities (including everyday problems) computers and the Internet are merely tools with no outstanding technological appeal and are thus no longer suitable for differential gender performance. However, when the activities and applications are no longer part of everyday routine and problems appear to lack transparency and to be uncontrollable, ICT again becomes a gender biased technology suitable for expressing gender differences. Consequently, computer buffs and nerds are still typically male.

Using a little interpretational boldness, further interesting results can be found in this data. We asked questions on the diversity of computer and internet usage and the answers revealed the above-mentioned results. On that basis, we examined the *diversity of computer use* in regard to correlations between/with the three competence classes. For this purpose, diversity of use was split into five categories. The first category included those students who use the computer with maximum diversity, while the fifth category included the students who use the computer with minimal diversity. The second to fourth categories were the gradations in between. We also categorized the three self-rated skills into four categories. Here, the first category included students who assessed their skills as being very low while the fourth category included students who assessed their skills as being very high. The second and third categories were the gradations in between. They showed the following results: Spearman correlation, that is, the coefficient measuring the strength of the correlation, between diversity of computer use and competency in standard software, 0.345;[6] Spearman correlation between diversity of computer use and competency in media design, 0.366; Spearman correlation between diversity of computer use and computer skills mastery, 0.424. Not surprisingly, there was overall a mild to medium correlation between the diversity of computer use and the self-rated computer skills since these items can be seen as being mutually related. This means, if the user assesses his competence high, he also assesses his diversity of use high.

However, viewing this from our basic assumption regarding the importance of self-assessment of competences for usage of technology, the data shows an interesting differentiation in relation to gender: Spearman correlation between diversity of use and competency in standard software is 0.417 (female) and 0.300 (male). Spearman

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[6] The correlation has a negative sign because of the categorization in the diversity (the value for high diversity is 1, the value for low diversity is 2. In comparison to this, a low self-rated skill = 1, and a high self-rated skill = 4). We have omitted the sign for better understanding.

correlation between diversity of use and competency in media design is 0.381 (female) and 0.282 (male). Spearman correlation between diversity of use and computer skills mastery is 0.443 (female) and 0.351 (male). So correlation between the self-assessed competences and the diversity of usage for female students is always slightly stronger than for the male students. Of course, this small difference could be considered as not particularly noteworthy. However, based on Hagemann-White's (1993) assumption that the regular male behavior is dominant and a part of the co-construction of gender and technology, the slight twist in the data makes sense. Consequently, men just go ahead and use technical stuff self-confidently without bothering too much about evident competences; whereas, women tend to use applications only if they really consider themselves to be competent, or if they consider themselves to be competent through having gained the relevant experience. So, even where at the surface gender differences cease to exist the co-construction of gender and technology can still be valid as a basic structure.

Interview Results

As mentioned, in addition to the questionnaire we interviewed 50 students from the four universities.

Table 4

Individual Interviews by Location and By Sex

By location and by sex	Individual interview $N = 50$
AKAD	14 / 28.0%
Berlin	12 / 24.0%
Freiburg	14 / 28.0%
Zurich	10 / 20.0%
Women	26 / 52.0%
Men	24 / 48.0%

The qualitative analysis of the interviews yielded a new point of view on the problem of gender and e-learning because, first of all, it revealed that students in general take a very pragmatic approach to their studies. Students have acquired the perspective of a consumer who estimates e-learning as being an everyday service based on a cost-benefit-analysis, that is, it becomes a question of time, effort, and relevance for one's course (cf. Schirmer et al., 2011). This study-as-consumption attitude includes a set of

relevant aspects: the avoidance of unnecessary time expenditure along with the expectation that the whole learning environment is designed to make pre-selected learning resources readily accessible. This implies that e-learning is regarded as a potential prerequisite for implementing and organising a study process that is as effortless (and thus as individual) as possible. The optimum process can thus be based on the learning resources that the (male or female) student receives from his university or professor and which adequately fulfil the requirements, hence saving the time involved in having to search for and find further materials.

This attitude may be reason to lament the decline of (learning) culture but it fits into our basic hypothesis since there is no difference in attitude between the sexes. The routinization (and kind of commodification) of e-learning in this higher education framework supports the proposition that it has lost its technology appeal and thus its suitability for expressing gender differences. This assumption is supported by the fact that the interviewees themselves consider e-learning as an everyday routine devoid of salient tech-savvy features as well as by the impression that computer and Internet merge into a quasi-natural information-technological unity.

However, in regard to this usual everyday technology, there are still fields in our interview data where conceptual tension can be found. One field where such tension or ambivalence shows up is the issue of possible dependency, that is, the dependency of human tasks on technology. Here, there is a tipping point between efficiency or flexibility on the one side and inevitability or habitualization on the other. The question arises as to whether it is still possible to spend at least some leisure time without the computer. A similar tension can be found in the discussion as to whether e-learning fosters or constrains communication. This problem has to be understood against the backdrop of the norm whereby face-to-face lectures or seminars are still the salient paradigm of academic learning, involving interaction between teacher, student, and fellow students at a personal level. From this perspective (of the mainly average German student) e-learning features have only a supportive or complementary function.

Conclusion

Almost two-thirds of the current customers of Big Fish Games, a major provider of download games, are female (Hegarty, 2012). Women are no longer reluctant to use video games, to download and install them. It has become an easy-to-do routine which provides fun. It is not a task loaded with technology anymore. Of course the usage patterns of video games can still be substantially different between the two genders. Our research however has also shown that in the case of e-learning in higher education the general usage patterns become similar. The more e-learning gains the status of an everyday learning resource, the less students (can) use it to perform their gender identity.

Overall the quantitative results of our questionnaire based survey and the qualitative results of our interview series show a common consequence: E-learning has largely lost its specific gender bias in everyday use at universities. Therefore in relation to the theory of co-construction of technology and gender where the technology appeal of e-learning is no longer valid, e-learning is rather inapt for gender construction via an identification of the individual as technophobe or technophile. Beyond that, the interview statements show a study-as-consumption attitude among students of both genders that takes e-learning as a service to be provided by the educational institution. Partially this attitude goes along with the concern that computers impair personal communication and communality.

Finally, our results imply that measures intended to compensate gender biases from a perspective of techno-governance or something similar can – in the long run – make themselves dispensable. It can be assumed that gender sensitive design of e-learning-resources (e.g., Mattern, 2009) has supported the processes of gender neutral routinization, but meanwhile it is losing relevance. Rather, the service orientation, inherent in e-learning, which fosters the study-as-consumption attitude, seems to be a critical issue if one is to conceive academic education as a means to achieve independence and emancipation of both women and men.

For the future it is thus to be expected that many more fields, also other than technology, which still show divergent gender performance will change in this respect. For instance the field of economic competences has long been a field where gender differences – similar to technology expressing less social power of women – were prevalent. Girls and women had less knowledge and more negative attitudes to economic phenomena (e.g., Hirschfeld et al., 1995). Meanwhile – with increasing social power of women – there are competence tests that do not show significant gender differences (Macha & Schuhen, 2013). Gender can be "undone". This does not mean that gender as such should be undone. As an essential part of our identity this would not be possible anyway. However undoing gender can be considered a positive process where gender performance aligns with other social structures (e.g., technology or economy) in a way that one gender is disadvantaged in relation to another.

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Development of Reflective Thinking through Distance Teacher Education Programs at AIOU Pakistan

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Abstract

The current study aims to investigate the possibilities of developing reflective thinking among learners through distance education programs. The case of Allama Iqbal Open University (AIOU) Islamabad, Pakistan is examined to achieve this task. The study is based on Mezirow's theory of reflective thinking, which divides thinking in four categories. The *Questionnaire of Reflective Thinking* (QRT) developed by Kember et al. (2000) based on Mezirow (1991) was administered to 450 AIOU students. The thinking and learning practices of students governed by their habitual actions, understanding, reflection, and critical reflection are statistically examined to meet the research objectives. Findings reveal that AIOU teacher education programs have a stronger tendency to promote understanding and reflective thinking among learners. The need to integrate content for developing critical reflection among learners is highlighted. The study also discovers the significant impacts of students' job status and previous qualifications on their thinking patterns.

Keywords: Habitual action; understanding; reflection; critical reflection

Introduction

Developing reflective thinking among learners is a fundamental aim of modern education. Dewy (1933, p. 9) defines reflection as "active, persistent and careful consideration of any belief or supposed form of knowledge in the light of grounds that support it and the further conclusions to which it tends." Schon (1995) and Rodgers (2002) make additions to Dewy's perspective offering the concept of "reflection in problem-solving." Reflection in problem-solving involves rethinking and reconsiderations of past events and experiences with the intention of gaining better and more refined solutions in future. Mezirow (1991) is more elaborative in defining reflection. He asserts that making "meaning" of any experience includes sensing and interpreting. Learning refers to the subsequent use of these meanings in decision-making. Mezirow hypothesizes that "meaning schemes" generate individuals' habitual actions which form and govern people's perspectives, assumptions, and decisions. People face different challenges including epistemic, psychic, and socio-cultural distortions, while generating and governing perspectives and decisions. Reflection, in Mezirow's view, refers to correct these procedural distortions whereas "critical reflection" challenges bases and presuppositions of generated "meanings" and "perspectives". Kember et al. (2000) derive four major states of thinking from Mezirow's theory, that is, habitual actions, understanding, reflection, and critical reflection.

Dinkelman (2000) determines that in educational setup, a teacher's role is more crucial and multi-dimensional in promoting reflective thinking. She has responsibility to protect her decisions from distortions as well as assess and reassess the basics of her academic decisions and instructional practices. Takona (2002) furthers that she evaluates students' attaining of thinking expertise and documents their school record. It is also her responsibility to sharpen reflection and critical reflection among students so that they can perform effectively in their future lives.

The question of how effectively teacher education institutions are preparing reflective teachers is gaining importance in contemporary research. Universities and teacher education institutions are attempting to make their programs more conducive for creating reflective thinking skills among graduates. In Pakistan, teacher education programs are offered at different levels. Allama Iqbal Open University (AIOU) Islamabad offers a variety of teacher education programs through postal correspondence, the Internet, radio, and television broadcasting. Curricular designs of AIOU teacher education programs comprise assignments, tutorial meetings, and workshops. Students are bound to submit two assignments and attend two day workshops (accumulatively 10 – 12 teaching hours) for each three credit hours course. Students are lectured basic concepts and contents of the courses in workshops. The current study aims to assess the presence of reflective thinking among prospective teachers getting training at AIOU Pakistan and examine the role of concerned syllabi in developing the four levels of thinking among student teachers.

The Current Study

The present research established its foundations on Mezirow's theory of reflective thinking. Mezirow asserts three major kinds of thinking, that is making meaning (schemes and perspectives), reflection, and critical reflection. He adds that making meaning is the result of habitual expectations (that are based on previous experiences) or understanding (assimilation and interpretation of new experiences). In the current study we evaluated how the AIOU teacher education syllabi promoted the four thinking categories (i.e., habitual actions, understanding, reflection, and critical reflection). Examining the impacts of students' previous education and employment status on different phases of their thinking was also accepted as a supplementary objective of the study.

The AIOU Pakistan is among the largest universities in the world according to active enrollments. Development of reflective thinking is an essential objective of education. It gains more importance in the case of teacher education programs due to the significant and diversified role of teachers in educational organizations. A case study of AIOU strengthens the tradition of evaluating university programs on the basis of their potential to promote higher order thinking among students.

Research Questions

The following research questions were formulated to facilitate data analysis and achieve the research objectives.

1. How cognitively do AIOU students deal with their study programs?
2. To what extent are AIOU teacher education programs supportive in developing reflective thinking among learners?
3. What are the impacts of students' previous qualifications and employment status on their thinking choices?

Research Methodology

An inquiry of two existing phenomena (students' thinking practices and the role of the AIOU teaching-learning process in promoting these practices) was the focus of this research. Viewing the non-experimental descriptive nature of the study, a survey method was adopted to collect the required information (Johnson & Christenson, 2010). The AIOU offers undergraduate, graduate, and postgraduate teacher education programs with multiple entry and exit points. These programs prepare teachers to educate students from primary to university level. Students of undergraduate and graduate teacher education programs are trained to teach primary, elementary, and secondary classes. However graduates of postgraduate courses (Master of Education

and Master of Arts in Education) are eligible to teach from primary to university level. The current study preferred to concentrate on the AIOU postgraduate courses of teacher training viewing the diversity of their curricula and the significance for the Pakistani educational system.

Multistage sampling was used to select the sample. Researchers selected nine out of 36 country wide AIOU regional centers as a convenience sample located at districts Bahawalpur, Rahim Yar Khan, Multan, Dera Ghazi Khan, Sargodha, Jhang, Sahiwal, Miawali, and Attock. From each regional center, fifty students attending workshops of their terminal semesters were randomly selected ($n = 9 \times 50 = 450$). Four hundred and twenty-three future teachers returned the filled instruments. Although a sample size of 200 is considered to be reasonable for descriptive, correlational, and regression research designs a standard error of the mean (SEM) was calculated to estimate how the mean of the sample is related to the mean of the underlying population (Fraenkel & Wallen, 2007; Kelley & Maxwell, 2003; Kenny, 2011; Nagele, 2003). The mean score of the ages of 399 respondents was 29.09 years; the remaining 24 students did not give their ages. Age of the respondents ranged from 20 to 48 years. Sixty-four percent of the respondents were female.

A major limitation of the current study is the generalizability of its findings. Since the respondents were selected from nine regional centers of AIOU, statistical conclusions of the current study were applicable to the student teachers attending workshops of their terminal semesters in these centers. Generalization of the research findings to the student teachers attending workshops at other regional centers is not possible.

Development of a valid and reliable research instrument on the basis of Mezirow's theory of reflective thinking was the most important phase of the current study. A review of the related literature, however, demonstrated that the *Questionnaire for Reflective Thinking* (QRT) developed by Kember et al. (2000) was relevant, valid, and reliable to meet the objectives of the current research. The QRT is based on the writings of Mezirow (1991). Kember et al. claim that the four subscales of the QRT assess four levels of reflective thinking (i.e., habitual action, understanding, reflection, and critical reflection). Characteristics of each level of thinking as expressed by Kember et al. are described here :

1. Habitual action: Activity that is learnt through frequent use. Later, it is performed automatically or with little conscious thought.
2. Understanding: Thoughtful activity of individuals in which they use their existing knowledge and get comprehension of different things/phenomena. Kember et al. (2000) elaborate that the construct "understanding (U)" comprises an understanding of a concept without reflecting upon its significance in personal or practical situations.
3. Reflection: The critique and appraisal of assumptions about the content or process of problem solving. It differentiates problem posing from

problem solving and raises questions regarding the validity of the problems' solutions.

4. Critical reflection: This is a profound level of reflection. Kember et al. elaborate that it involves testing of a premise. It reviews reflection evidence on the bases of conscious and unconscious prior learning. This level of reflective thinking is not observed frequently.

Kember et al. reported the values of Cronbach alpha as 0.621, 0.757, 0.631, and 0.675, respectively, for the constructs habitual action (HA), understanding (U), reflection (R), and critical reflection (CR). However the current study demonstrated Chronbach alpha values of 0.610, 0.632, 0.690, and 0.741 for the constructs respectively. Standard errors of the means (SEMs) for the four subscales were estimated at 0.023, 0.021, 0.021, and 0.025 relatively, which reveals strong narrowness between the sample and the underlying population means for the constructs. A brief introduction of the study, research objectives, scale, and subscales including the four levels of thinking was delivered to the respondents before administering the tool. The scale was administered to the sampled students converting it from a five to a four point Likert Scale from *strongly disagree* to *strongly agree*. Data were collected in the spring semester 2012.

Findings

Findings reveal that distance learners of AIOU teacher education programs support the idea that if they follow the lecturers and remember handout material, they do not have to think too much. In contrast, the learners oppose the statements that in their course they do things so frequently that they start to do these activities without thinking about it and they have a habit of doing so. The mean score of 2.36 for the construct "habitual thinking" demonstrates that, accumulatively, the AIOU learners have less attention to depend on their habitual actions (Table 1).

Table 1

Students' Thinking Practices Governed by Habitual Actions

Sr. #	Statement	Mean
01	When I am working on some activities, I can do them without thinking about what I am doing.	1.90
02	In this course, we do things so many times that I started to do them without thinking about it.	1.77
03	As long as I can remember handout material for examinations, I do not have to think too much.	2.63
04	If I follow what the lecturers say, I do not have to think too much on this course.	3.15
	Habitual action	2.36

Data further show that the distance learners support the idea of promoting AIOU students' understanding through their studies. Mean scores of 3.43, 3.57, 3.35, and 2.99 for the four statements of the construct "understanding" reveal the respondents' strong agreement in this regard (Table 2). The four statements demonstrate that the AIOU teacher education program requires understanding of the course concepts and study materials. Understanding is also considered necessary for success in examinations. The mean score representing the students' responses on the entire construct "understanding" is 3.34. It supports the notion that AIOU teacher education programs are conducive for generating understanding of content among the learners.

Table 2

Students' Thinking Practices to Gain Understanding

Sr. #	Statement	Mean
01	This course requires us to understand concepts taught by lecturers.	3.43
02	To pass this course I need to understand the contents.	3.57
03	I need to understand the material taught by the lecturer in order to perform practical tasks.	3.35
04	In this course I have to continuously think about the material I am being taught.	2.99
	Understanding	3.34

Findings demonstrate that the mean scores of students' responses on the four statements of the construct "reflection" are 3.07, 3.33, 3.47, and 3.63 (Table 3). It shows that distance learners of the AIOU teacher education programs have strong intentions to question the procedural process of problem solving and decision making adopted by themselves or others. A majority of them rethink and re-appraise their previous experiences with the objective to learn and improve their thinking practices. The mean score revealing the respondents' reflection is 3.63. It shows a strong reflective attitude among the prospective teachers studying under the AIOU distance learning program.

Table 3

Students Thinking Practices Governed by Reflection

Sr. #	Statement	Mean
01	I sometimes question the way others do something and try to think of a better way.	3.07
02	I like to think over what I have been doing and consider alternative way of doing it.	3.33
03	I often reflect on my actions to see whether I could have improved on what I did.	3.47
04	I often re-appraise my experience so I can learn from it and improve my next performance.	3.63
	Reflection	3.38

Table 4 shows the mean scores of 3.13, 2.94, 3.08, and 3.13 for the four statements of the construct "critical reflection", indicating that the AIOU teaching course supports the learners to challenge their firmly held ideas and help them to discover their underlying faults. The learners accept that they changed their normal way of doing things as a result of this course. Accumulative mean score of the construct "critical reflection" is 3.07, which reveals that a majority of the students possesses critical reflection.

Table 4

Students' Thinking Practices to Gain Critical Reflection

Sr. #	Statement	Mean
01	As a result of this course, I have changed the way I look at myself.	3.13
02	This course has challenged some of my firmly held ideas.	2.94
03	As a result of this course I have changed my normal way of doing things.	3.08
04	During this course I discovered faults in what I had previously believed to be right.	3.13
	Critical reflection	3.07

Comparison among the student teachers' responses in the four subscales demonstrates that the majority of them avoid making decisions through habitual actions. Data reveal that the assertion to use reflection and understanding in curricular designs of AIOU teacher education programs is stronger than promoting habitual actions and critical reflection (Table 5). The students avoid making decisions on the basis of habitual action whereas, to some extent, they support critical reflection. The presence of critical reflection among the distance learners is lower than reflection and understanding.

Table 5

Presence of Four Levels of Thinking in AIOU Learners

	Habitual action	Understanding	Reflection	Critical reflection
Mean scores	2.36	3.34	3.38	3.07

The AIOU offers distance learning programs to employed and unemployed learners. To find out the impacts of students' employment status on their thinking practices, *t* test was applied. Findings demonstrate that the *t* values of -3.248, -3.320, and -3.964 for habitual action (HA), understanding (U), and critical reflection (CR) respectively are significant at the level of 0.001 (Table 6). However the *t* value for the construct reflection (R) is insignificant.

Table 6

Impact of AIOU Students' Employment Status on their Thinking Patterns

Subscale	Status	N	Mean	t	M. D.	d
Habitual action	Employed	300	2.32	-3.248*	-0.167	0.73
	Unemployed	123	2.48			
Understanding	Employed	300	3.30	-3.320*	-0.144	0.72
	Unemployed	123	3.44			
Reflection	Employed	300	3.37	-0.447	-0.021	0.18
	Unemployed	123	3.39			
Critical reflection	Employed	300	3.02	-3.964*	-0.190	0.73
	Unemployed	123	3.21			

Note: N = sample size, t = t value, M. D. = mean difference, d = Cohen's d (effect size)

*the value is significant at the level of 0.001

Values of Cohen's d, representing the impacts of students' employment status on their thinking patterns, are 0.73, 0.72, and 0.73 for habitual action (HA), understanding (U), and critical reflection (CR) respectively (Table 6). It reveals a medium effect size of students' employment status on the three subscales of QRT. The students who are unemployed are more active in habitual action (HA), understanding (U), and critical reflection (CR). However data do not reveal a significant impact of employability on students' reflection.

Table 7

Impact of AIOU Students' Previous Education on their Thinking Patterns

Subscale	Previous Education	N	Mean	t	M. D.	d
Habitual action	B.A./B.Sc.	148	2.36	-0.118	-0.006	0.23
	M.A./M.Sc.	275	2.37			
Understanding	B.A./B.Sc.	148	3.45	4.119*	0.176	0.88
	M.A./M.Sc.	275	3.27			
Reflection	B.A./B.Sc.	148	3.28	-3.704*	-0.152	0.83
	M.A./M.Sc.	275	3.43			
Critical reflection	B.A./B.Sc.	148	3.20	3.830*	0.184	0.71
	M.A./M.Sc.	275	3.01			

Note: N = sample size, t = t value, M. D. = mean difference, d = Cohen's d (effect size)

*the value is significant at the level of 0.001

Findings reveal that the t value showing the effect of students' previous education on their habitual actions is insignificant. However, the t values to demonstrate the impacts of previous education of distance learners on their understanding (U), reflection (R), and critical reflection (CR) are 4.119, -3.704, and 3.830. These values are significant at the level of 0.001. Values of Cohen's d, 0.88 and 0.83, show that students' previous education has large size effects on their understanding and reflection, whereas the effect size of previous education on distance learners' critical reflection is medium as depicted by Cohen's d value of 0.71. The t values and mean differences show that the impact of students' previous education is positive on the subscales of understanding (U) and critical reflection (CR), whereas it is negative on the scale reflection (R).

Discussion

Findings reveal that the students accumulatively discourage the idea of using habitual actions in their study matters. Course requirements of the AIOU program and syllabi compel the students to work beyond using habitual actions in decision making. In previous research, Bakhsh (2010) investigated different components of the AIOU teacher education programs in detail. He concludes that according to a majority of learners, study materials and course content of AIOU teacher education programs are comprehensive and easily understandable. The current study verifies and further elaborates the results of Bakhsh. It reveals that the content of AIOU teacher education programs are not only self-exploratory and easily understandable, but they promote students' attitude of comprehension and reflection as well.

This study reveals that AIOU teacher education programs promote students' understanding and reflection more than develop critical reflection. Kember et al. (2000) conclude that the presence of critical reflection is, generally, lesser in people than understanding and reflection. The current study authenticates their findings. The AIOU teacher education programs highly support and promote reflection and understanding among future teachers. Hussain, Mehmood, and Sultana (2011) investigated the benefits of reflective practices in the open and distance learning system in Pakistan. Although they support the presence of reflective practices in distance study programs, the contribution of existing distance study programs in developing reflective thinking among learners is not comprehensively examined in their research. The current research fills this gap determining that the teacher education programs of AIOU discourage learners' attitudes of using habitual actions in their course requirements. Similarly, the programs are significant promoters of gaining understanding and using reflection to fulfill students' course requirements.

Impacts of students' employment status and previous education on their responses were examined to further explore the promotion of reflective thinking through AIOU teacher education programs. The employment status of the students has medium size effects on their habitual actions, understanding, and critical reflection. The impact of students' employment status on their reflection (R) is insignificant. Viewpoints of employed and unemployed learners are significantly varied on the three subscales of QRT. The unemployed learners demonstrate stronger agreement with the idea that their study courses promote understanding and critical reflection among learners. It can be assumed that unemployed learners can spend more time on their studies than their employed fellows. Consequently their perceptions about the role of AIOU courses in developing understanding and critical thinking of students are stronger. However the findings do not present a significant impact of the students' employment status on their perceptions about the development of reflection through the study programs. Promoting reflection among the students is a core objective of the AIOU distance education programs (Bakhsh, 2010). Opinions of employed and unemployed students are not significantly different on this important issue.

Learners in the AIOU teacher education programs approached in the current study have two types of previous education. One cohort enters the programs after passing bachelor degrees (i.e., 14 years of education). The other group enrolls in the same AIOU teacher education programs after passing master degrees (i.e., 16 years of education). Results show that the learners' previous education has strong size impacts on their thinking practices and opinions regarding the role of AIOU teacher education programs in promoting understanding and reflection among the students. The study further elaborates that the effect size of learners' previous education on their perceptions about the development of critical reflection through AIOU teacher education programs is reportedly medium. Values of t test and mean differences explain the directions of these effects. The students having 14 years of previous education have a stronger commitment to the idea of promoting understanding and critical reflection through the programs. However the situation is inversed for the subscale of reflection. Student teachers having 16 years of education have a stronger tendency to accept the AIOU teacher education programs as developers of reflective thinking among the students than their bachelor degree holder fellows. Overall and segment wise opinions of the respondents endorse that the AIOU teacher education programs are supporters and promoters of understanding, reflection, and critical reflection among the learners.

Conclusions

The current study examined the thinking patterns of AIOU teacher education learners and the role of their courses in developing these patterns on the basis of Mezirow's theory of reflective thinking. It is concluded that the AIOU teacher education syllabi discourage making decisions on the bases of habitual actions. The learners are also restricted in making meaning and interpreting new experiences unintentionally. The AIOU teacher education programs have a stronger tendency to promote understanding and reflection among the learners. Prospective teachers use deliberation in interpreting their new experiences and challenge procedural evidence of making meaning and perspectives. The study concludes that the AIOU programs have comparatively lower intentions to support critical reflection among learners than to promote understanding and reflection. Critical reflection, in Mezirow's theory, is the highest level of reflective thinking that challenges the fundamentals of individual decisions. It results, in many cases, in a paradigm shift. It is important that there is evidence of support for critical reflection in the AIOU programs yet their presence is lower than the content supporting understanding and reflection.

It is also concluded that students' employment status and previous qualifications have significant impacts on their thinking preferences. The unemployed students are comparatively stronger in their opinions that AIOU teacher education programs encourage reflective thinking among the learners. Similarly the students having 16 years previous education demonstrate a higher level of commitment to the idea of promoting reflective thinking through the AIOU programs.

Investigation of AIOU teacher education programs, regarding their role in the development of reflective thinking among students, supports the programs' worth and effectiveness. A major contribution of the current study is its evidence-based authentication that distance learning programs can promote the development of reflective thinking among learners. The study also highlights the possibilities of improvements in the case of critical reflection. The programs, though, have the intention of promoting critical reflection among learners yet the presence of such material is lower than understanding and reflection-promoting material. The task of developing critical reflection is at the top in educational objectives. The current study recommends integrating content in distance education curricular designs that is strongly supportive in developing critical reflection among the learners especially in the AIOU context.

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Looking Out and Looking In : Exploring a Case of Faculty Perceptions During E-Learning Staff Development

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Abstract

This explorative study captured the perceptions of faculty members new to technology enhanced learning and the longitudinal observations of the e-learning manager during dedicated professional development in order to compile a socially transformative emergent learning technology integration framework for open and distance learning at the School of Continuing Teacher Education at North-West University, South Africa. A pragmatic approach guided the bounded case study. The study followed a fully mixed sequential equal status design of mixing sequential qualitative and quantitative findings. Data collection strategies concern a custom-made questionnaire, interviews with faculty members, and longitudinal observations by the e-learning manager. The first phase uncovered 34 qualitative codes. After quantitating of the data, a t-test indicated significant differences for 17 variables between faculty perceptions and observations of the e-learning manager. Ward's method of Euclidean distances grouped the variables into five clusters according to the researchers' paradigm of *looking in* and *looking out* from the development context. The clusters formed the basis of a model for faculty development towards socially transformative learning technology integration for open distance learning. The five aspects of the model comprise (i) the environment in which faculty members should gain support from the institution; (ii) the environment in which faculty have to address the realities of adopting TEL; (iii) human factors relating to the adoption of TEL; (iv) concerns and reservations about the use of TEL; and (v) continuing professional development needs, expectations, and motivators. The sustainable integration of ICT into higher education institutions remains a major challenge for the adoption of TEL.

Keywords: Technology enhanced learning (TEL); teacher training; professional development; mixed methods research; interactive white boards; developing context; technophobia

Introduction

Spotts (1999) identifies five significant e-learning variables, the learner, faculty, technology, environment, and perceived value, in an effort to obtain information beneficial to faculty development of technology enhanced learning (TEL). However, implementing

> e-Learning could be a highly disruptive technology for education—if we allow it to be...if there is to be innovation and change in university teaching—as the new technology requires, as the knowledge economy requires, and as students demand—someone has to take responsibility for it. Who should that be, other than the university academic community? (Laurillard, 2006, p. 5)

These statements indicate that the final successes of implementing TEL at higher education institutions (HEIs) are to a great extent in the hands of faculty members. However, in many cases, faculty members require intensive pedagogical, knowledge, and skills training to make a real difference in the deposition of their learners.

> Utilizing the potential of IT in educational practice often implies that the role of the teacher has to change. Faculty not only has to learn IT basic knowledge and skills, but more importantly, has to learn appropriate pedagogical skills to be able to integrate IT in a sound way into educational practice. (Voogt & Knezek, 2008, p. xxxiii)

More than simple knowledge of technology is required to produce good teaching. Exemplary teaching combines skillful use of technology, embedding key elements into course design (Wilson, 2003). This paper explores the lived experiences of faculty in a developing context while they for the first time engage with TEL.

Context of the Study

This paper forms part of a larger investigation to establish a socially transformative emergent learning technology integration framework for open and distance learning (ODL) at the School of Continuing Teacher Education (SCTE) at North-West University (NWU) (Esterhuizen & Blignaut, 2011; Esterhuizen, Blignaut, Ellis, & Els, 2012). It explores with the aim to understand the lived experiences of faculty at a developing

ODL unit and subsequently forms part of the cyclic process of data gathering in which emerging themes initiate further data gathering cycles.

The SCTE employs few learning technologies to teach and support students within an ODL model of course delivery. These include compact disc read only memory (CDROM), short message service (SMS), and interactive white boards (IWBs). To enable students' participation in the information society, teacher training should include use of information communication technology (ICT). Faculty require competence in ICT use to enable their learners to develop their full potential. ICT can be a vehicle to personalise learning, provide access to information, provide flexibility regarding time, place, and pace of learning, and enable collaboration and continued study even while working full time (Ally, 2009; UNESCO, 2002).

The South African Government's White Paper on e-Education (Department of Education, 2004) demands a definite outcome of ICT mastery as a matter of urgency in teacher training and teachers should have access to in-service training on how to integrate ICTs into teaching and learning. The e-Education White Paper acknowledges the backlog in its e-learning expectations and calls for development actions in this regard:

> Many teachers have grown up in an environment that had less electronic technology available, and thus find the adaptation to working with ICT more difficult than their learners. A programme that urgently addresses the competencies of teachers to use ICT for their personal work, in their classrooms, should be developed. This will require extensive staff development and support. Thus, ICT will be central to the pre-service training of recruits and the on-going professional development of practising teachers. (Department of Education, 2004, p. 22)

The perceptions of faculty members as the enablers of adoption are at the heart of this exploration. The SCTE acknowledges the requirement for the advancement of e-learning in the development of a learning technology integration framework. It is necessary for teachers in training at the SCTE to adopt e-learning using ICT. Teachers' adoption of technology is influenced by both the *quantity* and *quality* of experiences with technology (Moolman & Blignaut, 2008) included in their teacher education programs (Agyei & Voogt, 2011).

The SCTE is in the process of evolving from paper-based distance education delivery to adopting TEL as part of ODL. In order to advance from physically travelling to lecture at one tuition center at a time to reaching remote facilitators and students simultaneously at 39 tuition centers across Southern Africa, the SCTE introduced synchronous computer mediated conferencing using interactive whiteboards (IWBs) at tuition centers. Faculty training in the use of IWBs necessitates developing faculty

competencies *both* in the area of technology use and in managing synchronous computer-mediated communication learning.

Literature Review

Distance education endeavours to expand access to education through the mass production of teaching and course materials, often largely based upon one-way transmission of information with little chance for sustained interaction. The face-to-face lecture is still viewed as the most efficient and dominant medium of instruction in higher education. However, "communications technology that supports sustained interaction is having a significant impact in higher education—both on-campus and at a distance" (Anderson & Garrison, 1998, p. 97). Wilson (2003) indicates that some of the reasons for using technology in teaching and learning are that it could improve student learning, benefit students in their research and communication, foster independent learning, provide access to worldwide resources, and improve career choices. Schneckenberg, Ehlers, and Adelsberger (2011) indicate that, in many cases, faculty concerns for their students motivate them to walk the extra mile of implementing TEL for the benefit of their students—a concern often more powerful than personal financial considerations.

Faculty unaccustomed to using technology in their teaching and learning—because they did not grow up with the technology, or have not personally tried out the technology—cannot draw from their lived experiences, or from their recent introduction to the technology. Faculty have to first-hand experience the affordances of learning technologies to effectively use them during teaching and learning. Faculty professional development is essential to introduce them to new technologies, ensure smooth adoption, and provide experience with the technology. However, successful faculty development interventions (i.e., ones that encourage faculty to adopt new technologies) should not only focus on the mechanical and technical aspects of TEL, but also place emphasis on appropriate pedagogy, address individual teaching beliefs, provide real life interaction as their online students would, and contextualize the professional development in terms of the local needs of the faculty. It is important to focus first on pedagogy and then on technology when training faculty, as well as when faculty adopt technology for student learning (Simpson, 2002).

As front-line enablers of adoption, faculty should experience the affordances of e-learning personally. This will enable them to convincingly adopt technology for teaching and learning of teacher-students at SCTE, and to adopt the concept of personal learning environments (PLEs)—learning environments like learning management systems (LMSs) (Attwell, 2007). To promote development of PLEs for faculty and student benefit, prevailing faculty perceptions on gainful e-learning should be explored. Faculty pedagogical practices should align with the needs of students. Faculties of in-service settings have to adapt their pedagogical approaches to learn how TEL could be

used to facilitate pedagogical approaches across different contexts. Christensen and Knezek (2008) have shown that faculty's attitudes towards ICT, their ICT competencies, and their access to ICT tools affect their use of technology. TEL competency is not limited to basic TEL knowledge and skills, but especially faculty's ability to combine content knowledge with TEL pedagogy.

The emerging pedagogical consensus is that constructivism is the most preferred and effective way of using online learning technology in order to support students during collaboration, authentic tasks, reflection, and dialogue (Mayes, 2001). Faculty that employ traditional teaching and learning styles may view learning technology as less appropriate and feel less positive about using TEL than those who believe in student-centered approaches. In an effort to supplement or replace live contact teaching and learning, technology-mediated distance learning frequently replicates the activities of face-to-face classrooms. Interactive technologies, like IWBs, are consequently employed to present one-way presentations to students in remote locations, thus furthering instructivist pedagogy. The most valuable activity in a classroom of any kind is the opportunity for students to work and learn together (Jonassen, Davidson, Collins, Campbell, & Haag, 1995).

Anderson and Garrison (1998) are of the opinion that education depends on acts of communication, but communication should be reciprocal, consensual, and collaborative to fully qualify as being educational. Collaboration implies shared control—not only one-way transmission of information without considering the process of constructing meaningful and worthwhile knowledge. Educational communication should explain why a concept makes sense or does not, and not simply state that it is right or wrong. It should be explanatory and not just confirmatory. Adopting a learner-centered pedagogy during the use of TEL often represents a radical paradigm shift when faculty members are accustomed to instructivist teaching styles. Poorly managed adoption of constructivist online learning may result in faculty and students feeling threatened. Transformation to TEL adoption should therefore be based on professional development with approaches to provide faculty with experience of using technology first hand (Ehlers & Schneckenberg, 2008). Anderson and Van Weert (2002) identify four broad and continuous approaches through which educational systems proceed in their adoption and use of ICT: emerging, applying, infusing, and transforming. In the process of transforming from traditional distance education, adopting constructivist pedagogy to cultivate e-learning methods involves interaction, collaboration, and nurturing the perceptions of faculty on the value of electronic learning technologies and their usefulness for collaboration essential for developing appropriate strategies and training approaches: "Academic development is most likely to succeed when the teacher's own beliefs about teaching and learning provide the starting point" (Errington, 2001).

Implementing TEL is complex, often ill-structured, and requires faculty to adopt alternative ways of grasping and acting on the complexity. At the heart of good TEL lie three core components, *content, pedagogy, and technology*, as well as the relationships

amongst and between them. These three core components form the core of the technology, pedagogy, and content knowledge (TPACK) framework (Koehler & Mishra, 2009). Interacting with these components and the relationships between them, across a variety of diverse contexts, accounts for wide variations in the extent and quality of TEL integration (Hinostroza, Labbé, López, & ost, 2008). Although TPACK is not enough for the integration of TEL, it determines faculty outlook towards educational change (Law, 2008). A learning-by-design approach requires faculty to navigate the complex interface between tools, authentic learning tasks, students, and learning contexts. Faculty can thereby explore TEL and develop ways of thinking about technology, design learning, and develop TPACK (Koehler & Mishra, 2005). Traditional methods of TEL training, mainly workshops and face-to-face courses, are ill-suited to produce the deep understanding required for faculty to become knowledgeable users of TEL.

It is not only faculty who should change their attitude towards the integration of TEL in their courses. Institutional organizational structures and contexts should allow faculty to experiment and adopt new pedagogical approaches. Leadership at HEIs should make provision in their strategic planning to integrate TEL across their institutions, providing facilities for faculty to develop a vision on why and how to integrate TEL into teaching and learning, and providing support across all administrative, technical, and pedagogical areas (Elton, 1999; Riel & Becker, 2008). Leadership at HEIs should therefore

> ...exert some influence over the way in which e-learning is used in universities, and direct its power overtly towards the needs of learners. Change in universities is an aspect of their organisation, and again, the opportunities of the new learning technologies, including all their capabilities for information processing, communications, mass participation, design, and creativity, support the kind of system structure that would enable change to be organic and progressive— adaptive rather than mechanistic. (Laurillard, 2006, p. 12)

Lastly, the faculty professional development trainer should assist in identifying and defining training problems, obtaining commitment in practice from faculty, simulating positive experiences of ODL students in TEL, designing pedagogically sound course units, identifying learning problem scenarios with faculty members; designing pedagogical objectives that encourage students to make autonomous decisions while engaging with complex context, creating real-world learning tasks for students, and encouraging faculty to take responsibility of their own professional development. In short the role of the professional development trainer is to create scenarios in the learning environment that reflect the complexity and uncertainty of decision-making in real TEL contexts (Ehlers & Schneckenberg, 2008).

Research Design and Methodology

Study Participants

The study participants related to two categories: the 21 academic faculty members from an ODL unit, the SCTE at NWU, and the e-learning manager. During their course design activities, the faculty members create course content, support students, and assess learning tasks and examination papers of under qualified and unqualified teacher-students across South Africa and Namibia. The e-learning manager over a period of more than two years interacted with the faculty members daily, providing training in the use of interactive electronic whiteboards for synchronous computer mediated communication, assisting in general computer use and literacy, sourcing of material for remote lecturing, and facilitating the recording of educational DVDs. His TEL involvement related to liaising with institutional committees on TEL at NWU, leading a NWU research project on TEL for ODL, strategic planning of TEL at the SCTE; developing a people-centered socially transformative learning technology integration framework for TEL for ODL, developing and implementing TEL infrastructure, and training of faculty on the design and implementation of TEL for ODL. This paper evolved from the culmination of the above roles.

Methods

This study stemmed from the pragmatic perspective that

> is characterised by a concern for providing explanations of the status quo, social order, consensus, social integration, solidarity, needs satisfaction and actuality. It is a perspective concerned to understand society in a way which generates knowledge which can be put to use. It is often problem-orientated in approach, concerned to provide practical solutions to practical problems. (Burrell & Morgan, 1979, p. 26)

A pragmatic approach guided "an intensive [bounded case] study of a single unit with an aim to generalize across a larger set of units" (Berring, 2004, p. 341) in order to provide fitting resolutions on how to guide faculty towards TEL competency. The research plan encompassed a fully mixed sequential equal status design of mixing of sequential qualitative and quantitative findings during the analysis of the data (Leech & Onwuegbuzie, 2009) (Figure 2).

Instruments

The main three strategies collected data from the two sets of research participants:

(i)   a custom-made questionnaire that collected (a) quantitative data from two questions (one binary and one Likert scale data), measuring faculty commitment to the adoption of TEL; (b) qualitative data from two open-ended questions on elaboration of the commitment; (c) quantitative data from an open-ended question, requesting faculty members to list learning technologies they have considered before; and (d) qualitative data from five open-ended questions on the perceptions of faculty on the use of learning technology in ODL (Table 1);

(ii)   individual interviews with four purposefully selected faculty members selected according to the criterion that they, at that point of the research, have completed making an interactive DVD as part of their electronic study material for their respective courses; and

(iii)   a concatenation of the reflective journals of the e-learning manager at the SCTE. The e-learning manager recorded all academic staff meetings, discussions, academic training, as well as technology task team meetings on learning technology integration and the development of e-learning. Such meetings included central university management and management of various service departments. The observations document included viewpoints from all the role players in relation to faculty experience and context. This summative document became the comparative voice to those of the faculty members during the qualitative analysis (Figure 2).
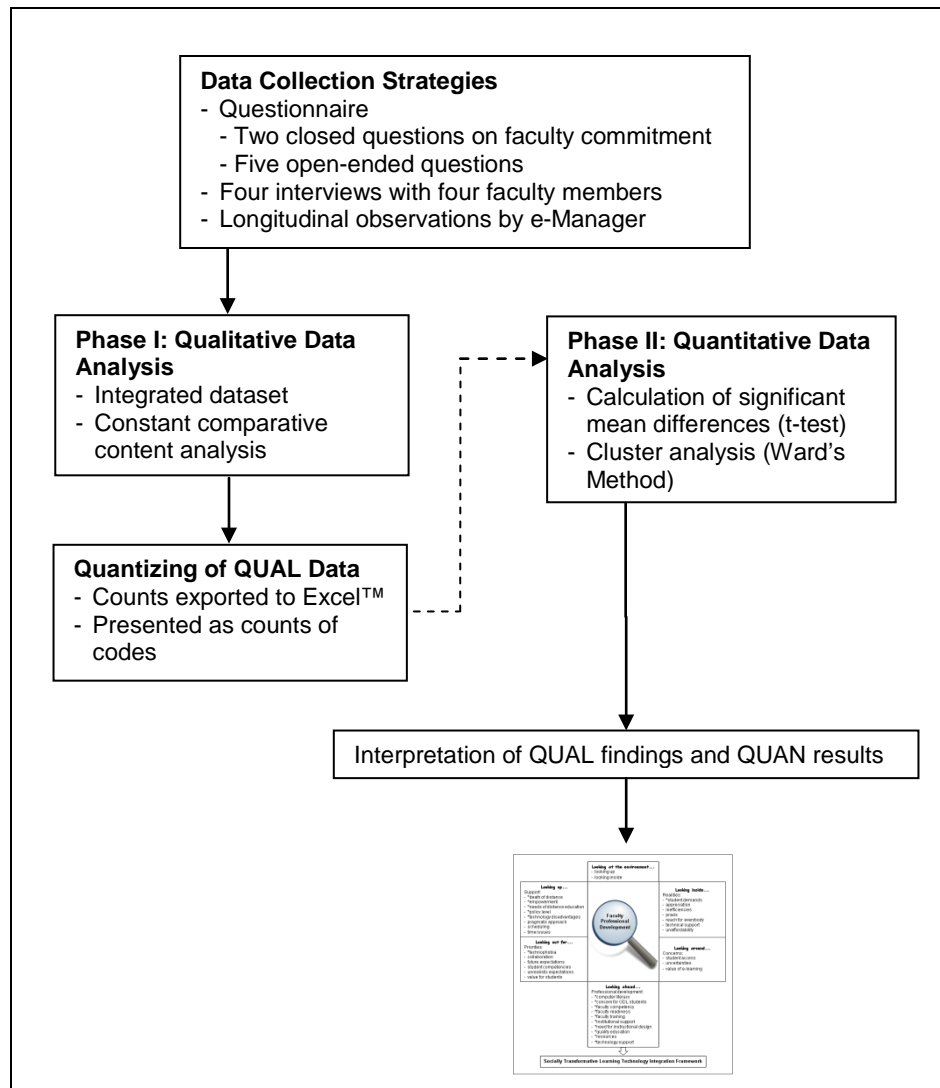
Figure 1. Pragmatic research design exploring faculty needs for technology enhanced learning.

Qualitative Analysis

The textual documents relating to the four interviews, captured as direct transcripts, the responses to five open-ended questions in the questionnaire, and the reflective document were assigned to Atlas.ti™, a computer assisted qualitative data analysis system, as an integrated dataset (Figure 2). The analysis followed Boeije's (2002) constant comparative process of qualitative content analysis where codes were allocated to sections of data, and subsequently each piece of data was compared with every other piece of relevant data. The content analysis resulted in 34 codes (Table 1) with a total of 457 quotations linked to the codes. After the qualitative analysis the data were

quantitised (Saldăna, 2009) and captured in Excel™ for further quantitative analysis with Statistica™ data analysis software system (StatSoft Inc., 2011) (Figure 2).

Quantitative Analysis

The questionnaire prompted the faculty members on their intention to implement e-learning at the SCTE and whether they considered it essential to increase the use of e-learning technologies in open distance learning initiatives. A further question requested respondents to compile a list of learning technologies they considered important. The first question elicited a five-point Likert scale response where 5 = *I definitely commit*; 4 = *I commit*; 3 = *I am neutral*; 2 = *I do not commit*; 1 = *I definitely do not commit.* The second required a binary response where *Yes* = 1 and *No* = 0. The responses to the open-ended question, requesting the respondents to list learning technologies they considered important, were captured and counted (Table I).

The quantitised (Saldăna, 2009) qualitative data were subjected to two statistical procedures: (i) testing for significant differences between the means of the two groups (faculty and e-learning manager) and (ii) cluster analysis of the codes in order to compile a model for faculty development relating to the use of technology enhanced learning in ODL. Cluster membership was assessed by calculating the total sum of squared deviations from the mean of a cluster. The criterion for fusion is that it should produce the smallest possible increase in the error sum of squares (Burns & Burns, 2008). The cluster analysis was performed according to Ward's minimum variance method. Ward's method provides a special case for measuring the objective function of Euclidean distances that ensures minimum distance between elements and maximum distance between clusters (Cohen, Manion, & Morrison, 2011). This method is most appropriate for quantitative, but not binary variables. It is distinct from other methods because it uses an analysis of variance approach to evaluate efficient distances between clusters (McMillan & Schumacher, 2001).

Results and Discussion

Table 1 lists faculty members' responses to their commitment of using e-learning during their teaching and learning on a five-point Likert scale, as well as their opinion on the value of e-learning. The faculty member who selected the neutral response in terms of his commitment to e-learning explained that he was not involved in lecturing at that point of time. He also selected No for the same reason in the second question.

Table 1

Faculty Committing to the Use of TEL

Question and scale	Responses
Question 1: I am committed to implementing e-learning	
I definitely commit	19
I commit	1
I am neutral	1
I do not commit	0
I definitely do not commit	0
Question 2: I consider it essential to increase the use of e-learning technologies in ODL initiatives	
Yes	18
No	1
Question 3: I consider the following as examples of e-learning technologies	
Interactive whiteboard	17
SMS: mobile phones	12
Internet: e-mail	10
LMS: Moodle / e-Fundi	9
iPad / iPod	5
DVD / MMD	2
Mobisites	2
Others: Computer gadgets; e-readers, social networks, iPhone, m-Learning, radio, reading literacy labs, screencasts, Skype, Web2.0	1 each

The discussion of the results takes place from a firm faculty commitment to participation in the adoption of e-learning, and a conviction that it is essential to increase the use of e-learning technologies in ODL initiatives. Yet, faculty have limited perspectives on the scope of learning technologies, as well as their affordances for ODL. During interviews conducted at the start of the active development process, faculty informally named only seven examples of learning technologies, maintaining that they had not been exposed to others. After the introduction of IWBs, while some could only refer to different technologies, others could discuss their use and affordances (Table 1).

A *t*-test calculated significant differences between the means of the perceptions from faculty (looking out) and the e-learning manager's observations (looking in). Table 2 indicates that significant differences occurred in 17 of the 34 variables.

Table 2

Calculation of Significant Differences between Faculty Perceptions (Looking Out) and Observations of e-Learning Manager (Looking In)

Variable	Mean out[a]	Mean in[b]	*t*-value	*p*	Std dev out[a]
* Computer literacy	1.67	18	-8.28	0.000	1.87
* Concern for students	3.11	15	-3.84	0.005	2.93
* Death of distance	0.89	7	-7.42	0.000	0.78
* Empowerment	0.67	5	-2.91	0.020	1.41
* Faculty competency	4.67	17	-2.38	0.045	4.92
* Faculty readiness	2.22	10	-2.31	0.050	3.19
* Faculty training	6.11	20	-2.55	0.034	5.16
* Institutional support	2.00	15	-5.52	0.001	2.24
* Need for instructional design	3.11	18	-3.94	0.004	3.59
* Needs of distance education	0.67	6	-4.53	0.002	1.12
* Policy level	0.11	6	-16.76	0.000	0.33
* Quality education	0.44	16	-14.56	0.000	1.01
* Resources	0.44	14	-9.64	0.000	1.33
* Student demands	0.56	2	-2.60	0.032	0.53
* Technology disadvantages	1.22	5	-2.57	0.033	1.39
* Technology support	1.22	14	-8.69	0.000	1.39
* Technophobia	1.89	10	-2.36	0.046	3.26
Appreciation	0.67	1	-0.28	0.784	1.12
Collaboration	2.11	7	-2.05	0.074	2.26
Future expectations	1.44	2	-0.24	0.820	2.24
Inefficiencies	0.67	2	-0.96	0.367	1.32
Pragmatic approach	2.22	5	-1.61	0.147	1.64
Praxis	1.44	0	1.55	0.159	0.88
Reach for everyone	0.33	0	0.63	0.545	0.50
Scheduling	2.00	2	0.00	1.000	2.00
Student access	4.33	0	1.20	0.265	3.43
Student competencies	2.11	8	-2.10	0.069	2.67
Technical support	1.00	2	-0.67	0.521	1.41
Time issues	2.11	3	-0.28	0.784	2.98
Unaffordability	0.33	0	0.45	0.667	0.71
Uncertainties	3.78	5	-0.38	0.712	3.03
Unrealistic expectations	2.78	9	-187	0.098	3.15
Value for students	1.22	4	-1.33	0.221	1.99
Value of e-learning	5.78	9	-0.58	0.576	5.24

Variable	Mean out[a]	Mean in[b]	*t*-value	*p*	Std dev out[a]
[a] *Faculty observations*					
[b] e-learning manager's longitudinal observations					
* Significant difference *p* ≤ 0.05					
Df: 8					
Valid N Out [b]: 9					
Valid N In [a]: 1					
Std Dev In [a]: 0					

A cluster analysis according to Ward's method using Euclidean distances was used to cluster the 34 variables into five clusters (Figure 2). Figure 2 reflects the researchers' adoption of the metaphor of faculty members *looking out* from their perspective of acquiring TEL competencies for ODL, and the e-learning manager's perspective of *looking into* their development. The cluster analysis resulted in five cluster themes: (i) *looking up*, the environment in which faculty members are expected to adopt learning technology use from the perspective of support from above; (ii) *looking inside*, the environment in which faculty members are expected to adopt learning technology use from the perspective of inherent realities; (iii) *looking out*, human factors relating to the adoption of learning technologies; (iv) *looking around*, concerns and reservations about technology use; (v) *looking ahead*, continuing professional development needs, expectations, and motivators.
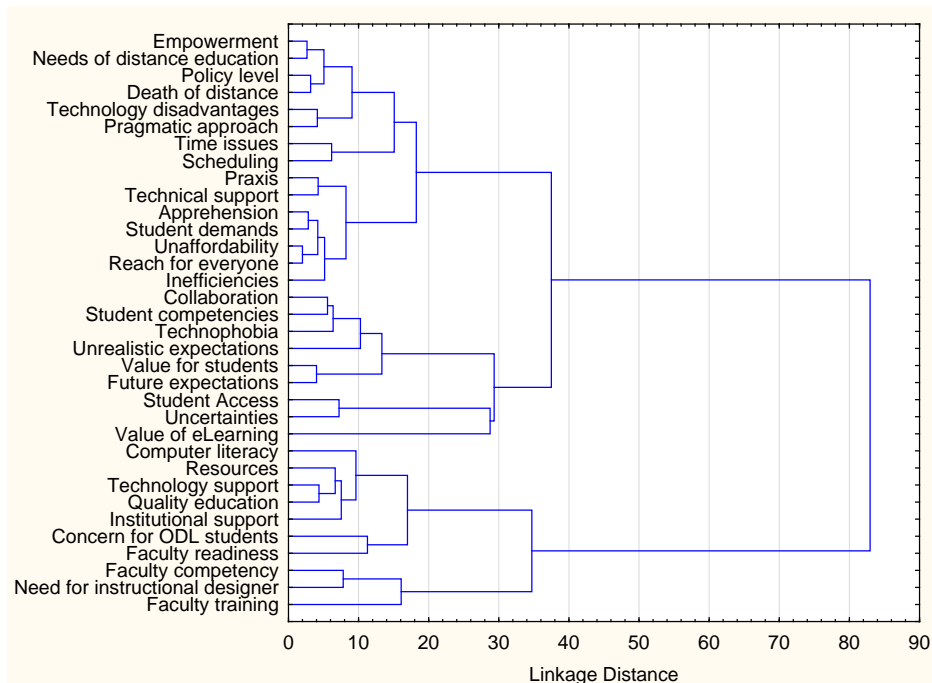

Figure 2. Clustering tree diagram for 34 variables according to Ward's method for Euclidean distances.

Table 3 depicts the five cluster themes (Figure 2) as a discussion framework for implementing TEL at the SCTE. It lists the five cluster themes (looking up, looking inside, looking at, looking around, and looking ahead), as well as the variables that faculty and the e-learning manager during the statistical analysis agreed upon and those that deferred.

Table 3

Cluster Themes with Agreement and Contrast Between Intensities

Themes	Agreement	Contrast
1 Looking up The environment in which faculty members are expected to adopt TEL use from the perspective of support from the institution	• pragmatic approach • scheduling • time issues	• *death of distance • *empowerment • *needs of distance education • *policy level • *technology disadvantages
2 Looking inside The environment in which faculty members are expected to adopt TEL from the perspective of local realities	• appreciation • inefficiencies • praxis • reach for everybody • technical support • unaffordability	• *student demands
3 Looking at Human factors relating to the adoption of TEL	• collaboration • future expectations • student competencies • unrealistic expectations • value for students	• *technophobia
4 Looking around Concerns and reservations about the use of TEL	• student access • uncertainties • value of e-learning	
5 Looking ahead Continuing professional development needs expectations and motivators		• *computer literacy • *concern for ODL students • *faculty competency • *faculty readiness • *faculty training • *institutional support • *need for instructional design • *quality education • *resources • *technology support

 * Significant difference $p \leq 0.05$

Table 2 indicates that no significant differences occurred in two clusters between the perceptions of faculty members and the observations of the e-learning manager between (i) the variables in cluster 1, looking around, the concerns and reservations about

technology use, student access, uncertainties, and value of e-learning and (ii) the variables in cluster 5, looking ahead, continuing professional development need and motivators, computer literacy training, concern for ODL students, faculty competency, faculty readiness, faculty training, institutional support, need for instructional design, quality education, resources, and technology support. Theme 1 shows the largest number of discrepancies between the perceptions of the faculty and the observations of the e-learning manager. While faculty focused on their daily work-related challenges, following a pragmatic approach, scheduling, and general time issues, the e-learning manager's attention related to more strategic issues: death of distance (the irradiation of the negative effects of distance education), empowerment of faculty and learners, needs of distance education, policy level issues, and disadvantages that the adoption of technology posed for the SCTE. Clusters 2 and 3 only relate differences with regard to one variable each, contrasting the observations of the e-learning manager and the perceptions of the faculty. Again, in both cases, the observations of the e-learning manager related to strategic issues, while the perceptions of faculty zoomed in on their daily practices.

From the looking-in perspective of the e-learning manager, variables such as the need for instructional design to be freely available to faculty, the improvement of faculty computer literacy and faculty competency in pedagogical application through learning technologies in quality education, concern for ODL students, institutional support, technology support, resources, faculty readiness, and technophobia all relate to themes to be addressed during faculty professional development for the adoption of TEL. From the perceptions of the faculty looking out, perspectives on staff development are dominated by a strong plea for comprehensive practice-based faculty training. Next, the value of e-learning is in high regard, followed by concerns over faculty competency, access of students to the Internet and to ICT technology, reservations about the possibilities of e-learning adoption, concern for ODL students' needs, and need for instructional design to effect e-learning development. Further instances revolve around unrealistic expectations (faculty's perception of performing functions which they are neither trained for nor have experience in), faculty readiness (committed to the mission of SCTE to use TEL), pragmatic approach, insufficient student competencies, collaboration, time issues, institutional support, scheduling, technophobia, and computer literacy. These relate to 17 of the 34 codes in order of intensity. These issues are graphically depicted in Figure 3 as a model for faculty development towards socially transformative learning technology integration for ODL.
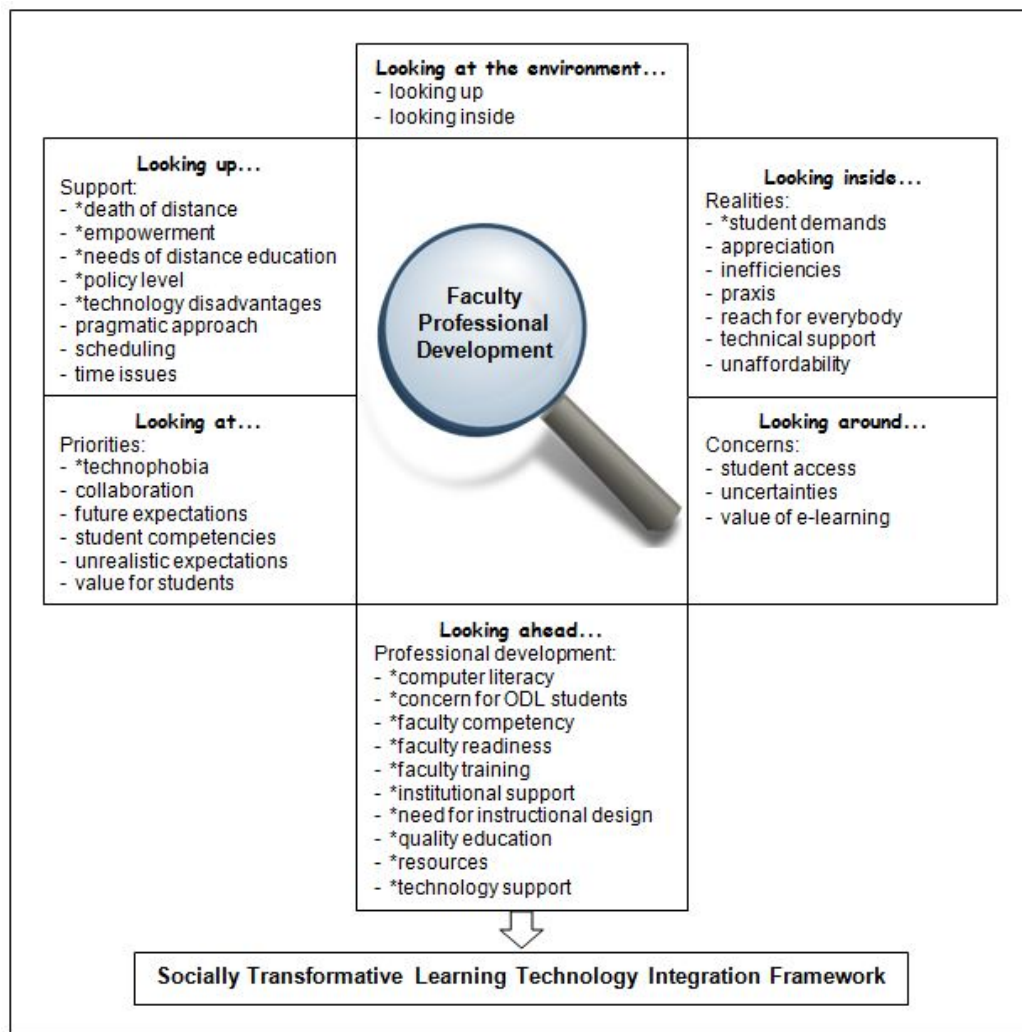
Figure 3. Model for faculty development towards socially transformative learning technology integration for open distance learning (* significant difference $p \leq 0.05$).

Conclusions and Recommendations

This explorative analysis according to a multimode research methodology resulted in a model indicating (i) the environment in which faculty members adopt TEL from the perspective of support from the institution; (ii) the environment in which faculty members adopt TEL from the perspective of local realities; (iii) the human factors relating to the adoption of TEL; (iv) the concerns and reservations relating to the use of TEL; and (v) the continuous professional development needs, expectations, and motivators of faculty. This analysis indicated the agreement and disagreement of the development variables between the perceptions of the faculty and the observations of the e-learning manager. While the faculty mainly zoomed in on TPACK issues (Mishra & Koehler, 2006), the e-learning manager zoomed out to strategic issues in order to

gradually shift the teaching and learning approach from an instructivist towards a more constructivist approach (Jonassen, et al., 1995).

The analysis indicated that faculty perceptions at the onset of a transition process from paper-based distance education to e-learning adoption reflected a need for comprehensive practice-based faculty training. This is motivated by the plight of the SCTE ODL teacher-students—practicing teachers on whom thousands of learners depend for an education. The five aspects of the model (Figure 3) drive the adoption of TEL at the SCTE. Faculty look up for support from management to look inside the institution to provide procedural support in terms of pragmatic approaches to focus on TEL adoption (Schneckenberg, et al., 2011). Faculty request measures to manage their workload and scheduling of pedagogical priorities, interventions to overcome technological unfamiliarity, and TPACK training to use TEL effectively. Interventions that transform faculty require bold decisions to foster creativity and enable learning content and curriculum transformation as "educators' roles are changing from managing content to connecting learners in new ways to other learners, resources, and expertise" (Schwier, 2010, p. 91).

Changes in technology may introduce uncertainty and lead to technophobia (Christensen & Knezek, 2008, p. 352). For example, during this study, the versions of computer operating system, interactive whiteboard software, Microsoft Office™ programs, and logon authentication used by the university changed. Professional development has to focus on holistic coping strategies to build technological confidence, rather than on an overload of detailed information and mechanistic operating procedures (Minovic, Stavljanin, Milovanovic, & Starcevic, 2008). However, faculty hold the key to the successful integration of learning technologies. The SCTE faculty is committed to the integration of learning technologies. Faculty's perceptions show a strong concern for SCTE students, many of whom are from disadvantaged backgrounds with low confidence in using technology, inadequate computer literacy, and limited access to the Internet and to technology. TEL has the potential to enhance flexible learning by providing students with permanent access to learning resources and by widening their learning options independent from place and time; and ICT can help to raise quality standards and to create a culture of excellence in teaching and learning by adding digital communication channels for increased collaboration to the course setting.

At many HEIs the innovative potential of TEL is not being systematically utilized for the macro-level of their strategic options and/or the micro-level of faculty implementation of TEL. The rapid pace of technology development tends to outpace strategic thinking and pedagogical design in higher education. Recent studies show that the diffusion of new technologies threatens TEL integration into universities (Schneckenberg, 2008). Zemsky and Massy (2004) are of the opinion that sustainable integration of ICT into HEIs remains a major challenge and that they should substantially increase efforts to involve and engage faculty, who play a key role in education innovation. Faculty face a growing demand from students to offer a more flexible, technology-enriched course delivery while they themselves increasingly race technology to compete for their

students' attention. They also face the pedagogical challenges to design innovative learning environments, which respond to the changing needs of technology-able students, and to integrate TEL to further the vision of the HEI (Schneckenberg, et al., 2011).

Faculty require professional development in order to acquire new competences that enable them to know and to judge why, when, and how to use ICT in education. If HEIs want to move forward in an organized way to improve the range and quality of their teaching and learning, they have to define coherent strategic frameworks for e-learning which include the creation of adequate support units and measures which foster the development of ICT-related competences.

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Challenges for Successful Planning of Open and Distance Learning (ODL) : A Template Analysis

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Abstract

How to plan an open and distance learning (ODL) unit in higher education is not clearly described in the literature. A number of ODL facilities at residential universities have not been successful because of a lack of planning or because of failure to ensure that all the different systems for ODL delivery were in place and functioning. This paper sheds light on how to plan strategically and how to implement an ODL unit at an existing university.

A template analysis was used to construct a road map for ODL planners. We used this analytical tool to organise data from a large collection of articles, books, and documents from 1980-2010. We purposefully chose template analysis as a document analysis process to foster the recurring themes found in published articles on planning and implementing ODL facilities in higher education.

The results indicate four main strategies for successful implementation of an ODL unit. The template consists of strategic planning, policies, systems, and challenges. It was concluded that the template for ODL planning offers new insight into distance education. It could be used as a foundation for ODL planning, implementation, monitoring, and evaluation. We recommend further research on the template with the aim of theory construction for ODL planning and implementation.

Keywords: Template analysis; challenges in open and distance learning; distance education

Introduction

Very often the question arises of what to do when an ODL unit is to be planned and implemented at traditional face-to-face higher education institutions. In many cases these institutions rush to provide technology-enhanced learning or ODL, which is in contrast with their initial goals and strategies, in an effort to stay competitive in the field or for financial reasons. Financial reasons are usually the wrong reasons for implementing ODL or technology-advanced learning. The costs are initially high, and with ever-changing technology, it could end up costing more than face-to-face teaching.

This article is intended to engage academics and academic planners from face-to-face universities in strategic thinking before ODL or technology is implemented with undesirable outcomes. My aim with this article is to shed light on strategic thinking in order to plan ODL and technology-enhanced learning in traditional face-to-face universities in a step-by-step manner. The purpose of the literature review was to construct a road map for ODL planners and implementers in higher education. From the study it is clear that ODL cannot be implemented successfully without strategic planning and a clear mandate for ODL.

The promise of distance education remains unfulfilled in many education institutions. Despite many good intentions, education institutions are still failing to recognise particular key planning and implementing steps which could make the difference in successful and sustainable distance education initiatives. Historically, the growth and success of distance education were fuelled by the need to increase access to learning and the availability of technology for delivery. There are many more challenges affecting the planning of ODL, such as globalisation, joint course development, material sharing, computer and information technology (Watkins & Kaufman, 2003).

The greatest challenge for education institutions in moving towards ODL is to adopt a singular vision, policies, and procedures for ODL implementation. In general, ODL planning is focused on budget and staffing issues and not on the critical pedagogical issues of ODL. However, ODL is so much more than just a teaching mode or method; it is a distinct and coherent field of education which is focused on new delivery methods with a pedagogical philosophy (Levy, 2003).

To add to this problem, there are no clear guidelines available to follow when planning open and distance learning in higher education (Gunawardena & McIsaac, 2004). Academic planners of ODL need to think about the reasons for offering courses via ODL and whether it is possible to offer the course via ODL. Before any investments are made in distance education, a rigorous needs assessment of the educational institution may justify another option or other difficult decisions may need to be considered first.

When education professionals ponder on the feasibility of distance education programmes and whether or not to implement ODL, their first impulse is to search through the curricula to determine which courses can easily be translated into online,

video, or digital formats. Rumble (2003) makes it clear that educators must understand that distance education may not necessarily be the best solution to their problems in education. Meanwhile, each year, the number of higher education institutions offering distance education learning courses continues to grow significantly.

Literature Review

Distance education and ODL are currently important topics for educational planners, administrators, academics, and policymakers because of the growth of distance learning and technology-enhanced learning (Bishop & Spake, 2003; Levy, 2003; Pacey & Keough, 2003). According to Bishop and Spake (2003), policymakers are faced with an array of choices related to planning ODL, such as infrastructure, student support, support to academics for their changing role as distance educators, and costs, to name a few. To add to this, distance education delivery is faced with changes such as the movement from correspondence-type delivery to open access and technology-enhanced learning where technology is changing constantly (Bishop & Spake, 2003).

Similarly, electronic or technology-enhanced courses do not necessitate more facilities, but institutions will incur capital outlays such as computer hardware and software and their updating and maintenance, additional personnel costs such as webmaster, instructional designers, course administrators, and e-tutors, and computer assistance to students. The most important aspect is the quality of education and the threat of dishonesty in technologically advanced learning environments (Lezberg, 2003).

The history and evolution of ODL is well documented, but the planning process of an ODL unit within a university and how to ensure quality education to students in the ODL mode are vague. The literature available deals with certain aspects of planning and implementation of ODL. What matters most is that consideration must be given to the different challenges when an ODL unit is planned (Watkins & Kaufman 2003).

From the template analysis it is clear that there is a gap in the literature regarding a practical guide for planning ODL. Furthermore, it should be noted that this article does not claim to provide a comprehensive list of all academic publications or Web sites. The geographical scope of this template analysis provides a worldview on the planning of ODL units, departments, or colleges at traditional face-to-face universities. It is my view that this template could be used as a guide to plan an ODL institution as well.

The systems view as described by Moore and Kearsley (2005) guided the template analysis. This systems theory has different levels of complexity and is influenced by governments, national and international policies, and challenges. For the purpose of this template analysis, the following processes and elements of a distance education system were analysed: strategic planning, administration, staffing and training, control and monitoring for quality, policy, organisation and culture, course development,

support structures, teaching and learning processes, and challenges (Moore & Kearsley, 2005). The final template was reconceptualised and simplified into four main codes, namely strategy, policy, systems, and challenges.

Methods

This paper addresses challenges to plan and implement an ODL unit in an existing higher education institution. The key component of this study was the design and production of a template for planning and implementing ODL using peer-reviewed journal articles and books on distance education. In this study, we drew on more than 30 peer-reviewed and published literature sources to present a template for planning an ODL unit.

A relatively new development in organisational research has been the application of template analysis to structure qualitative data (Waring & Wainwright, 2008). One of the most common approaches to content analysis is thematic analysis, where the coding scheme is based on categories designed to capture the dominant themes present in the text (Attride-Stirling, 2001; Hardy & Bryman, 2009). Thematic analysis is ideally suited to get a clear picture of the basic content of text. Therefore, the purpose of the study was to analyse the literature on ODL planning and implementation to develop a template for ODL planners.

The research question stated for this study was as follows: What needs to be considered in higher education institutions embarking on planning an ODL unit?

There are multiple interpretations to be made from the phenomenon of planning ODL. The contextual constructivist position in this study lent itself to reflexive and flexible ways of examining the issues and challenges in ODL planning (Braun & Clarke, 2006). The study therefore did not narrow in on one best method to plan ODL facilities. We provided a template for ODL planners to use and to choose from, and they can decide how and when they want to implement the different aspects of the template.

The data used in this study were sourced using reliable databases and peer-reviewed journal sources, books, and documents. We started with 55 literature data sources and excluded 25 of these based on our inclusion and exclusion criteria. Data sources were mined using electronic databases available at Unisa. Databases searched in this study were Eric, EBSCO, ProQuest, Sabinet, Theses Canada, FirstSearch, SAGE, Google Scholar, and Theses and Dissertations.

Planning of Open and Distance Learning/Education, Strategic Planning in ODL, Challenges in ODL

Inclusion and exclusion criteria were used to identify the relevant sources. Inclusion criteria were aspects such as publication date and articles published from 1980 until 2010 on ODL or distance education. Peer-reviewed research articles as well as subject specialist articles and books on planning distance education or ODL were included. Exclusion criteria were articles published before 1980, articles which did not refer to higher education, distance education, and ODL, and articles which were not peer reviewed.

The process of template analysis on the 30 data sources involved the identification of themes through careful reading and rereading of the data. This is a form of pattern recognition within the data, where emerging themes become the categories for analysis. The template was based on the preliminary scanning of the data sources (Cassell, 2008; King, 2006; Woodhouse, 2006).

Reliability and credibility of the codes needed to be tested. Another researcher verified and checked the codes with the literature. We applied the template codes and added additional codes throughout the process of data analysis. We connected the codes and identified the themes, and corroborated and legitimated the coded themes by moving between the template, literature, and themes while considering the coded themes. Codes were written with reference to the code label or name, or the definition of what the theme entailed (Fereday & Muir-Cochrane, 2006).

Inclusion Criteria for the Template

Different definitions applied for each code. More definitions were added as the data analysis proceeded. For a new level two or three codes were included, and careful data checking and validation were done. For example, code 1 included aspects in the literature which referred to the definition. Strategic issues, which included purpose statements, vision, mission, strengths, weaknesses, opportunities, and threats (SWOT) action plans, goals, and objectives, were aspects listed under code 1. The inclusion criteria for code 2 included policies in education, the alignment of policies with the strategy and policies on teaching and learning, governance, faculty, or academics, legal, technical, and philosophical policies.

For code 3, the systems included aspects of communication, human resources, financial management, and administration. Code 4 initially included aspects regarding the culture of the education institution, namely values, morale, interrelationships, commitment, diversity, and a sense of belonging. However, these aspects were recategorised under policies where they belong. Code 4 then referred to challenges which included basic infrastructure to deliver ODL courses, such as costing, appropriate basic technologies, basic technology services such as wiring, networking, connections,

computers, software, and licensing, technological support for staff and students, staff development, and strategic alignment with ODL.

Results of the Study

The final template consists of four codes, namely strategy, policy, systems, and challenges. The first level-one code is strategy, which comprises ten level-two codes: the mandate, refinement of purpose statement, vision, mission, analysis of internal environment, analysis of external environment, and formulation of strategic issues, goals, objectives, action plans, and decisionmaking.

The second level-one code, policies, encompasses another set of key issues for the study. Five level-two codes, 21 level-three codes, 8 level-four codes, and 103 level-five codes emerged from the literature on this theme. Policy issues serve as guidelines to meet goals and in planning an ODL unit these aspects play a key role in the success of the initiative. Twelve level-two codes were identified as the basic framework aspects for policies in ODL with 30 level-three codes specifying particular policies and aspects of policies in ODL. We recategorised "Culture" under policies as it is mostly an aspect of an organisation that develops later with organisation growth and that involves policy issues. See Table 1.

The third level-one code, namely systems, encompasses key issues in the planning of ODL facilities. To start with, this code accounts for 29 level-two codes and 16 level-three codes. The 29 level-two codes are management systems, which include a bureau of management information and a quality improvement system. This code includes ICT services, such as information and communication technology systems, information communication, telecommunication services, and computer service and support systems for students and academics. The financial system consists of financial management, financial autonomy and transparency, how the money is spent, and financial control as a measurement of effective spending. Teaching and learning includes curriculum, examination, undergraduate and postgraduate student affairs, language service, assignments, dispatch system, and administrative support systems. The staffing or human resource system includes work responsibilities, skills to perform job descriptions, and opportunities for training in place to administer the staff for ODL. Support systems comprise the call centre, examination administration, graduation ceremony, bureau of student counselling and career development, student financial aid bureau, bureau of learning development, safety services, and student support and library services.

"Challenges" was the fourth and last level-one code. Five level-two codes and 22 level-three codes were identified. The 22 level-three codes are purely descriptive: basic infrastructure to deliver ODL courses, which is expensive, appropriate basic technologies, basic technology services, such as wiring, networking, connections,

computers, software and licensing, and technological support for staff and students. Staff development, strategic alignment with ODL, corporate learners, professional enhancement learners, traditional learners and degree-completion adult learners are more challenges facing ODL planners.

Lastly, we linked the codes and identified the themes, corroborated and legitimated the coded themes by moving between the codebook, literature, and the themes, and considered the coded themes. Codes were written with reference to the code label or name, the definition of what the theme covered, and, lastly, a description of how to know when the theme occurs, as displayed in Table 1.

Discussion of Results

The most difficult decision that we had to make was the decision to stop the process of template analysis. No template can be considered as final, as new data sources emerge all the time. After seven months of template analysis and working with the data by reading the data sources several times, we considered the template as final. The final template consists of four level-one codes, namely strategy code 1, policies code 2 (which became code 2 because of the magnitude and obvious order importance of this code), the systems code renamed code 3, and challenges code 4.

From the template analysis, it was clear that a strategy for ODL planning and implementation must be mandated by government. To move from a face-to-face institution to ODL needs redefining of the institution as a whole. Strategic planning for ODL needs a decision from institutional management to embark on the initiative. A SWOT analysis, a gap analysis, and a functional analysis need to be done to establish the feasibility and criteria for planning. Aspects such as hardware, software, distance delivery technologies, technical staff, and academic support for staff are important considerations. Instructional development support staff, administrative support, student services, financial plans, costing of distance education, and staff development and training should be in place before ODL is implemented (Knipe, Van der Walt, Van Niekerk, Burger, & Nell, 2002; Levy, 2003). Many more processes and structures will be needed for successful implementation of ODL, as we discovered during our template analysis journey.

Code 2, policies in ODL, was the largest code in this study. From this template analysis it is evident that a government mandate and institutional guiding policies are of the utmost importance for the delivery of distance education. The literature is clear on the importance of guiding policies in ODL and most of the data sources refer to policies in ODL. The presence of policies can provide a framework for operation. An agreed-upon set of rules that explain all participants' roles and responsibilities is essential; the lack of this can compromise the quality of programmes (Braimoh & Lekoko, 2005).

ODL institutions need policies for governing and operations which include aspects such as geographical, service area, and physical boundaries. Governing policies such as the board, collaborations, course offerings, curricula, support, staff training, conflict management, profit sharing, and control of resources and certification must be developed (Braimoh & Lekoko, 2005).

An ODL institution will need human resource policies on compensation, evaluation and course evaluation, promotion, performance management, and intellectual freedom. Regarding staff support, staff development/training, skills training, course/programme support, local facilities, and leave aspects need to be addressed in different policies (Gellman-Danley & Fetzner, 1998; Simonson & Bauck, 2003).

Legal policies should be included to guide staff on aspects such as intellectual property, plagiarism, liability, educational technology, and labour relations. ODL institutions need student policies to regulate aspects such as registration, resources, training and tutoring, assessment, and student support services. Technical policies, including ICT issues, internet, and contractual agreements, are crucial for the smooth running of ODL. ODL needs fiscal policies on a number of student issues and state funding and contracts.

With regard to code 3, system, in Table 1, all support functions must be in place, such as curriculum and course development system, call centre, examination administration centre, and undergraduate student affairs. Student support services such as postgraduate student affairs, graduation ceremonies, bureau of student counselling and career development, student financial aid bureau, bureau of learning development, and student support form the backbone of ODL. Library services, a bureau of management information, safety services, telecommunication services (ICT), language services, assignments, dispatch, state-of-the-art printing services, academic directorates, colleges, departments, institutes, and units all provide specialised support to the academics and students and are focused on quality ODL delivery and improvement of teaching and learning.

This template analysis indicated the main challenges for ODL, of which start-up costs and expenses, learner profile, competition for students, and student support were the most important. The new student base that grows up in a technology-rich environment might challenge the usage of technology in higher education and specifically in ODL. This is a challenge to get academics to use technology effectively in ODL. Another challenge for ODL providers and academics could be the fact that students who were rejected at other institutions register at ODL institutions and are in fact the weak students. The combination of very young weak students, professional enhancement students, and traditional students could challenge teaching and learning strategies in ODL. In reality there is competition among universities as students are viewed as consumers. Another challenge for ODL is the diverse needs of ODL students.

Student support is always an important issue for universities. From the literature on ODL it is clear that student support in ODL needs awareness programmes, firstly, as

students are not aware of the support available. All staff at ODL institutions must receive special training regarding support services to be able to point students in the right direction when the need arises.

Academic support to ODL students is of the utmost importance. In ODL where there is little or no face-to-face contact, academic support and feedback sometimes become the only interaction with the student. Academic support needs to be investigated and effective support needs to be a given in ODL. This means more costs, academic appointments in ODL, more technology for student support, and more training of academics to use the technology to support the students (McKay & Makhanya, 2008).

Table 1

Template for the Study on Access for Success in ODL Planning

Code 1

Label	Strategy
Definition	Strategic planning is proactive, dynamic and directed toward a culture of change (Levy, 2003).
Description	1. Mandate from government vs. globalisation (Berge, 2003)
	2. It is a redefining of the organisation as a whole, the entire context
	3. Systematic strategic planning process model:

- Planning initiation: a decision to start

- Planning guidance and scheduling: leadership intent is articulated, clear purpose of the planning effort

- Analyses: environmental and the needs/gap analysis and SWOT analysis

- Mission refinement: defined in measureable terms that provide a clear and concise picture of what is to be accomplished and why

- Assumptions: logical, realistic and essential for planning

- Strategy development and courses of action, also course of action (COA) development (Rovai, Ponton

& Baker, 2008)

- Functional analysis: COA developed must be reviewed and compared against a number of criteria

- Implementation: resource allocation or tactical plans

- Assessment: post-implementation assessment and formative assessment during the implementation

- Periodic review to identify and assess the impact (Pisel, 2008)

4. Purpose: involvement of all the stakeholders to determine the purpose and goals for ODL programmes (Levy, 2003)

5. New vision is inspirational, defines success; correct timing, organisational buy-in and shared (Levy, 2003; Pisel, 2008). The old vision cannot be moulded into the image of existing residential-based programmes (Levy, 2003)

6. Mission is ever-changing (Berge, 2003); integrated with the institutional mission (Berge & Schrum, 1998)

7. Financial planning and costs, why distance education? Adequate number of qualified academics available who are willing to teach at a distance; additional costs of programme development (Berge & Schrum, 1998)

8. Investigate successful models at other organisations (Berge, 2003)

9. Identify solution requirements and alternative solutions (Watkins & Kaufman, 2003)

10. Formulation and alignment of strategic issues, goals, objectives and action plans

11. Decisions on:

- the type of ODL system (paced or not)

- self-paced or programme systems

- open access or not (student selection for admission)

- single or dual mode institution

- technological capacity

- attendance requirements

- certification and accreditation (COL, 2004)

Code 2

Label   Policies

Definition   A policy is defined as a written course of action, such as statute, procedure, rule or regulation that is adopted to facilitate programme development (Simonson & Bauck, 2003).

Distance education policies should promote, encourage and support the orderly development of distance education as well as associated technologies, infrastructure and staff development. These policies should help to enhance the effectiveness and management of distance education at minimal economic and social costs (Gokool-Ramdoo, 2009).

Description 1. Content of the policy

- Involves the vision, goals, critical success factors, strategies and elements

- The content of policy generally involves the formulation of a problem, proposes solutions, states the goals of the policy and outlines the strategy for implementation

- Academics should be involved in determining the priorities, policies and procedures for implementing ODL from the beginning (Levy, 2003)

2. Context in which the policy operates

Policies do not exist in isolation but are deeply interconnected with factors such as demographic, sociopolitical, economic, public service, specific sector and the department (Simonson & Bauck, 2003)

3. Processes applied

- Processes refer to the way in which policies are implemented

- Processes involved include:

  o policymaking stages

  o organisational processes – planning, performance management, decisionmaking, culture, communication, co-ordination, leadership, conflict management, learning, technology

  o change management (Gokool-Ramdoo, 2009)

4. Actors involved

- Actors involve the stakeholders and their values, interests, influence and relationships

- In order to assess how effectively a policy is implemented, we need to understand the relationships, values, interest and behaviour of the different stakeholders

- Conducting a stakeholder analysis could assist in developing insight into the interaction of the various actors (Levy, 2003)

5. Categories of policies in ODL institutions

- ODL policy (Nonyongo, 2009)

  o ODL policy for the institution

  o ODL policy for governing department (Nonyongo, 2009)

- Philosophical policies

  o Vision

  o Mission

  o Activities (Levy, 2003)

- Academic policies

  o Students

- – Admission policies (Gellman-Danley & Fetzner, 1998)

- – Assessment policies (Meyer et al., 2012)

- – Academic records

- – Academic calendar

- – Teaching and learning

- – Support

- – Credit transfer (Gellman-Danley & Fetzner, 1998)

  o Academic staff

  - – Evaluation

  - – Credentials

  - – Research and ethics (Gellman-Danley & Fetzner, 1998)

  o Curriculum

  - – Course development

  - – Accreditation

  - – Course approval

  - – Course evaluation (Gellman-Danley & Fetzner, 1998; Simonson & Bauck, 2003)

  - – Quality improvement (Braimoh & Lekoko, 2005)

  - – Completion criteria

- Policies for governance and operations

  o Geographical

  o Consortia agreements

  o Service area, local versus international (Gellman-Danley & Fetzner, 1998)

- o Regulations that define the physical boundaries for recruitment and services (Gellman-Danley & Fetzner 1998)

  o Management and structure/governance

  o Board

  o Provider contracts (Gellman-Danley & Fetzner, 1998)

- Human resources policies

  o Compensation

  o Compensation for the development and instructional expertise in working with distance learning initiatives (Gellman-Danley & Fetzner, 1998; Simonson & Bauck, 2003)

  o Overtime compensation

  o Evaluation

  o Course evaluation

  o Promotion

  o Performance management

  o Intellectual freedom

  o Support

  o Staff development/training, skills training

  o Course/programme support

  o Local facilities

  o Leave (Simonson & Bauck, 2003)

  o General

  o New policy formulation or revising existing policies on:

    – class size and workload

- development incentives

- intellectual property

- assignment of full-time or adjunct academics

- "master teachers" shared among institutions

- office hours

- academic training workload (Gellman-Danley & Fetzner, 1998)

o Job satisfaction

o Culture

o Support for the values of the organisation

o Values and the generation of it

o The central values that govern the organisation

o Level of morale in the organisation

o Motivated to work

o Type of dynamics amongst colleagues

o A willingness to share ideas

o Problems resolution

o A forum or opportunity to raise problems

o Criticism

o The level of commitment

o Give full potential

o Racial/gender/class/political/sexual preference/age etc. conflicts

o Conflict management

o The organisational policies

- Feeling part of the organisation

- Important role of everyone

- Acknowledgement for the work that they do

- Beliefs and norms

- Organisational values

- Language

- Innovation

- Xenophobia (Braimoh & Lekoko, 2005; Parrish & Linder-VanBerschot, 2010)

- Legal policies

    - Intellectual

    - Copyright

    - Liability

    - Student

    - Academics

    - Organisation

    - Educational technology

    - HR and labour relations regulations (Gellman-Danley & Fetzner, 1998)

- Non-academic

    - Student counselling

    - Library

    - Marketing

    - Privacy

    - Access to learning facilities and equity

- o Material deliveries

- o Textbooks

- o Equipment and software (Gellman-Danley & Fetzner, 1998)

- Technical policies

  - o Physical delivery system/network

  - o System reliability

  - o Access and connectivity

  - o Setup, equipment and maintenance

  - o Usage of appropriate technology

  - o Sustained funding for ICT

  - o Expertise and technical know-how

  - o Contractual

  - o Agreements (Braimoh & Lekoko, 2005)

- Fiscal policies

  - o Special fees

  - o State funding

  - o Administrative costs

  - o Telecommunication costs

  - o Tuition rate, technology fee, FTE's consortia contracts, government fiscal regulations (Gellman-Danley & Fetzner, 1998)

  - o How much will a course cost? Will there be a technology fee? (Gellman-Danley & Fetzner, 1998)

  - o Fees and contractual arrangements for institutions providing venues and resources ("receiving sites") (Gellman-Danley & Fetzner, 1998; Mays, 2005)

Code 3

Label   Systems

Definition   A distance education system consists of all the component processes that operate when teaching and learning happens at a distance, according to Moore and Kearsley (2005).

Description
1. Management system for distance education (Berge, 2003); responsibilities such as pedagogical and organisational issues (Berge, 2003)

2. Information communication

   - Does everyone have access to the flow of information?

   - Are your suggestions heard?

3. Work responsibilities

4. Skills to perform their job descriptions

5. Opportunities for training

6. Career plan

7. Performance management

   - Incentive for performance

   - Performance appraisal

   - Promotion

   - Recruitment and selection

   - Affirmative action policy

   - Nepotism

   - Induction process (Berge, 2003)

8. Financial management

   - Financial autonomy

- Transparency

- How is the money spent and raised?

- Financial control systems (Berge, 2003)

9. Administrative systems

    - How is work administered?

    - How long does it take for administrative work to be completed?

    - Time management (Berge, 2003)

10. Curriculum and course development system

11. A call centre

12. Examination administration

13. Undergraduate student affairs

14. Postgraduate student affairs

15. Graduation ceremonies

16. Bureau of student counselling and career development

17. Student financial aid bureau

18. Bureau of management information

19. Bureau of learning development

20. Safety services

21. Student support

22. Library services

23. Telecommunication services (ICT)

24. Language services

25. Assignments

26. Dispatch

27. State-of-the-art printing services

28. Academic directorates, colleges, departments, institutes and units which all provide specialised support to the academics and students

29. Quality improvement (Inglis, 2005; Milheim, 2001; Normand, Littlejohn & Falconer, 2008)

Code 4

Label	Challenges
Definition	Proactively identifying and responding to strengths, weaknesses, opportunities, threats as well as emerging opportunities and barriers such as academic compensation and time, organisational change and lack of technical expertise and support in distance education (McKay & Makhanya, 2008).
Description	For ODL there are six strategic challenges.

1. Start-up costs for a distance education programme are expensive

- Basic infrastructure to deliver ODL courses is expensive

- Appropriate basic technologies

- Basic technology services such as wiring, networking, connections, computers, software and licensing, technological support for staff and students

- Staff development

- Strategic alignment with ODL (McKay & Makhanya, 2008)

2. The new student base that grew up using information technology

- Corporate learners

- Professional enhancement learners

- Traditional learners

- Degree-completion adult learners

- Recreational learners

- Students who were not successful at residential universities (McKay & Makhanya, 2008)

3. The competition among universities has intensified as a result of distance education

   - Students are viewed as consumers and can study anywhere, any time, any place and at their own pace

   - The emergence of corporate universities (in-house training facilities to cater for the changing labour market)

   - The rising costs of tuition at traditional universities

   - Dealing with both society's and students' needs (McKay & Makhanya, 2008)

4. Marketing anticipated and the process which enables the student needs to be identified

   - Client/potential students' needs must be identified and satisfied

   - Recruitment plans (McKay & Makhanya, 2008)

5. Student support

   - Access to a range of student support services such as registration and admission, financial aids services and technology

   - Three areas for support:

     o Enrolment

     o Instruction

     o Support (Howell, Williams & Lindsey, 2003)

Recommendations

I recommended that higher education institutions (traditional face-to-face institutions) that want to implement ODL into their offerings start small with small successes to draw people to the change process. In the end it is easy to get the buy-in of academics when small successes are a reality in ODL delivery. The image of ODL can easily be damaged when too many courses are developed and offered too quickly. Developing ODL courses could be a very time-consuming process and the pressure of mass education could hamper quality course construction. When the strategy, policies, and systems are aligned for ODL delivery, the most important aspect of the systems usually seem to be forgotten. Most academics came from face-to-face institutions and course development in an ODL mode with ODL philosophies may be unfamiliar to them. Academic and other staff need time to develop ODL skills. It can take up to five years to build up a core staff establishment that is equipped to fully operate ODL (COL, 2004).

Next, when an ODL unit is planned, it is recommended that the template be used and adapted to specific needs. Furthermore, it is recommended that ODL be kept small and confined to certain courses and target groups. Planning of ODL should follow the sequence of the template. Start with strategic and visionary thinking, taking into consideration the SWOT analysis and challenges posed by higher education, social, and economic forces. During the strategic planning phase, planners of ODL need to buy in to a singular vision to move forward. It is recommended that the ODL policy and the mandate from government on ODL be clear to ensure alignment of all policies and processes for ODL delivery.

Conclusion

From the results of the study it is clear that the implementation of ODL needs careful and systematic planning to ensure success. A great deal of thought should go into planning and analysis of markets for ODL. As with any other system, ODL becomes cost-effective when it can take advantage of economies of scale. This means that the more users of the system, the lower the cost for each person or, in the case of education, the student.

The division of labour is familiar in other walks of life, but in education, specialisation seems not to be the practice. In traditional face-to-face classrooms, individual teachers develop and deliver their own courses (Care & Scanlan, 2001). Educators try to be everything to everyone and to be experts in communication, curriculum design, course design, assessors, motivators, facilitators, as well as content experts. This could be wasteful in ODL and simply adding new and more technology will not result in good teaching and learning. For ODL to be successful, it is important to move to a system where teachers are the specialists within a system (Casey, 2008; Moore & Kearsley, 2005).

The template analysis on ODL planning clearly illustrates that systems for ODL delivery must be well developed before ODL can be implemented. We developed four sets of insights from our analysis, each integrating structural and process elements in planning and implementing ODL facilities.

First we saw the dynamics between the processes of strategy, policies, and systems. We became aware of the impact of the challenges on planning processes in ODL. Each of the processes incorporates a set of decisions and is shaped by certain characteristics. There is infinite potential for overlap and interplay between strategy, policies, and systems which are influenced by challenges. This study indicated that strategy precedes policy and systems. Different challenges impact continuously on all plans and processes (Olugbenga, 2010).

Secondly, different policies for ODL need to be drawn up, the most important being the ODL policy for the organisation. All other policies must be aligned with this ODL policy. Following the policy process is the systems which need to be put in place for the smooth running of ODL. Effective ODL delivery needs certain support systems to function.

Thirdly, the systems must be put in place and operational before ODL is implemented to ensure service delivery. In this study, we found that systems needed for ODL to be successful are complex and huge. No organisation could survive without a collection of operational systems in place. ODL relies on a wide variety of systems to function smoothly to ensure student satisfaction.

The challenges in ODL include economic and social changes, technology advancements, computers and software, and student demographic changes. More research and specific reflective research needs to be done on ODL planning and implementation. The template for ODL unit planning provides a clear guideline for ODL planners and the next logical step would be to test the template further and develop it into a model for ODL planning and implementation.

There are three reasons why ODL must not be implemented too quickly and why it must not be treated as a short-term solution to long-term problems in education. Higher education providers, especially face-to-face learning institutions, have been tempted to set up new ODL facilities with large student numbers. Then, very soon they realise that good planning and student support systems need to be in place to ensure quality ODL (Moore & Kearsley, 2005).

This template analysis indicates a careful and systematic planning process for ODL. Political, economic, and social challenges need to be taken into consideration in strategic analysis and planning for ODL. If this risk analysis is not done, the risk of failure might be high (Moore & Kearsley, 2005). We further concluded that for ODL to be implemented successfully, staff must be reskilled and developed since ODL is a change process which has a domino effect on all aspects of learning and teaching. The role of unions could pose a challenge for ODL planners and implementers of policies

and therefore need consideration at all stages of planning and implementation, especially regarding human resource issues.

The best way to plan ODL facilities is to do so in a sequential roll-out fashion. ODL planning starts with strategic planning, followed by the development of ODL policies for alignment with all efforts, strategies, and processes. The greatest effort will be to put the systems in place for ODL delivery and support. ODL organisations and planners must continuously be mindful of challenges facing ODL delivery. It might be a good strategy to start ODL with teacher education since teachers are invariably keen, disciplined ODL students (COL, 2004; Moore & Kearsley, 2005).

Finally, it is of the utmost importance for the success of ODL implementation that the systems for ODL delivery be in place and working (training may be needed) before ODL students are admitted into the system. A well-developed student support system is a guarantee for success in ODL teaching and learning (Segobye, 2007). Lastly, this template could be used to guide government decisions on how to plan and implement ODL institutions. It could be a useful tool for academic planners to plan and implement ODL and technology-enhanced learning. ODL institutions could use the template as a training tool for staff (academic, administrative, and support staff) to ensure that everyone understands ODL and their specific place and task to enable student success.

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Sustaining Teacher Control in a Blog-Based Personal Learning Environment
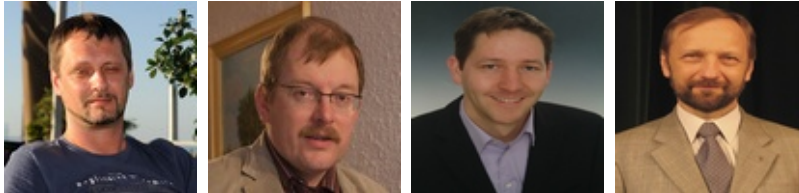
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Abstract

Various tools and services based on Web 2.0 (mainly blogs, wikis, social networking tools) are increasingly used in formal education to create personal learning environments, providing self-directed learners with more freedom, choice, and control over their learning. In such distributed and personalized learning environments, the traditional role of the teacher is being transformed into that of a facilitator. This change inevitably means a reduced level of control on the part of the teacher. This is evidenced, for example, in difficulties experienced in retaining the necessary levels of control when the learning process moves away from institutionally maintained systems to blog-based personal learning environments. In conducting a course in a formal education setting however, it is still essential for the teacher to retain control over certain learning activities, such as course enrolment, assignments, and the assessment process.

A course management plug-in for the WordPress blog platform called *LePress* was designed and developed as a possible solution to this problem. By using LePress, teachers are able to more easily manage and coordinate courses in a distributed blog-based environment. Teachers are able to regain control over some important aspects of online course management, while maintaining the learners' freedom and choice for self-directed learning. This paper documents the results of a survey of a group of 37 teachers who used LePress for at least six months. The study demonstrates that by using LePress, teachers experienced an enhanced level of control over several aspects of the course and this reinforced their perception about the ease of use of the system.

Keywords: Teacher control; PLE; LMS; blog-based learning; perceived easy to use

Introduction

In the formal education context, technology-enhanced learning is usually conducted with the help of an institutional learning management system (LMS). Modern learning management systems provide teachers and learners with a set of tools for sharing learning resources, communicating within a study group, course enrolment, assignments, tests, assessments, activity monitoring, and other types of learning or course management activities. Learning management systems provide a secure and highly structured online learning environment, supporting various types of pedagogical approaches. In spite of this, learners and teachers increasingly adopt new types of web-based tools such as blogs and wikis, which are not hosted, provided by, or even recommended by the university. Users are attracted to such tools because they often have higher levels of user participation, openness, and network effects (Zourou, 2012), and often offer high quality learning resources (Ullrich et al., 2008). While some studies reflect enthusiasm about the use of Web 2.0 tools by teachers and learners (Lee & McLoughlin, 2007; Redecker, Ala-Mutka, Bacigalupo, Ferrari, & Punie, 2009; Safran, Helic, & Gütl, 2007), others are more sceptical about this process. Although they do not deny a growing interest in using Web 2.0 tools in the context of formal education, they call attention to the conflict between the participatory and collaborative nature of Web 2.0 learning and the current structures of formal education (Cole, 2009; Clark, Logan, Luckin, Mee, & Oliver, 2009; Conole & Alevizou, 2010; Crook, 2012; Greenhow, Robelia, & Hughes, 2009).

An opportunity to have more control over one's own learning process and environment is another incentive for using alternative online tools outside of an institutional LMS. By reflecting the hierarchical organizational structures of universities, the LMS is built on a strict top-down approach, giving absolute administrative control to technical specialists in an IT department, while giving less control to the teachers. Steel and Levy have found that integrating the use of the LMS into teacher practices presents a significant challenge in which teachers routinely try to reconcile their internal tacit beliefs with LMS environments (Steel & Levy, 2009). The students in the LMS are placed at the "bottom rung of the ecological hierarchy" (Dron, 2007): They have only limited opportunities to implement those learning activities, tools, and resources, which have been pre-defined by teachers (McLoughlin & Lee, 2007; Siemens, 2006). By contrast, when using Web 2.0 tools, a student or teacher is able to build a *personal learning environment* (PLE), which gives their owners high levels of choice and control over their learning activities.

An example of this kind of environment is a blog-based environment in which students publish reflections about course materials, discuss with others, and submit their assignments through personal weblogs (Pata & Merisalo, 2009). Another example of adapting blogs as a PLE is demonstrated by the widespread use of blogs as the main personal tool in massive online courses (Fini, 2009; Kop, 2011). Kim (2008) provided several reasons for using blogs instead of traditional computer-mediated communication applications, such as the sense of ownership, the support of both social

and individual learning, the less intrusive "pull" RSS technology, and the possibility to archive user data (Kim, 2008). As students have control over their personal weblogs, they also have greater control over their learning.

To differentiate the PLE from any other common set of Web 2.0 services, several technical and educational attributes of the PLE can be identified. Among educational attributes, Salinas et al. (2011) proposed considering the ability of students to define learning goals, manage learning content and process, and communicate with others during the learning process (Salinas, Marín, & Escandell, 2011). According to Attwell (2007), another important feature of the PLE is that it allows learners to configure and develop a learning environment that suits and enables their style of learning (Attwell, 2007). Control by the learner over the choice of learning activities, resources, and tools perfectly corresponds with the self-regulated learning theory (Zimmerman, 1990) and encourages the shift from teacher-centred to learner-centred learning. Yet, the teacher must keep a balance between teacher control and learner autonomy in order to retain the effectiveness of self-regulated learning (Drexler, 2010). Similar arguments have been presented in organizational and workplace learning domains where a balance between individually driven learning and organizational guidance has been captured in concepts of knowledge maturation (Kaschig et al., 2012; Schmidt et al., 2009).

The requirement for combining the LMS and PLE functionalities stems from the different kinds of affordances they offer. While LMS have more affordances for course management, Web 2.0 tools and social media have more affordances for individual expression of students, self-directed learning, expression of ideas, and group collaboration.

One way to achieve this balance is by integrating external Web 2.0 tools with formal LMS, which is increasingly being applied in universities (Dron, 2007; Meccawy, Blanchfield, Ashman, Brailsford, & Moore, 2008; Sankey & Huijser, 2009), thanks to powerful APIs of the most popular LMSs. The problem with this approach is that the LMS is still in a dominant role and learners cannot avoid using two completely different environments in parallel.

An alternative scenario is based on conducting learning activities completely outside of the LMS, yet providing enhanced support for course management in Web 2.0 based personal learning environments. For example, one problem in the blog-based scenario referred to above is that getting an overview of all course activities is difficult, and, hence, teachers have no control over the learning environment (Attwell, 2007; Dron, 2007). Consequently, the authors have been researching and developing a software solution that could act as a course coordination space (Wilson, 2007) in blog-based learning environments. The course coordination space was proposed as a lightweight system that sits "between the personal system and the enterprise" (PLE and institution) and introduces a common course related view and semantics in an otherwise distributed PLE environment. For example, the course coordination space can play the role of a central point for gathering data from distributed Web 2.0 tools, provide required

learning semantics for student's activities (such as course enrolment, homework submission), and provide features for monitoring and analysis (such as a grade book, an overview of students' learning activities). After considering such functionalities, the authors developed a software plug-in called LePress[1] (Learning with WordPress) for the most popular blogging platform, WordPress. By conducting several design-based research iterations (Tomberg & Laanpere, 2008, Tomberg & Laanpere, 2009, Tomberg, Kuli, Laanpere, & Normak, 2010, Tomberg, Laanpere, & Lamas, 2010), a balance was achieved between learner autonomy and teacher control in the blog-based personal learning environment. This study presents the final iteration of a major design-based research exercise. The study focused on the following question: Can a dedicated course coordination tool such as LePress sustain the teacher's control over learning management activities in blog-based personal learning environments?

It is important to mention that this research does not suggest all the possible ways for using Web 2.0 tools in the context of education (e.g., group work of students), but concentrates on issues related to a teacher's and individual learner's interactions.

This study begins with a review of recent research on issues related to teacher control and then introduces LePress as a possible solution for improving course coordination in a blog-based PLE. A description of the design of the survey conducted among teachers is presented, followed by a discussion of the survey results.

Teacher Control and the Blog-Based Learning Environment

Teacher Control

While the majority of studies on the locus of control in the context of learning are concerned with issues of learner control, this study focuses on the less-studied perspective of teacher control.

Garrison and Baynton (1987) interpreted control as an opportunity and ability to influence, direct, and determine decisions related to the educational process (Garrison & Baynton, 1987). The concept of control in distance education has been elaborated by Moore's transactional distance theory (Moore, 1993). The theory describes the psychological distance between learners and teachers that depends on three types of variables: (1) the autonomy of learners, (2) the dialogue between teachers and learners, and (3) the course structure. The last two types of variables describe the relationship between the learner and teacher and are directly interrelated – when the structure decreases, the amount of dialogue increases and vice-versa; these changes happen dynamically to maintain the stability of a student-teacher communication system (Saba,

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[1] http://wordpress.org/extend/plugins/lepress-20/

2002). Such a dynamic shift of balance between the dialogue and the structure influences the levels of both learner and teacher control.

The locus of control becomes visible through decision-making: "who is making the choices about where to go next at any given point in a sequence of learning activities" (Dron, 2007). Learner control is an important condition for successful self-regulated learning and it is supported by the PLE. Dron noted that even when the learner chooses a particular option, this choice could still be suggested or predefined by the teacher or the software. A homework assignment is a typical case in point because deadline, format (e.g., 500 word essay), and topic are predefined by the teacher. Therefore, providing possibilities for structuring and predefining online learning activities might enhance the teacher's sense of control.

The concept of learner control is related to the approach of self-directed learning (Hiemstra, 1994; Knowles, 1975). In the case of self-directed learning, the balance of control can dynamically change between the learner and the teacher, depending on the specific situation, personal capabilities of the learner, and the readiness of the teacher to provide support (Candy, 1991). Dron illustrated the unstable nature of control by describing control as "a constant and dynamically changing variable, not just because it is a negotiable quantity, but due to the nature of people and their diverse needs as learners" (2007).

Modern learning theories promote reducing teacher control:

> The locus of control in a social-constructivist system shifts somewhat away from the teacher, who becomes more of a guide than an instructor, but who assumes the critical role of shaping the learning activities and designing the structure in which those activities occur. (Anderson & Dron, 2011)

To support the balance of control between the teacher and the learner, Candy proposed using various instructional strategies that could be placed at intervals along the learning "continuum" (1991).

For successful implementation of the formal course in the informal learning environment, learning activities that are chosen for implementation should be defined in terms of formal learning that is familiar to the teachers. Teacher control becomes apparent in the context of different teaching activities and choices (Dron, 2007) that occur over time (Figure 1).
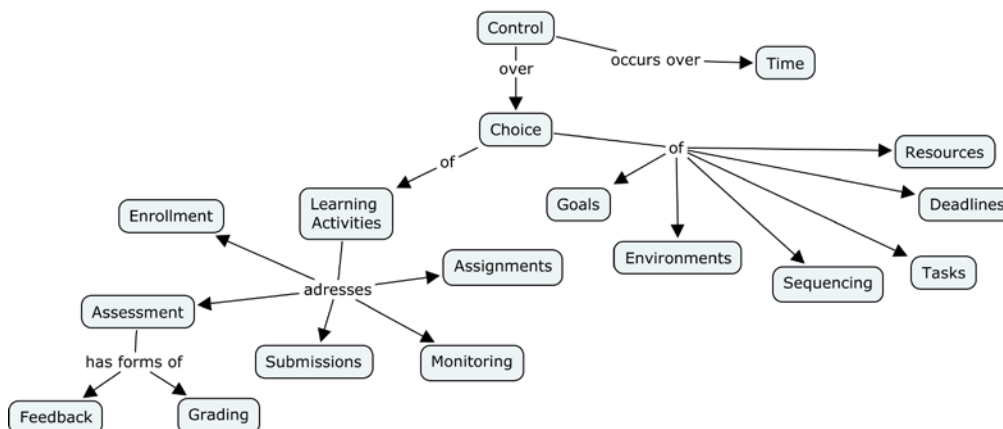
Figure 1. Model of teacher control in the context of formal learning.

The figure shows that by following Dron, we define control as *choice* over different *learning artefacts* such as *tasks*, *resources*, *deadlines*, and so on, and as choice of different *learning activities*. In the context of formal learning (even if it is carried out in an informal learning environment), teachers expect to control such learning activities as *the enrolment* of students into a course, official *announcements*, *assignments*, the collection and assessment of *homework submissions,* and the *monitoring* of the overall learning process in the course. Formative assessment of learning outcomes can be implemented in the form of written *feedback* from the teacher, while summative assessment is usually provided in the form of a *grading scale*.

Learning Environments as Determinants for the Locus of Control

Dron (2007, p. 12) argued that new Web 2.0 tools can never be ideal for teaching:

> It would generally be difficult to base an entire sequence of learning transactions on such tools as they are unable, on their own, to perform or to support the full range of functions that might be expected of a teacher.

Some identified issues were addressed in the design of LePress.

- *Loss of control*. Dron and Bhattacharya identified specific issues of control over tools, services, and data. LePress serves WordPress data by maintaining learning metadata. This allows the implementation of specific learning activities that are required for formal learning. LePress also addresses concerns regarding personal data safety. For example, personal grades of students are only accessible privately.

- *Loss of monitoring.* Monitoring is an opportunity of the teacher to track interactions of students. LMSs have tools for initiating, directing, and monitoring every student's action. PLEs have a bottom-up approach, where the student decides not only when and with whom to interact but also whether to make these interactions invisible to the teacher. LePress allows teachers to monitor course enrolments and submissions of homework.

- *Assessment issues.* In a PLE the teacher has difficulty in *keeping records of students*. Assessing results in dispersed blogs of students can be a time-consuming task. LePress enables student submissions to be combined to form a class book. The teacher can access all submissions from one designated interface. The same interface can be used for proving the validity of course results by allowing an institutional auditor to verify consistency and fairness of assessments.

The structure of an environment influences the behaviour of users (Dron, 2007; Senge, 1991). Taking the previous framework of control, one can assess the impact of different learning environments on the locus of control in teaching. The teacher and the learners can have very different levels of control over the same type of choice. In a Web 2.0 learning environment the student can have almost unlimited control over the choice of *goals*, *tasks,* and *resources,* depending on personal experience and level of self-direction*.* In contrast, the teacher has maximum control over learning activities such as *course enrolments*, *assignments,* and *assessments* in an LMS. Closed environments like LMSs allow limited, often predefined paths of learning. LMSs are designed to implement the requirements of institutional learning and reflect institutional structure. "Most universities and other higher education academies are natural hierarchies, with the learner at the bottom of the chain" (Dron & Bhattacharya, 2007). Highly structured, top-down managed hierarchies in an LMS induce highly structured pedagogical behaviour, which cannot be changed by the students. In contrast, in a PLE the learner uses bottom-up design: The learners are free to adapt the system for their tasks. In Web 2.0 learning environments the user is less directed and has much more freedom of choice.

While freedom of choice supports the constructivist approach and self-regulation of learners, it conflicts with the structural requirements of formal learning and limits control by the teacher, who has no tools to implement required learning activities. Pata et al. (2012) argued that it is essential to design elements that enable self-organization of the course as an ecosystem, as well as to regain some control over what is happening in the system. Attwell (2007) also argued that there is an increasing need to formalize the outcomes of informal learning, which until recently received little attention from researchers (Attwell, 2007).

The teacher in a blog-based PLE today is not so much a designer of the environment but a fellow navigator (Bhattacharya & Dron, 2007). Hughes (2009) proposes that teachers

work *with* a set of circumstances rather than trying to control or alter them. However, in the case where students are not prepared to make use of a PLE, teacher control over the course is highly welcomed. Notice also that effective use of a blog-based course assumes certain technical skills on the part of learners and teachers as well as regular feedback to learners (Tammets & Normak, 2012).

Based on the concept of teacher control, we designed LePress, a software solution aimed at supporting teacher control in blog-based courses. This will be presented in the next section.

LePress: Sustaining Teacher Control in Blog-Based Course Environments

Kim (2008) noted that current educational blogs are normally not customized for educational purposes in terms of user interface and functional features (Kim, 2008). LePress was designed to sustain teacher control in blog-based courses by adding some course management functionalities to WordPress. LePress is a meta-mediator, that is, it mediates the learning-related mediators (enrolment requests, participants' lists, assignments, submissions, feedback) seamlessly between the teacher's blog and the blog-based PLEs of learners (See Figure 1).

LePress is an add-on module (plug-in) installed on top of WordPress that makes use of a subset of native interface elements, communication protocols, and other features of WordPress with minor user interface enhancements (additional submenu on WordPress dashboard, additional checkbox in blog post editing view, front-end widget).

In Figure 2 the front-end widgets for the teacher (a) and for the student (b) are shown. While all learning activities provided by LePress are available through a WordPress dashboard, these widgets allow course participants to interact with the course directly in the blog web-page. Using the widget, the students can select the required course and register instantly.
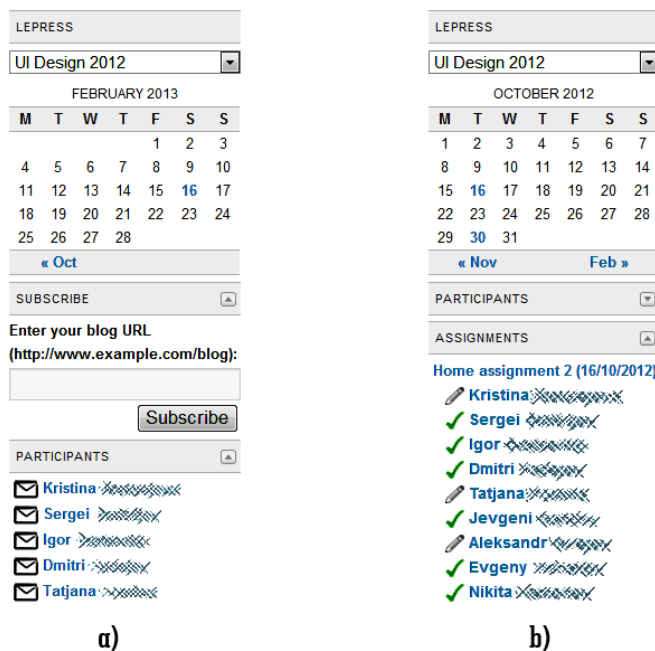
Figure 2. LePress sidebar widgets for a student (a) and for a teacher (b) (family names are shaded).

Besides a calendar showing deadlines for submissions, the teacher and the students have access to a list of the course participants, which refers to students' homepages and email addresses. Students can immediately subscribe to the course by entering the URL address of their own blog, or in the case where they are already logged in, just by clicking the "Subscribe" button. The students can initiate a homework submission by selecting an appropriate assignment in an "Assignments" list. In turn, the teacher can use the "Assignments" list to view the names of students who have already begun an assignment.

While use of blogs in education makes the assumption of group work based on communications of students, the focus of the current study is limited to teacher-student relationships. There are certain design approaches that could support group-based assessments in the blogs, but these functionalities are planned for future development. Nevertheless, there are other research and development activities that can be used for this purpose. One example is the software project EduFeedr, which allows monitoring of the feedback given by one student to another (Põldoja, Savitski, & Laanpere, 2010; Põldoja & Laanpere, 2009).

LePress is designed with the aim of implementing workflow that is the least disruptive to the existing blogging workflow of WordPress. While LePress adds some learning-related features to WordPress, all the original publishing functionalities of WordPress remain intact after installing the LePress plug-in.

LePress shares some characteristics of a *course coordination space* as suggested by Wilson (2007). Figure 3 shows how LePress coordinates what we call *learning flow* between blogs of teachers and students involved in the course. The diagram illustrates the learning flow between the teacher and the student. Both participants have LePress installed in their personal WordPress blogs. As shown in Figure 3, WordPress is used for implementing existing blogging activities like posting and commenting. LePress adds learning semantics to these activities and turns traditional blog communication flow into learning workflow.
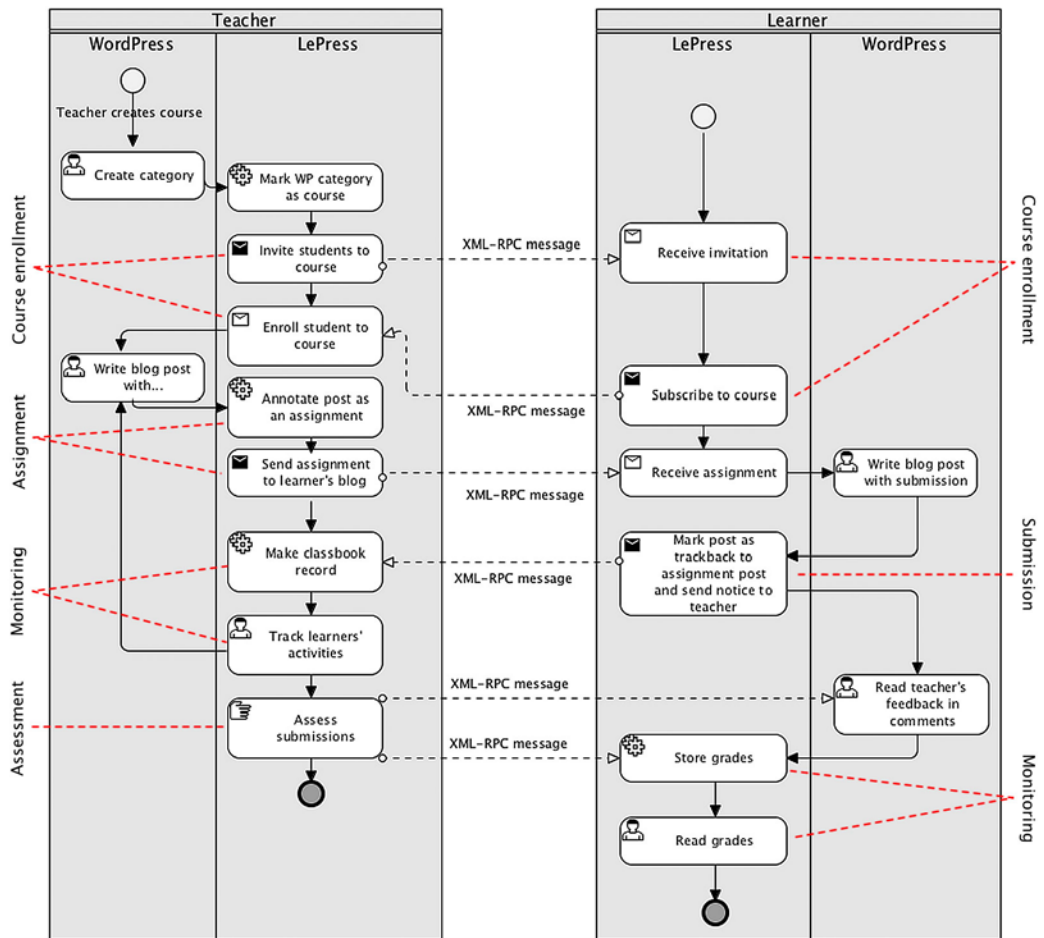
Figure 3. Learning activities of LePress.

LePress specifically adds several functionalities to WordPress to address challenging issues related to teacher control (see Figure 1) in an existing blog-based environment. Any WordPress category in the blog of the teacher can be marked as a course, allowing the teacher to organize course activities and learning content around it. Using LePress, the teacher can enrol students in a course in an open or controlled manner, turn any blog post into an assignment, set submission deadlines, monitor submissions of students, provide formative assessments in the form of feedback using the WordPress

comment field, and provide summative assessments using the LePress private grading system. LePress also enhances the productivity of teachers by allowing them to save course content as a template and to reuse it in future courses.

LePress is positioned as a tool, which can balance control between the teacher and the learner in PLE. In Figure 4, a diagram is presented that illustrates the speculative distribution of control between teacher and student (horizontal axis) in different learning environments. The vertical axis shows the structure to dialogue ratio, where we consider the amount of dialogue proportional to the amount of choice, as proposed by Dron (2007). This picture is intended to situate LePress in the context of other popular tools. In addition, this diagram illustrates the role that learning environments play in the distribution of control between teacher and learner.
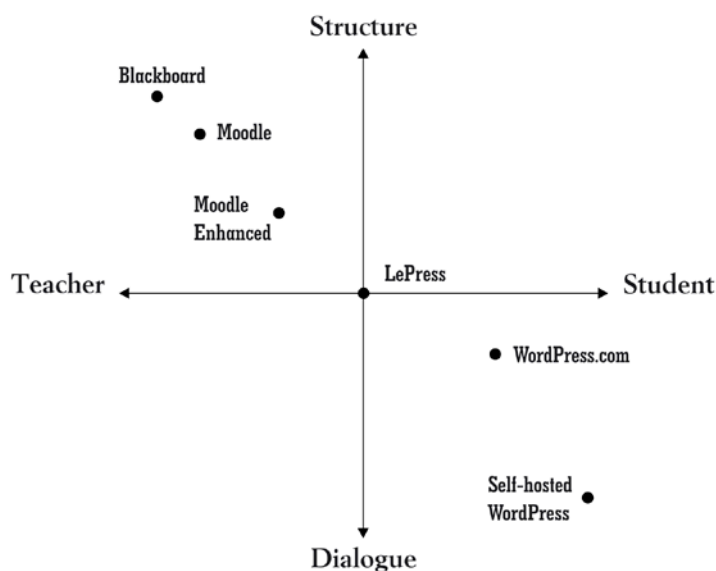
Figure 4. Speculative distribution of control over learning flows between the teacher and the student in different learning environments.

A comparison is made here of several environments that have different levels of structure and dialogue. In the top left corner Blackboard LMS is placed as the most structured and the least controlled by the student environment. Blackboard is a closed environment based on proprietary software. There is only a minimum amount of customizing of the environment available and only for the teachers. All learning flows are strictly predefined and cannot be modified. Another example of the traditional LMS is Moodle, which is a less structured and a more open environment that is more adaptable to students' needs. Thanks to open source code and the extendable architecture of Moodle, possibilities for customization increase dramatically by means of plug-ins. Lots of Moodle plug-ins have been developed that allow the use of different forms of dialogue between the teacher and the learner (e.g., a blog plug-in, which gives students more control).

The authors consider a blog installed on the wordpress.com platform as a tool that provides more possibilities for dialogue, thereby shifting control to the student's side; thus it can be used as a PLE. However, the hosting policies of wordpress.com are very strict concerning the installation of plug-ins and therefore the possibilities for customization of the environment and the adaptation of it to learning flows are limited. These limitations do not apply when using the self-hosting WordPress blog, because many diverse plug-ins are available. In this situation, the student has almost unlimited possibilities for customization and almost full control over the environment. At the same time, the amount of teacher control vanishes.

LePress is intended as an add-on to the self-hosted WordPress blog. It provides the teacher with more control over the dialogue by providing control over feedback, assessment, and grading. As the diagram shows, LePress balances control between the teacher and the student and between structure and dialogue.

The authors conducted a survey to examine both usability and perceived teacher control in a course in which LePress had been used. The results of this study are presented in the following sections.

A Survey on Perceived Teacher Control Using LePress

The development of LePress has been accompanied by iterative design-based research (DBR) (Barab & Squire, 2004; Sandoval & Bell, 2004; Van den Akker, Gravemeijer, McKenney, & Nieveen, 2006; Wang & Hannafin, 2005).

According to Banathy (1996), in design science "methods are tools for creating and changing human artefacts" (Banathy, 1996). An artefact created as a result of a pedagogical design study could be, for instance, a piece of educational software, digital content, curriculum, or a project. DBR is often used for research in learning environments. The main goal of such research is not the production of a software product per se, but rather that the exploration of research questions about learning or teaching are reified, explored, and tested by the design and use of the software/learning environment (Kelly, 2006).

Several different pedagogical and technological questions relating to the design of LePress have been examined in previous iterations. These include the problem statement and idea (Tomberg & Laanpere, 2008), issues of semantic interoperability (Tomberg & Laanpere, 2009), technological implementation of test-based assessments in a blog-based environment (Tomberg, Kuli, Laanpere, & Normak, 2010), and the design of learning workflow and semantics (Tomberg, Laanpere, & Lamas, 2010). Each result was the basis for another iteration of redesigning LePress. In the current iteration, the authors focused on the perceptions of teacher control in PLEs that are enhanced by LePress. The results of this study could be reused in designing not only the

next version of LePress but, more importantly, could address the impact of learning environments on teacher control in a more general sense.

Research Questions and Design

A questionnaire was designed that asked teachers for their perception of the amount of control they felt they had when using LePress as compared to teaching in blog-based learning environments. They were also asked for their perception of the usability and ease of use of LePress.

The reason for focusing on usability is that perceived ease of use is assumed to be one of the main determinants of intention to use, and the future adoption of, an eLearning system (Davis, 1989; Hu, Clark, & Ma, 2003; Teo, 2009; Teo, Lee, & Chai, 2008). This is especially relevant for PLEs as there is usually a much higher degree of freedom and choice for teachers to adopt them or not. Accordingly, Gillet (2010) noted usability as one of the most challenging features of a PLE (Gillet, 2010). Clearly, any solution that is designed as a superstructure over a PLE, such as LePress, needs a critical level of usability and learnability. The additional superstructures require users to change their habitual patterns of using the software and extra effort is required when learning new features. In cases where the software is too complex, teachers will not adopt it.

The authors hypothesized the following: (1) LePress would be perceived as easy to use by its users, and (2) LePress would be perceived as enabling a higher degree of teacher control. Finally, in order to establish the importance of teacher control in the context of online learning, it was also hypothesized that (3) perceived teacher control would be a significant factor to contribute to perceived ease of use.

Participants

The sample of this study consisted of 37 teachers (30 female and 7 male) from different Estonian K-12, vocational, and higher education institutions. The sample was relatively homogenous concerning their prior e-learning experience, related attitudes, and behaviour. Their teaching experience was between 1 and 34 years (median 18 years). Seven teachers had already used LePress before in more than one of their regular courses within the last year. The rest of the respondents had participated in a 6-month staff-training programme, where they actively used LePress. Twenty-nine respondents had prior experience of teaching with traditional blogs. Therefore, they were well able to compare teaching with and without LePress in a blog-based PLE.

Questionnaire

A questionnaire was created consisting of two demographic, 26 Likert scale, 16 multiple choice, and two open response questions. An online questionnaire was implemented in the Estonian language using an open-source survey tool called Limesurvey[2]. The items

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[2] http://www.limesurvey.org/

were grouped into three parts: respondent's background information, perceived usability of LePress, and perceived teacher control in LePress.

The second part of the questionnaire focused on the usability of LePress and consisted of three sub-groups:

1. The items related to the usability of LePress in general (e.g., "The user interface of LePress is intuitive");

2. The items related to affordances of LePress regarding learning and teaching tasks (e.g., "I don't mind if assignments are submitted as blog posts");

3. The items related to perceived ease of use of LePress with specific learning activities (e.g., "Assessment of students' submissions is easy in LePress").

In the last part of the questionnaire, respondents were asked to assess the perceived level of teacher control in LePress in comparison to blogs without LePress. The respondents were asked to indicate their agreement or disagreement with six claims on a 5-step Likert scale. One of these claims was generic ("LePress enhances teacher's control over the course"), while others focused on specific aspects of teacher control (e.g., "LePress enhances teacher's control over course enrolments").

Procedure

One week after completion of the staff-training programme, the participants were then asked by email to complete the online questionnaire anonymously during a one-week period. Forty-two requests were issued; after one week, 37 surveys had been completed online. Following that, the data was pre-processed and analysed using MS Excel and SPSS software.

Only very few teachers completed the open questions, so these revealed little further qualitative insight. Therefore, the results are not reported here.

Results

The following section examines the results pertaining to the following three hypotheses:

1. LePress is perceived as easy to use by its users,
2. LePress enables a higher degree of teacher control, and
3. Perceived teacher control significantly contributes to perceived ease of use.

Perceived Ease of Use

LePress has gone through a number of design iterations. Within these iterations, considerable feedback has been taken into account in order to improve the perceived ease of use of the software. To validate the hypothesis, eight items were included to measure perceived ease of use (Cronbach $\alpha = 0.840$). Each item was answered on a five-point Likert scale with a neutral midpoint (0) and two levels of agreement (1, 2) and disagreement (-1, -2).

The eight items were included in a composite variable, perceived ease of use (mean = 0.78, std = 0.54, $n = 36$). A one-sample t-test indicated that the mean was significantly higher than the neutral midpoint ($t = 8.68$, $df = 35$, p one-tailed < 0.0001).

For each of the eight items, one-sample t-test was then performed to check for significant differences to the neutral midpoint. For these analyses, one-tailed tests were performed and the critical alpha level was adjusted according to the Bonferroni correction ($\alpha_{crit} = 0.00625$) to take into account the multiple tests performed. Table 1 shows the results of these analyses. Six of the eight scales give a significant value difference, while two do not reach critical p levels (The user interface of LePress is intuitive and creating a new course is an easy task in LePress).

We conclude from these results that users perceive LePress as being easy to use. The detailed analyses also show that it is perceived to be easy to learn and user-friendly and that it is easy to add students, to give assignments, to find submissions, and to assess students' work. This is remarkable since new software is often judged as being more difficult to use than the customary software to which it is compared.

Table 1

Perceived Ease of Use of LePress by Teachers

	n	Mean	Std. Dev.	t	$p*$
Perceived ease of use (Composite value)	36	0.78	.540	8.680	<.0001
LePress is easy to learn for a novice teacher	35	0.89	.676	7.750	<.0001
LePress is user-friendly	35	0.86	.733	6.915	<.0001
The user interface of LePress is intuitive	30	0.37	.765	2.626	.0067
Creating a new course is an easy task in LePress	25	0.48	.918	2.613	.0076
Addding a student to a course is an easy task in LePress	25	0.80	.764	5.237	<.0001
Giving assignments for students is an easy task in LePress	27	0.89	.801	5.769	<.0001
It is easy to find the students' submissions in LePress	33	1.06	.788	7.730	<.0001
Assessment of students' submissions is easy in LePress	27	0.78	.934	4.328	<.0001

* one-tailed, adjusted $\alpha_{crit} = 0.00625$

Perceived Teacher Control

The second hypothesis was that users would perceive LePress as enhancing teacher control over the course. Five items (Cronbach α = 0.891) asked users to estimate their level of control of blog-based courses. Again, each item was answered on a five-point Likert Scale with a neutral midpoint (0) and two levels of agreement (1, 2) and disagreement (-1, -2).

The five items were included in a composite variable, perceived teacher control (mean = 1.06, *std* = 0.65, *n* = 33). A one-sample *t*-test indicated that the mean was significantly higher than the neutral midpoint (*t* = 9.386, *df* = 32, *p* one-tailed <0.0001).

As in the case of perceived ease of use, a one-sample *t*-test was performed for each of the five items. For these analyses, one-tailed tests were performed and the critical alpha level was adjusted according to the Bonferroni correction (α_{crit} = 0.01). Table 2 shows that *means* in all scales were significantly higher than the neutral midpoint.

We conclude that LePress is perceived to increase teachers' opportunities to exert control in the course. Users were in considerable agreement that LePress improves control over the course and enrolments, enhances the monitoring of activities, and gives a better overview of assignments, feedback, and grades.

Table 2

Perceived Teacher Control Results

	n	Mean	Std. Dev.	*t*	*p*
Perceived teacher control (Composite value)	33	1.06	.647	9.386	<.0001
LePress enhances teacher's control over the course	28	1.04	.744	7.362	<.0001
LePress enhances monitoring of course activities	29	1.21	.675	9.628	<.0001
LePress gives students better overview of assignments	32	1.16	.954	6.855	<.0001
LePress shows grades and feedback to students in more convenient way	33	1.18	.846	8.024	<.0001
LePress enhances teacher's control over course enrollments	23	0.83	.834	4.750	<.0001

* one-tailed, adjusted α_{crit}=0.01

Perceived Teacher Control Increases Perceived Ease of Use

The results so far indicate that LePress has good usability and increases the teacher's control during the course. The last hypothesis will attempt to establish that there is a relationship between these variables. If perceiving higher control leads to higher ease of use, then this will also lend credence to the assumption that teacher control is an important factor in how favourably learning software is judged by teachers and, hence, how likely it is that they will adopt LePress in their course.

The validity of this hypothesis was tested by performing a linear regression analysis. The independent variables were the five items from the perceived teacher control scale. The dependent variable was the composite variable, perceived ease of use. The linear regression with all the predictors entered into the model gave a highly significant result ($F = 5.226$, $p = 0.005$) with an overall $R = 0.788$ ($R^2 = 0.620$). A stepwise regression shows that the item *LePress enhances teacher's control over the course* is the most important predictor. When only this variable is entered into the model, the model is significant ($F = 21.20$, $p < 0.001$) with an overall $R = 0.717$ ($R^2 = 0.515$). Due to the high inter-correlation of the items, the rest of the items do not add any significant amount of predictive variance to the model. The two items that come the closest to being entered as well are (a) *LePress enhances teacher's control over course enrolments* ($\beta = 0.384$, $p = 0.053$) and (b) *LePress shows grades and feedback to students in a more convenient way* ($\beta = 0.310$, $p = 0.075$). This could be interpreted as meaning that teachers placed special importance on being able to control enrolments and grades when judging ease of use. However, due to the high inter-correlations of predictors, beta weights should be interpreted with caution, and additional research is needed to establish the relative importance of different factors of teacher control for judging ease of use.

Conclusion

The students and teachers continue to escape from walled gardens of institutional learning environments to the "Web 2.0 jungle" (Dron & Bhattacharya, 2007). They like to use new services with elements of social media, improved usability, and extensive learning content. The amount of learner control goes up at the expense of a lower level of teacher control. An effect of these circumstances is the inability of teachers to control learning activities that are required in the context of formal institutional learning.

This study tested three hypotheses about the course management plug-in, LePress, for use on the WordPress blog platform:

1. LePress would be perceived easy to use by its users;
2. LePress would be perceived as enabling a higher degree of teacher control; and
3. Perceived teacher control would contribute to perceived ease of use.

We found that teachers perceive LePress as being easy to use. Teachers consider creating a new course, adding a student to a course, giving assignments, finding the students' submissions, and making assessments of students' submissions as easy tasks when using LePress. They also consider LePress as easy to learn for a novice teacher, user-friendly, and intuitive.

While there are several other studies that are concerned with issues of learner control in the context of self-directed distance learning, this study explored the issue of teacher control in blog-based distributed environments. Today teachers and educational institutions are facing a choice between closed institutional LMSs and distributed, open, weakly controlled, but very powerful PLEs based on Web 2.0. This study shows that teachers who move to blog-based PLEs can be supported by designing additional features in a PLE that sustain their control over learning activities.

The results show that specifically designed lightweight software tools like LePress can be used for coordinating courses taught in a PLE in a formal education context. When allowing the learners to use available resources in Web 2.0 environments, meta-mediator tools like LePress could help teachers sustain a feeling of control over managing the course activities. Additional results show that this may be especially so for less experienced teachers. We observed a negative correlation (r =-0.334, p < 0.01) between teaching experience and the inclination of the teacher to teach using blogs, and a positive correlation (0.395, p < 0.01) between the inclination of the teacher to teach using blogs and the belief that LePress enhances teacher control over the course. We assume that teachers with shorter teaching experience perceive LePress to be more helpful which in turn increases their inclination to teach with blog-based environments. It is likely that teachers with longer teaching experience have developed alternative methods to control the course workflow.

We also found evidence that teacher control is an important factor in determining how favourably learning software is judged by teachers. The regression model has substantiated the perception of control as an important predictor of ease of use. Following the claims and research of the technology acceptance model (Liao & Lu, 2008; Ma, Andersson, & Streith, 2005), it is assumed, therefore, that teacher control will also be a key factor in determining the adoption of LePress and the intention to use it continuously. While the latter should be subject to further research, it has become evident that teacher control is an important factor to be considered by designers in the future development of PLE.

Clearly, there are other actors besides teachers and learners who are involved in control over choice in the context of formal learning. Garrison and Baynton (1987) considered *teacher*, *student,* and *content* as the transactional elements that determine the balance of control. Dron (2007) extended this list by adding the *group of students* as a separate element, arguing that a group can have a different amount of control compared to individual members (Dron, 2007). We would argue that in addition to these elements,

the technical environment used for course management constitutes an element that needs to be considered. Another important element that is seldom considered is the level of control exerted by the national educational policy on stakeholders. While this element is not the most prominent, it still defines many rules that the teachers and the learners must abide by. The role of the national educational policy makers as the stakeholders in control corresponds with Dron's (2007) ideas about different levels of scale as it relates to control. We consider this topic as one of interest for future research. Understanding new ways of supporting control can help in the development of dedicated tools for administrators or dashboards for universities since these could track the success of implementing education policies.

The next steps in the research are experimental and ethnographic studies. These could help to investigate typical learning activity flows and specific needs of teachers in personal learning environments and support better scaffolding of learners while retaining opportunities for implementing formal institutional requirements.

Acknowledgements

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Addressing the Needs of Diverse Distributed Students

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Abstract

Two interrelated studies were undertaken to assist Alberta post-secondary institutions with meeting challenges associated with providing services to diverse distributed students that are of similar quality to services provided to traditional classroom students. The first study identified and assessed best practices in distributed learning; the second refined the focus to students who were identified as members of diverse sub-groups. Research activities for the studies included: a comprehensive literature review of best practice in distributed service delivery; an online survey for students enrolled in distributed learning through eight colleges and technical institutes; staff and student focus groups; and interviews with students, front-line staff, senior post-secondary administrators, and representatives from provincial government and community organizations. Findings highlight impressions and experiences in relation to best practice criteria for service delivery in distributed learning, along with "best practices behind the best practices" that facilitate the adoption and improvement of distributed service delivery.

Keywords: Best practice; diversity; distributed learning; e-learning

Introduction

The unprecedented numbers of students enrolling in courses and programs offered through alternative formats (Allen & Seaman, 2009; Nagel, 2009; Radford, 2008), along with growing numbers of post-secondary institutions making the investment to expand their modes of content delivery (Parker, Lenhart, & Moore, 2011), are gaining the attention of educators, policy makers, and researchers. Community colleges are on an upward trend in the number of courses and programs offered via distributed environments. Radford, for example, found that enrolment in post-secondary distance education[1] was most common among students in two-year college programs. Similarly, Parker et al. revealed that 91% of two-year colleges in the United States offered online courses.

Though systematic e-learning enrolment data for Canada does not presently exist, it is estimated that between 875,000 and 950,000 students are now registered in a "purely online" college or university course at any one time, including approximately 100,000 full-time students (Contact North, 2012, p. 14). There is evidence Canadian policy makers see distributed learning becoming increasingly prevalent going forward (Borokhovski et al., 2011).

As distributed learning (defined here as any delivery mode available to students at a distance) has become more common, so too have examples of the successful use of distributed learning models. However, the mounting enthusiasm for distributed learning has been inconsistently matched in policy direction and in the use of best practices (Bates, 2011; Borokhovski et al., 2011; Contact North, 2012). The impact of this can be seen in institutions' organizational structure, staffing policies and procedures, and academic and other student related policies. While many examples of successful or best practice exist, they must be complemented by an understanding of how such practices relate to the experiences and needs of students who are diverse in their social, cultural, and English language backgrounds. Up to this point, there has been insufficient communication of issues and solutions in this area. While leaders in the post-secondary system seem committed to ensuring that distributed students receive instruction and services of a similar quality to their classroom counterparts, it is clear that more work is needed (Borokhovski et al., 2011). Canada is in need of system-wide solutions that help make distributed learning successful (Bates, 2011; Contact North, 2012).

Colleges in Alberta have a mandate to conduct applied research, undertaken to produce practical results with immediate application to real-world situations. In pursuit of this mandate, and in order to address gaps in knowledge to inform changes in policy and practice related to distributed learning, Bow Valley College (BVC) led two interrelated studies. The first, *Successful Practices in Supporting Students in Distributed Learning*

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[1] The author cited the 2008 National Postsecondary Study Aid Study definition of a distance education class as "primarily delivered using live, interactive audio or videoconferencing, pre-recorded instructional videos, webcasts, CD-ROM, or DVD, or computer-based systems delivered over the Internet."

(*Successful Practices*), explored best practices in distributed student support as well as the cultural, structural, and policy features of organizational practice that make these practices possible – the 'best practices behind the best practices' (Shimoni, Barrington, & Wilde, 2010). The second study, *Meeting the Needs of Diverse Students Engaging in e-Learning* (*Diverse Students*), examined the needs of diverse students in a distributed learning environment and the extent to which needs were being or could be met (Shimoni & Barrington, 2010). The first study was funded by the Alberta Ministry of Advanced Education and Technology (AET); the second received funding from eCampusAlberta, a consortium of Alberta post-secondary institutions established to facilitate access to online learning.

Both studies examined existing successful practices in distributed learning, and were conducted simultaneously in partnership with eight Alberta colleges and technical institutes: BVC, Lethbridge College, Northern Alberta Institute of Technology, NorQuest College, Northern Lakes College, Olds College, Portage College, and Red Deer College. The studies were guided by a single steering committee comprised of senior representatives from the eight partner organizations, the director of eCampusAlberta, and a representative from AET.

While there is overlap in the interests of the two studies, they are distinctive in both primary focus and research questions. The first study sought to uncover best practices in supporting the general distributed student population. The second refined the focus to specific sub-groups of students who may have had needs distinctive from, or in addition to, those of the general student population. As many of the participants were from the same populations, the data collection tools for both studies were combined, allowing researchers to be more effective in data collection and more respectful of the time commitment of participants. Presenting the findings of the studies together allowed key stakeholders to obtain a broader view of both problems and proposed solutions, and ensured that the needs of the populations studied in the *Diverse Students* study would be integrated into recommended policy and practice.

Study Goals and Key Research Questions

One purpose of the *Successful Practices* study was to explore the current state of academic, enrolment, and student services across publicly funded colleges and technical institutes in Alberta as well as in the community organizations that support adult learners. This involved the identification of services and strategies that contributed to the success and satisfaction of distributed students, along with areas requiring change. Institutional policies, procedures, and practices that were seen as essential for the implementation of successful practices were reviewed.

The *Diverse Students* study examined the existing services and the need for further or different supports for diverse students. The term *diverse* was broadly defined – purposely so – and identified sub-groups included students residing in rural areas, non-native English speakers, Aboriginals, and those with disabilities (including learning or

physical disabilities and mental health concerns). It was presumed that such students may have need for services and/or strategies different than, or in addition to, those identified in the *Successful Practices* study.

The intention of both projects was to develop recommendations that would lead to higher quality support services for distributed students. The studies sought both to develop a greater understanding of successful practices and needs of diverse students within a distributed learning environment, and to inform the successful implementation of practices and policies to help post-secondary institutions better serve their distributed students. Project funding included the production and implementation of tools and processes for disseminating findings and acting on steering committee recommendations. These processes are ongoing and will be reported on separately.

Key research questions of the two studies addressed students, college services, and the post-secondary system and are presented in Table 1.

Table 1

Research Questions by Study

Study	Research questions
Successful Practices in Supporting Students in Distributed Learning	• What are the existing best practices in innovative alternative service delivery to students? • What are the "best practices behind the best practices" – the cultural, administrative, human resource, and policy supports within post-secondary institutions that are congruent with successful alternative delivery programs? • What are effective strategies to encourage collaboration and information sharing among post-secondary institutions? • What changes are required for post-secondary institutions desiring to implement relevant and efficient academic learning services to distributed students?
Meeting the Needs of Diverse Students Engaging in e-Learning	• What are needs of diverse groups within the overall student population as it pertains to distributed learning? • What barriers currently prevent participation? What would reduce these barriers? • What successes or promising practices exist that have demonstrated effective support for diverse students? • What inter- and intra-institutional changes are required to provide required services to diverse distributed students?

Methods and Tools

The following section describes the research activities undertaken for the two studies, including a description of the relevant populations targeted.

Literature Review

A review of relevant studies in online and other non-traditional learning environments was carried out prior to the two studies (Fiege, 2010). The review served as background for the research in developing a conceptual framework and fostering shared understanding of a "best practice" for distributed learning. Current literature and the field-based experience of the steering committee led to the development of a definition of a "best, successful, or promising practice" as any practice that reduced or eliminated barriers to students' access to services and academic success.

In addition to the online provision of services, which much of the existing research considers an essential component of best practice (see LaPadula, 2003; McCracken, 2005), these studies included other delivery modes provided they were available to students at a distance and at times that were convenient to them, such as blended approaches, video- and teleconferencing, and itinerant trainers. This definition of distributed learning allowed the research team to simultaneously categorize environments outside of traditional classroom learning and address challenges associated with definitions in this domain (Canadian Council on Learning, 2009; Moore, Dickson-Deane, & Galyen, 2011).

The literature review examined available knowledge, largely through peer-reviewed journals and books, on best practice in distributed learning, along with its applicability to the needs of diverse students[2]. The review organized available evidence according to the inclusive student services process model proposed by Floyd and Casey-Powell (2004), which provides a "framework for designing processes and programs to support students in both traditional and online courses" (as cited in Fiege, 2010, p.17). Based on findings from the literature review, a list of 10 criteria for successful practice in serving diverse distributed learners was developed. These criteria were vetted by members of the steering committee who had extensive experience in the implementation of distributed learning in their respective institutions. After incorporating feedback from the steering committee, the best practice criteria were finalized, forming the basis of subsequent elements of the studies:

1. The admissions and registration processes are well-organized and easy to follow.

2. Students can access comprehensive initial assessment, academic advising, and orientation.

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[2] The literature review can be accessed through the eCampusAlberta website: http://www.ecampusalberta.ca/files/Literature_Review_Report.pdf

3. Financial aid and financial services information are provided to students on the institution's Web site.

4. Students can access adequate support on how to use and troubleshoot technology.

5. Students can access adequate academic and/or tutorial support services, including assistance with learning strategies and writing skills.

6. Students can access bookstore services and relevant bookstore information.

7. Students can access library services and relevant library information.

8. Students can access adequate career counselling and relevant career services.

9. Students can access adequate personal counselling and relevant counselling services.

10. Students in identified diverse subgroups (Aboriginals, non-native English speakers, rural students, and those with disabilities or mental health issues) can access adequate support services.

Participants

The studies elicited participation from individuals connected with distributed learning through a variety of perspectives. Participants included key informants from colleges, technical institutes, community organizations, and provincial government.

Post-secondary representatives included senior administrators, deans, and directors involved in decision-making for distributed learning at the partner institutions. In addition, front-line staff from these institutions took part in the research, including representatives from each of the best practice service areas identified from the literature review. Community organizations whose members provided input were the Community Adult Learning Centres of Alberta (CALC) and Innovative Communities Connecting & Networking (ICCAN). Representatives from two provincial government ministries – Alberta Advanced Education and Technology and Alberta Employment and Immigration – also participated.

A significant portion of the research involved contributions from students engaged in distributed learning through the 16 eCampusAlberta member institutions. Students were considered as both an overall group and by identified sub-groups of diverse students, including Aboriginal students, students with disabilities or mental health issues, new Canadians for whom English is a second language, and rural students.

Data Collection Methods and Tools

A variety of data collection tools were employed for the two studies. An online survey was deployed to address the 10 best practice criteria identified by the literature review as well as to identify members of identified diverse sub-groups. Survey data was used as a means of informing a subsequent qualitative component of the studies, involving interviews and focus groups.

Originally, focus groups were planned for front-line staff and students for the *Successful Practices* study, primarily based on resource considerations. With the subsequent funding of the *Diverse Students* study, interviews were added to ensure that input from these students (including those with disabilities and non-native English speakers) was appropriately represented. Ultimately, practical considerations determined whether focus groups or interviews were used. For example, it was at times impossible to coordinate participant schedules for a focus group discussion, in which case researchers attempted to reach individuals for an interview to ensure representation from all partner institutions.

While each project had its own logic model and data collection matrix (DCM), most target populations were the same. As such, data collection tools were largely designed with integrated questions for both studies to avoid placing additional demands on the time of participants[3]. See Table 2 for participant totals for each data collection method.

Survey.

An online survey was targeted exclusively at students enrolled in programs using distributed learning environments at each of the eight partner institutions. Prior to its launch, the survey was piloted with a group of students at BVC, after which minor revisions were made. The survey was also reviewed by an expert in English language learning to determine whether the language used was appropriate for all student participants.

The survey included measures for helpfulness of services for distributed students, including English support, intake processes, orientation, academic advising, textbook services, library services, technical support, instructor support, career services, and more (Shimoni, Barrington, & Wilde, 2010). Tests for Cronbach's alpha indicate that responses to items measuring these concepts are consistent, with all measures producing scores above 0.7 (alpha was not calculated for measures with fewer than three items). Students were also encouraged to provide more information through open-ended comment boxes.

All students enrolled in courses at each of the partner institutions with access to their institution's learning management system (LMS) were recruited to participate in the

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[3] Copies of the data collection tools can be found as appendices to the final study reports,hyperlinks to which are available in the reference list.

survey. Students were recruited through LMS administrators, who posted the hyperlink for the survey in three ways: 1) emailed to students; 2) posted to the login page of their LMS; or 3) posted to the announcements page of their LMS. The survey was also posted to the homepage of the eCampusAlberta Web site. Respondents were free to self-select to complete the survey, and it is possible that some were enrolled in both distributed and traditional face-to-face courses at the time of completing the survey.

As an incentive for participation, students were given opportunity to enter a draw for a portable media player. The survey controlled for students who were not enrolled in an online course or program through a screening question at the beginning of the survey; these respondents were still permitted to enter the draw. The survey was administered using Fluid Surveys[4] and was live for six weeks.

Interviews.

Open-ended interview protocols were developed and used with students, front-line staff, senior college administrators, and representatives from community organizations and provincial government departments. As a validation measure, all interview protocols were reviewed by the steering committee, who provided feedback on wording and relevance of the questions as well as their views of the completeness of the tools.

Students were recruited for interviews through an item in the online survey. Steering committee members identified and provided contact information for administrators and front-line staff at the partner colleges, as well as for relevant government officials. Representatives for community organizations were contacted directly by the researchers. Additional interview participants were recruited through existing participants using a common "snowball" recruitment technique (Goodman, 1961). Students were asked about their experience with college services from a distributed learning perspective. Questions also focused on student perceptions regarding what was needed for them to be successful in their course or program. Other participants were asked questions on similar topics as relevant to their respective roles.

Focus groups.

Focus groups were conducted with students and front-line staff. Similar to the process undertaken to construct the interview tools, the focus group protocols were reviewed by the steering committee for wording, relevance, and completeness. Using the snowball technique, staff participants were identified by steering committee members and they in turn recommended other participants. Similar to interview recruitment, students who indicated interest in a focus group through the online survey were invited to participate. Topics discussed by focus groups were also similar to those covered in interviews.

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[4] See http://fluidsurveys.com/

In light of the distributed learning focus of the studies, focus groups were facilitated through Adobe Connect[5], a web-based interactive communication tool with two-way audio and instant messaging capabilities. In cases where technical difficulties prevented a participant from taking part in a focus group, attempts were made to follow up for an interview instead.

Policy review.

An attempt was made to examine government and college policies to see how they informed, supported, and/or unintentionally discouraged[6] best practices for diverse distributed students. The Government of Alberta policy regarding educational institutions providing online/distance education served as background for the studies. An initial web-based search for relevant policy documents from partner colleges was conducted, as well as a further online search among several institutions recognized for their success in distance education. Additionally, a request was made by BVC's vice-president learning to all institutions that were members of the Alberta Association of Colleges and Technical Institutes (AACTI) requesting they share any policies that may not have been accessible online. Finally, if policies were mentioned by a study participant as part of an interview or focus group, an attempt was made to follow up and obtain a copy.

Data Analysis

Quantitative analysis.

Responses from the student survey were downloaded and analyzed using traditional techniques for descriptive statistics. An emergent analysis framework was developed to look at services from the perspective of

- availability,
- participation or use,
- ease or difficulty, and
- utility.

Information was organized by college and sub-group according to the general topics in the DCM. Using SPSS, frequencies and percentages were calculated and scale items were analyzed for means and standard deviations. In some cases, cross-tabulation analysis was also conducted. Open-ended items were examined through the development of emergent categories and the information was coded, sorted, and summarized.

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[5] See http://www.adobe.com/products/adobeconnect.html

[6] For example, attendance-based student funding could unintentionally exclude distributed learners from eligibility.

Qualitative analysis.

Thematic analysis was performed on data from interviews and focus groups. Transcriptions were entered into a word processor and were then transferred into a spreadsheet and coded for themes based on relevant questions in the DCM. Sub-themes were identified and coded as they emerged. Coded comments were organized by research question and participant group and were then sorted by frequency and key themes according to each best practice category identified in the literature as well as according to relevant sub-group. An 11th category was developed to capture the best practices behind the best practices. Representative quotes were selected for inclusion in the final reports, some of which have been carried over to this article.

Policy analysis.

The review yielded few examples of policies in place at post-secondary institutions related to distributed students. If policies existed, they were not publicly available through institutions' Web sites or calendars. In addition, requests to institutions for policy samples were either not returned or received a response that the institution had not yet adopted policies specific to distributed learning. Some institutions reported they were in the planning stages of developing policies in this domain. Ultimately, only one institution responded with an example of an adopted and implemented distributed learning policy. As a result, the decision was made to forego policy analysis for these studies and to pursue this area of inquiry at a later time.

Data Summary

A comprehensive data summary was compiled and reviewed by the research team. In addition to considering the triangulation of data, summarized data was compared with observations from the field. From there, best practice data were analyzed according to criteria determined from the literature review and assessed for cross-college applicability. Finally, draft study conclusions and recommendations for the two studies were developed for review by the steering committee.

Results and Discussion

Findings from the two studies are summarized below. Integrated conclusions, recommendations, and next steps stemming from study findings are described in the sections that follow.

Participation

Of over one thousand total participants, 942 were students enrolled in courses offered via distributed learning. An additional 112 participants were post-secondary staff,

administrators, and representatives from government and community organizations. The breakdown of participants is presented in Table 2.

Table 2

Study Participants by Data Collection Tool

Data collection tool	# of participants
Student survey	942
Student interviews	34
Student focus groups	5
Front-line staff interviews	36
Staff focus groups	21
College administrator interviews	42
Government personnel interviews	4
CALC/ICCAN interviews	9

Successful Practices in Distributed Learning

Findings from the *Successful Practices* study are organized according to each of the 10 best practice criteria that emerged from the literature review and were validated by the steering committee. The key organizational policies, strategies, and structures required to sustain these practices are also summarized.

Best practices.

1. **The admissions and registration processes are well-organized and easy to follow.**

> The first issue I had was when I was actually researching to join this program. I emailed a few times to the school just to get an idea of what was required and that type of thing ... And what I found was that the program coordinator ... didn't respond to me for two or three days at a time and she also didn't take the time to discuss my options. I've been out of school for seven years and I had no idea how this practice works. (Student)

Students and staff alike acknowledged the importance of being able to access information online prior to and during the admission and registration process. Students also identified the need for an accessible and knowledgeable contact person to assist them with this process.

2. **Students can access comprehensive initial assessment, academic advising, and orientation.**

Student experience with these processes was limited: Twenty-two percent of survey respondents (*n* = 717) reported having undergone an initial assessment, 40% had spoken with an academic advisor (*n* = 712), and 35% had participated in an orientation session (*n* = 706). This suggests that either these services were not widely available at the partner colleges at the time of research or that students were often not aware of their existence or potential to assist.

3. **Financial aid and financial services information are provided to students on the institution's Web site.**

Students indicated that they needed more information on financial aid. However, other stakeholders suggested this lack of information is related to limited funding options for part-time online students, putting many students at a disadvantage. Funding tends to be tied to the number of credits taken by students, their level of involvement (i.e., part-time or full-time), and the nature of program delivery (i.e., asynchronous or synchronous).

> Because [my program] is online I don't qualify for anything. You have to actually attend the class in order to get any of the funding. (Student)

4. **Students can access adequate support on how to use and troubleshoot technology.**

> I took an online course because I work full-time. The only time I have time to work on my studies is on the weekend, when tech support is closed. (Student)

Respondents from all groups recognized the importance of readily available technical support for students 24 hours a day (or at least extended hours). Quick response times from help desk staff or others providing assistance, and access to up-to-date and compatible technology, were also identified as essential services.

5. **Students can access adequate academic and/or tutorial support services, including assistance with learning strategies and writing skills.**

While access to academic support services is necessary, the role of instructors was seen as much more critical for distributed students. Students identified a number of unmet needs related to course design, including the need for greater interaction with both

instructors and peers to accommodate various learning styles, to model the learning expected of them, and to include opportunities for discussion. Students' schedules were another identified barrier as they related to scheduling course exams. Participants suggested that the use of blended delivery models and universal design principles would support greater accessibility of course materials. Instructor training regarding the needs of distributed students remained central to these participants, some of whom felt their needs were not prioritized appropriately:

> [O]ne of my biggest issues with online learning is that the instructor often has a lot on their plates or they don't realize what online teaching entails and they tend to put us on the back burner, or that is how it seems. You might not get feedback, for example on a posting or what-have-you, for a month or two months. You might not know until after the mid-term whether your group is on the right track or if you are way off in left field. (Student)

6. **Students can access bookstore services and relevant bookstore information.**

An issue raised by students was their need to order books online. Access to bookstore services during extended hours and access to booklists prior to course start dates were also identified as important.

7. **Students can access library services and relevant library information.**

Students indicated that navigation of library Web sites was a barrier, particularly when trying to find required materials (e.g., journal articles). Best practice for library assistance noted by both students and staff was orientations and/or tutorials for online library services, as well as the availability of real-time support provided through an instant messaging service on the library's Web site or through a help line:

> Yeah I use the online (library). It works really well ... One thing that is offered to us in online courses is there has been a person to call that is going to help you for that course who works at the library. If you can't find something in the database you can always call and get help ... I wish it was 24 hours but it's not. (Student)

8. **Students can access adequate career counselling and relevant career services.**

Few students (7.5% of 691 respondents) reported that they had accessed career counselling services. This finding reinforces comments made by front-line staff and

senior administrators that there was a need to find better ways to provide and engage distributed students in these supports.

9. **Students can access adequate personal counselling and relevant counselling services.**

Five percent of students (n = 638) had accessed counselling services, and of these only one student reported having accessed these services online. In many cases, these services may not have been available to off-site students. A key challenge identified by staff was the fact that many online students do not disclose their personal and/or learning needs, making early identification difficult. Lack of face-to-face interaction was also reported to prevent instructors or other advisors from noticing signs that may indicate a student requires counselling services.

10. **Diverse students can access adequate support services**

On the whole, participants identified as "diverse students" either faced challenges in accessing relevant support services, or were unaware that services existed[7].

Best practices behind the best practices.

1. **Paradigm shift**

A need was identified for a paradigm shift in the post-secondary system to incorporate a full commitment to distributed learning, as opposed to the view of alternative delivery as an add-on to routine practice.

2. **Quality assurance policies**

Senior college personnel identified a lack of policy related to quality assurance and ways to measure distributed learning, and demonstrated uneven awareness regarding existing policies.

3. **Training and support for instructors**

Instructors play a key role in the provision of quality distributed learning. However, training and support to orient instructors to students' learning needs in a distributed environment and to the appropriate technology for online teaching were described as limited.

4. **Institutional collaboration**

Participants identified a strong need for coordination and collaboration, both within and between institutions. Colleges need to share information about distributed learning across departments and systems. Additionally, systems to facilitate cross-college

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[7] This point is expanded upon in the report of findings from the *Diverse Students* study.

enrolment and college-community partnerships and resources are needed to support rural students.

5. **Greater options for funding**

Financial support for distributed learning was described as limited for both students and institutions, and this was identified as a barrier to effective delivery and student participation.

Needs of Diverse Students in Distributed Learning

Findings from the *Diverse Students* study relate to both the needs of identified sub-groups and relationships between these needs and the identified best practice criteria. Of the 942 survey respondents, 32% identified themselves as rural students, 15% as non-native English speakers (NNES), 9% as Aboriginal students (First Nations, Métis, or Inuit), and 6% as having a disability or mental health concern. Figures for survey respondents who self-identified as part of each of these sub-groups are presented in Table 3, sorted by institution.

Table 3

Diverse Learners by Sub-Group and Institution

Institution	Students with disabilities		NNES students		Aboriginal students		Rural students	
	n	%	*n*	%	*n*	%	*n*	%
Bow Valley College	14	30.4	54	46.6	8	11.8	50	20.8
Lethbridge College	3	6.5	1	0.9	9	13.2	20	8.3
NAIT	9	19.6	46	39.7	10	14.7	44	18.3
NorQuest College	2	4.3	6	5.2	9	13.2	21	8.8
Northern Lakes College	0	0.0	0	0.0	0	0.0	2	0.8
Olds College	2	4.3	1	0.9	0	0.0	4	1.7
Portage College	7	15.2	3	2.6	28	41.2	63	26.3
Red Deer College	9	19.6	5	4.3	4	5.9	36	15.0
Total	**46**	**100.0**	**116**	**100.0**	**68**	**100.0**	**240**	**100.0**

In addition to students, other study participants who had experience with diverse distributed students contributed to the identification of key barriers and supports. These findings are organized according to common themes.

1. Shared needs

Overall, diverse students reported many of the same needs as the general student population participating in distributed learning. The provision of online supports – such as orientation, library support, and technical assistance – was identified as important by many students regardless of demographic. As in the *Successful Practices* study, participants indicated that such supports were inconsistently available to and accessed by distributed students. In addition, there were few unique needs identified for each sub-group. Most needs were shared by two or more sub-groups, though these needs may have been experienced in different ways and necessitate different strategies for resolution.

2. Blended delivery methods

> I think the other thing too is, with our learners, it needs to be engaging. It just can't be your face-to-face course but online with just a bunch of text. There are a lot of learners who do use a lot of technology and they are used to Facebook and Skype and all of those things and I think their expectation would be more dynamic, not just all word documents, and it builds a sense of community. (College front-line staff member)

Comments from all participant groups, and all student sub-groups, expressed the desire for greater interaction with instructors and classmates. Greater face-to-face communication (e.g., through video-conferencing) was found to help address the sense of isolation reported by rural and Aboriginal students as well as those with disabilities. Opportunities for verbal interaction were reported to support the oral traditions and learning styles common within Aboriginal cultures. Verbal and face-to-face interaction was also reported to support the learning of non-native English speakers.

3. Access to technology

> Learners outside of [community name] do not have sufficient access to computers or internet. Many learners have no access to high speed internet in their homes. Many small communities have no high speed internet... (There are) few computers and no video conference equipment. (Community organization member)

A key barrier to successful participation in distributed learning for rural students and Aboriginal students (many of whom reside in rural communities) was access to essential

resources. These included stable internet connections as well as software applications needed for full participation in their courses. Lack of transportation also played a role in access issues.

4. Community organizations

Community organizations were identified as a resource to connect students with necessary technology and technical support. The fact that use of these organizations was noted as best practice both by their representatives and by government officials but were seldom mentioned by front-line staff and senior administrators suggests that they are an underused resource.

5. Early identification of student needs

Students' responses varied as to whether they underwent a needs assessment at the outset of their programs. As such, challenges related to English language ability, learning disabilities, physical disabilities, and mental health concerns were inconsistently identified – all with consequences for the provision of supports. College personnel reported that many distributed students in need of language assistance, counseling, or other specialized supports did not self-disclose. This increased the challenge of providing needed services in a timely fashion. For those who had self-disclosed, accessibility of services remained an obstacle to receiving assistance:

> I think the biggest barrier for a lot of our students is that lack of supportive services, especially some of our students with learning disabilities or students with mental health issues. Being isolated is a huge barrier for them. I know online isn't the ideal place for a person to get a lot of collaboration and support and I think there are more things we can do in providing those supports. That sense of being a part of a class and part of a bigger environment. (College front-line staff member)

6. Universal design

The theme of universal design (the design of products, resources, and services for use by people with a wide range of abilities and circumstances) in the creation and delivery of course content was raised by college personnel and students, and was related to needs of students with disabilities and non-native English speakers.

> In terms of students with disabilities we ensure that all of our video streaming has closed captions. We design our sites for universal design. We cut them to make sure if you are colour blind it is going to look a certain way. We take advice from our centre for learning support

> when we are designing these sites. (College front-line
> staff member)

For those with disabilities, access to adaptive or assistive technology was identified as a key support; however, access to such technology at home and support in using the technology were identified as challenges. The use of plain and consistent language in course delivery was viewed as a vital support for non-native English speakers (and all distributed students in general). Participants also pointed out that differences between spoken language and language typically used online could pose a challenge for students still learning English.

7. Funding

Lack of or insufficient funding was frequently seen as a barrier for distributed students. In particular, the availability of funding for rural, part-time, asynchronous distributed students was reportedly limited in comparison with urban, full-time, and traditional classroom students. Funding for community groups to purchase current technology that could benefit rural and other distributed students was also reported to be difficult to obtain.

Key Findings

The examination of findings brings the extensive connections between the two studies into focus. Figure 1 demonstrates the findings of the studies, with conclusions from *Title1* on the left, *Title2* on the right, and common findings in between.
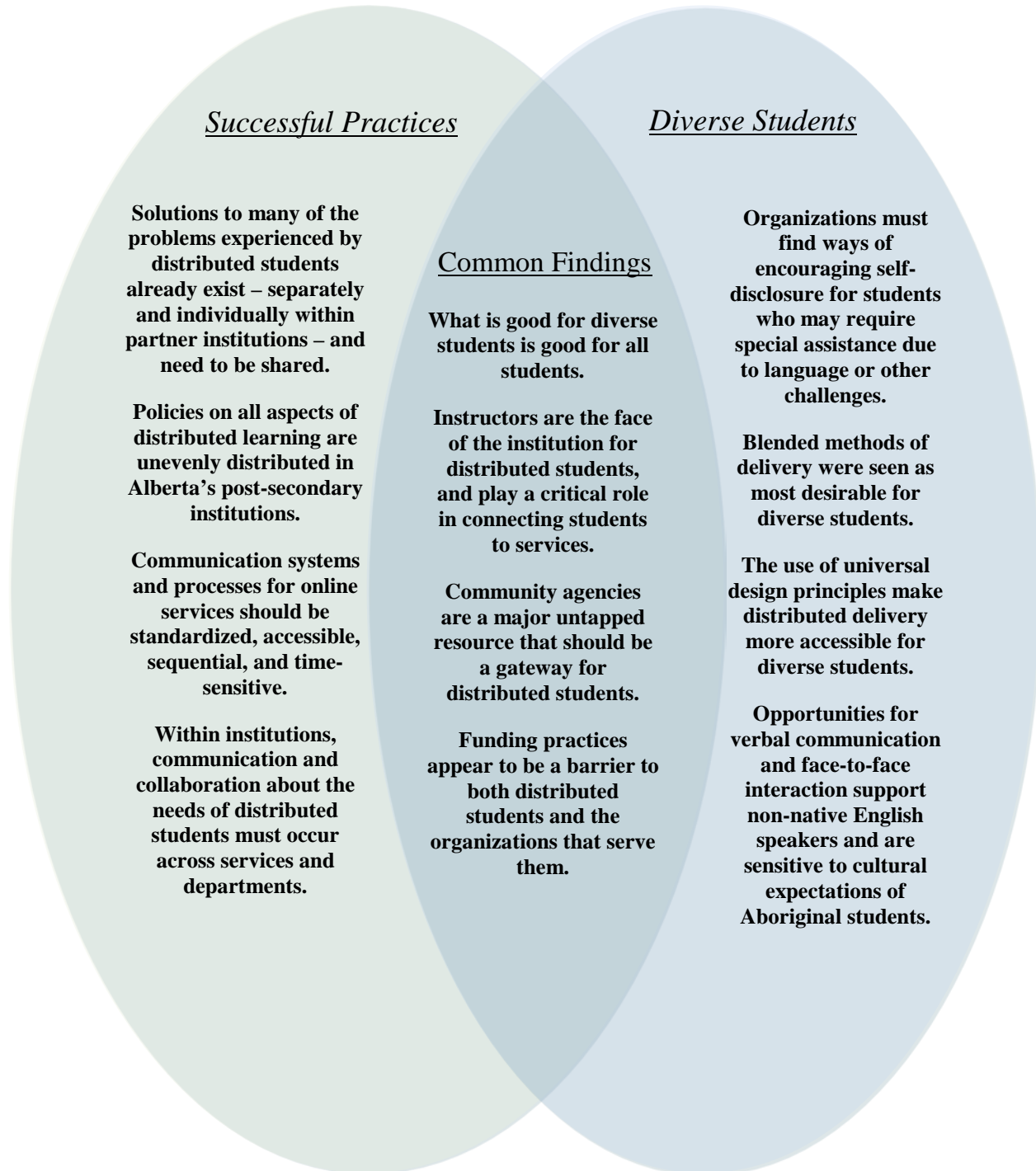
Successful Practices

Diverse Students

Common Findings

Solutions to many of the problems experienced by distributed students already exist – separately and individually within partner institutions – and need to be shared.

Policies on all aspects of distributed learning are unevenly distributed in Alberta's post-secondary institutions.

Communication systems and processes for online services should be standardized, accessible, sequential, and time-sensitive.

Within institutions, communication and collaboration about the needs of distributed students must occur across services and departments.

What is good for diverse students is good for all students.

Instructors are the face of the institution for distributed students, and play a critical role in connecting students to services.

Community agencies are a major untapped resource that should be a gateway for distributed students.

Funding practices appear to be a barrier to both distributed students and the organizations that serve them.

Organizations must find ways of encouraging self-disclosure for students who may require special assistance due to language or other challenges.

Blended methods of delivery were seen as most desirable for diverse students.

The use of universal design principles make distributed delivery more accessible for diverse students.

Opportunities for verbal communication and face-to-face interaction support non-native English speakers and are sensitive to cultural expectations of Aboriginal students.

Figure 1. Key findings of the studies.

Strengths and Limitations of the Studies

Due to privacy concerns, a Canadian software company, FluidSurveys, was chosen to collect data for the survey. There were some glitches in this system that resulted in loss of data, and unreliable data was not included in the analysis. Specifically, there was a need to eliminate age from demographic descriptions of students.

Some data was lost due to technical difficulties in the taping of telephone interviews. Similarly, researchers and participants experienced connectivity and hardware issues during the focus groups, including computer issues, microphone failures, and headset problems. As well, despite orientation and back-up support, some respondents did not have the technological experience necessary to participate successfully.

While a considerable number of students took part in the studies overall, students with disabilities and Aboriginal students were few in number. Therefore, it is difficult to offer detailed recommendations for these groups and further study in this area is needed. In addition, while senior level stakeholders were very willing to collaborate, it was challenging to find front-line staff to participate in interviews.

A main strength of the studies was the extensive involvement of the steering committee, which provided input into study design, instrument development, and report preparation to ensure appropriateness, relevance, and clarity. Their support for data collection was significant and all partner colleges participated in the interview process. The enthusiasm of senior level participants and their willingness to engage in interviews was of significant value.

Another strength of the studies was the "matching" of researchers whose experience related to specific target groups. Thus, a senior administrator interviewed senior administrators, a front-line staff member interviewed front-line staff, a new graduate worked with students, and so forth. This approach ensured study participants were comfortable exchanging knowledge with their peers.

Recommendations and Next Steps

Members of the steering committee worked with researchers to generate recommendations based on study findings. Discussions focused on how to best facilitate the implementation of the best practices and ensure that these practices are congruent with the needs of all students. Two key recommendations emerged.

First, there was a strong recommendation to find an effective mechanism for sharing best practices across the post-secondary system in Alberta. This needed to include not only a description of the best practices, but also a variety of tools and strategies that would assist college personnel in their implementation.

The year following the research was dedicated to the development of an eToolkit that is currently hosted by eCampusAlberta. The eToolkit (Fiege & Wilde, 2010) explores a range of student services and the evidence-based processes and characteristics that make them successful. It is organized according to 10 student support service categories, and summarizes findings from the literature and the two research studies in relation to each category. The eToolkit also presents policy considerations for each service category, provides samples of "successful practices" from existing institutions, and supplies flexible measures for organizations to assess their own policies and procedures[8].

The second recommendation emerged from a discussion of the best practices behind the best practices, where members of the steering committee agreed that without the backbone of policy, improvements in services for diverse distributed students would be inconsistent at best. The general absence of institutional policies related to distributed learning discovered in the policy review portion of these studies further indicated that this was an area in need of attention. This recommendation resulted in a development process where the partner institutions worked together to identify gaps in policy and to develop, with the assistance of a policy consultant, generic policies that could be adapted for their own use. In addition, five of the institutions worked with the consultant to create or adapt individualized policies related to distributed learning. A policy toolkit was subsequently developed to assist organizations seeking to be truly "bi-modal" in providing the same high standards of service and support to distributed students as their on-campus counterparts (Wood, 2011). The toolkit outlines processes for developing comprehensive institutional policies in relation to distributed learning, including samples for reference[9].

Acknowledgements

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[8] Interactive and print versions of the Student Services eToolkit can be accessed through the eCampusAlberta Web site (etoolkit.ecampusalberta.ca/).

[9] The Policy Development Toolkit is also available on the eCampusAlberta Web site (http://www.ecampusalberta.ca/files/Toolkit-Policy_Development.pdf).

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Athabasca University

Do UOC Students Fit in the Net Generation Profile? An Approach to their Habits in ICT Use

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Abstract

Some authors have stated that university students born after 1982 have been profoundly influenced by digital technologies, showing different characteristics when compared to previous generations. However, it is worth asking if that is a current observable phenomenon. Are those students born after the 80s really more familiar with ICT tools than those born in previous generations? Do they show different study habits and learning paths? Different research lines (Kennedy, et al., 2010; Bennett, Maton, & Kervin, 2008; Gros, García, & Escofet, 2012) highlight that scientific data is rarely used when discussing this generation's characteristics; however, none of them have proved in statistical terms that college students do not fit in the Net Generation characteristics and that their habits of ICT use in social and professional activities do not differ from older generations. The international research project, Digital Learners in Higher Education, seeks to develop a sophisticated and evidence-based understanding of university learners in different institutional contexts and the perception of cultures in their use of technology in a social and educational context. Data has been collected from four institutions in Canada and Spain: the British Columbia Institute of Technology, the University of Regina, the Open University of Catalonia (UOC), and the University Rovira i Virgili. In order to develop this project, we used a multi-case study embedded design (Yin, 2009). The UOC's case is deeply analysed in this paper to affirm that the Net Generation is more speculative than real and that includes students' perception about this phenomenon, and guidelines are proposed in an eLearning context.

Keywords: Digital learners; Net Generation; students' habits; ICT; online learning; higher education

Introduction

Nowadays, there is a trend to claim the existence of a new generation that has been brought up surrounded by the mass media and technology (Oblinger & Oblinger 2005; Palfrey & Gasser, 2008; Prensky, 2005; Tapscott, 2009; Bajt, 2011). Some authors assure that this generation's experience with technology gives them a deeper and more intuitive knowledge of ICT. This fact is supposed to affect their learning in that they seem to have different thinking paths (Tapscott, 1998; Jukes 2009).

From this perspective, the vast majority of university students, with an age range from 18 to 30, could be considered within this so-called *Net Generation* as they were born after 1980 (Oblinger & Oblinger 2005).

The Net Generation is supposed to have been in contact with ICT since their early childhood, being capable of adapting quickly to the changes linked to the technological revolution.

Different authors labelled this generation by trying to define their chronological context as well as their characteristics. They have been denominated, for example, as *Millennials* (Howe & Strauss, 1993; Martin & Tulgan, 2001), *Digital Generation* (Tapscott, 1998), and *i-Generation* (Rosen et al., 2010). One of the most known is *Digital Natives*, defined as those native speakers of the digital language of video games and the Internet (Prensky, 2001), in contrast with *Digital Immigrants* applied to those born before 1980. Not feeling comfortable with the label "Generation", and according to their belonging to the educational context, we use the term *Digital Learners* (Bullen et al., 2008; Romero et al., 2011) to refer to them.

Some of the authors mentioned identify a number of features of this generation (Oblinger & Oblinger, 2005; Dede, 2005; Connaway et al., 2008; Barnes, Marateo, & Ferris, 2007): being digitally literate (using technology, communication tools, or networks to search and create information), being continuously connected, and showing a need for immediacy in receiving information, preferring social activities, being active experiential learners together with showing a capacity to carry out several tasks simultaneously, and being involved in the community.

There are some authors that even identify them as neurologically different, processing information differently while using different parts of the brain for learning (Jukes, 2009). These facts are supposed to make one rethink which learning activities do teachers have to offer to them (receiving information quickly, multitasking activities, access to multimedia information, immediate rewards …) (Skiba & Barton, 2006). But, is it necessary to change our teaching strategies to adapt to this way of thinking? Are they somewhat different from other generations? Is generation really the issue?

Some research studies (Kennedy, et al., 2010; McNaught et al., 2009; Bennett, Maton, & Kervin, 2008; Guo et al., 2008; Selwyn, 2009; Salajan et al., 2010, Bullen et al.,

2011; Romero et al., 2011; Gros, Garcia, & Escofet, 2012) show that there is a scientific gap demonstrating the principal claims about this generation. In fact, some of the authors mentioned refute the Net Generation characteristics arguing that they can also be found in other generations: The oft-used example of a young person doing homework while engaged in other activities was also applied to earlier generations doing homework in front of the television (Bennett, Maton, & Kervin, 2008). They also refute its validity: Many studies fail in trying to find evidence to support claims that young students use digital technologies in a radically different manner or have a significantly different set of characteristics (Margaryan, Littlejohn, & Vojt, 2011). In fact, there is "no evidence of fundamentally new learning processes emerging from the so-called Digital Natives' lifelong encounters with IT" (Ellis & Goodyear, 2010, p. 42) nor a shift in the structure of the brain associated with growing up with digital technologies (Jones, 2012).

Empirical studies of university students' actual in situ uses of the Internet as a source of academic information are also surprisingly few (Selwyn, 2008); so it is not possible either to demonstrate that the so claimed Net Generation students are experts using it for educational purposes.

The scientific gap is also visible in the methodology of the studies supporting the Net Generation thesis, revealing some notable mistakes (Schulmeister, 2008).

- Media activities of young people are reviewed from the perspective of entertainment without any regard for other aspects of their lives.

- Research into the actual use of the media shows that young people continue to watch traditional television and listen to music to a great extent and also read print media, in contrast to internet use.

- The studies make incorrect generalizations about the whole generation based on the results of accidental samplings.

- Most Net Generation authors assume that new media determines young people's behaviour; while various surveys show that the use of these media is not transferred to learning preferences.

- Therefore, young people that were part of these studies are far from being highly capable of using technology, being constantly connected, socially linked, and impatient when doing passive learning activities.

In fact, research is starting to demonstrate that exclusion criteria regarding the Net Generation are based purely on the age factor (Lee, 2005; Hargittai, 2010). However, some studies suggest a great variation in the use of technology in the same age range in selected samples (Kennedy et al., 2008). In consequence, most of the empirical research on the digital divide argued that age seems to be only one of several interrelated factors, rather than the sole factor (Jones & Hosein, 2010; Jones, 2012).

If we focus on higher education, the scepticism about some claims in the literature are more obvious because, firstly, the use of ICT in learning activities does not imply a greater knowledge of it: Exposure to computer information systems at the high school or community college level was found to have little significant impact on student computer literacy (Karsten & Roth, 1998; Selwyn, 2009). And, secondly, the fact of having extensive skills in ICT use has not been linked to their use in academic activities: A transfer of the abilities gained from using the computer to learning does not seem – or at least not to the degree expected – to take place. The use of the computer for school assignments as well as for work done at the university is soberly regarded by users as a means to an end. Possessing a high degree of e-competence does not mean that the wish to transfer e-methods to learning is in the blood (Xiaoqing, 2008). However, there are some studies supporting the claims in the literature about this generation in higher education (Conole et al., 2007).

Most studies show that Net learners do not consider the use of technology at university as something indispensable (Bennett, Maton, & Kervin, 2008). In fact, students that participated in the mentioned studies are far from asking their teachers to change their practices; they seem to agree with traditional pedagogies that use fewer technological tools to show content (Margaryan, Littlejohn, & Vojt, 2011).

Moreover, the conception of digital learners and digital immigrants is changing in that new terms like Prensky's *Digital Wisdom* crop up, which can be defined as a concept that refers to both wisdom from the use of digital technology to improve our cognitive power and from the prudent use of technology to enhance our capabilities (Prensky, 2009).

The international research project, Digital Learners in Higher Education, seeks to develop a more sophisticated and evidence-based understanding of how postsecondary learners in different institutional contexts and cultures think about technology and how they use it in their social and educational lives. This project examines the issue in depth to gain an understanding of what the growing use of new digital technologies means for teaching and learning in higher education.

The Digital Learners in Higher Education project has so far collected data from four institutions in Canada and Spain: the British Columbia Institute of Technology, the University of Regina, Rovira i Virgili University, and the Open University of Catalonia (UOC).

This paper will outline the process of this research project as well as its application at the UOC. We present an analysis of the results of two surveys on the same population with two different courses, thus trying to find out if there is any statistically significant relationship between our student's age and the Net Generation's characteristics and their perception about the use of ICT in academic, social, and professional activities. In order to perform the data analysis, our research sample (1,036 students in the first survey and 398 in the second one) has been divided (according to Oblinger & Oblinger, 2005 and

Oliver & Goerke, 2007) into those who were born before 1982 and those who were born in 1982 and later.

Considering the aforementioned research refuting certain affirmations regarding the Net Generation, our contribution tries to highlight a different perspective of what our students perceive about their use of ICT in different contexts and how they feel about the Net Generation phenomenon.

Research Design and Questions

Digital Learners in Higher Education is an international research project that investigates how postsecondary learners in different institutional contexts and cultures think about ICTs and how they use them in their social and educational lives. The goal is to gain an understanding of what the growing use of the new ICTs means for teaching and learning in higher education.

The research questions driving this study are as follows:

- Do higher education students distinguish between their social and educational uses of ICTs?
- What impact does student social use of ICTs have on postsecondary learning environments?
- What is the relationship between social and educational uses of ICTs in postsecondary education?

We use a multi-case study embedded design (Yin, 2009). This method understands the study of a single case with embedded units in which "data can be analysed within the subunits separately (within case analysis), between the different subunits (between case analysis), or across all of the subunits (cross-case analysis)" (Baxter & Jack, 2008, p. 550). Our research project is focused on a within case analysis of the four units of social and educational use of ICTs that consist of four distinct postsecondary institutional contexts: a Canadian polytechnic teaching institution (BCIT), a Canadian research-intensive university (University of Regina), and two European universities, a face-to-face university (Rovira i Virgili University) and an online university (UOC).

Bearing in mind that the case study method needs a unit of analysis (Miles & Huberman, 1994; Rowley, 2002), this paper addresses and analyses a selected group of students of the UOC. These students can give, in our opinion, a new perspective about the Net Generation debate for the following reasons.

- There is no relevant research about how the supposed Net Generation students use tools and learn in an online environment.

- The UOC students present a wider age range than the traditional university

students. This fact allows us to analyse in more depth the characteristics of older students regarding their use of ICT in academic activities and to demonstrate the empirical gap in the literature claims about the digital literacy of younger students.

- In order to analyse the UOC's case, we are basing the research on more concrete research questions: Do our students fit in the Net Generation's characteristics claimed in the literature?

- What is the perception of students about the Net Generation phenomenon? Do they feel comfortable with this label?

- Is there any significant difference between the UOC's Net Generation students and non-Net Generation ones regarding their perception about their use of ICT in academic, social, and professional activities?

Furthermore, the multi-case embedded different methods that can be applied within the subunits (Scholz & Tietje, 2002, p. 10), so two online surveys were applied in two different phases (with three semesters of difference) as explained in the above sections.

Methodology

Research Subjects: ICT Competences Course Students at the UOC

The Open University of Catalonia was founded on 6 October 1994. It is an open online university governed by a board of trustees made up of the Generalitat de Catalunya (regional government). The UOC is a leading university in the application of ICT in academic activity and research. It has more than 15 years experience in online teaching. Our university offers an internet-based learning system in a virtual campus, through which students can, at any time or place, create and access a dynamic and personalized learning process.

Our students are generally older than other university undergraduate students: Nine percent are under 25, 33% are between 25 and 30, 40% are between 31 and 40, and 18% are over 40.

Being a fully online university, the UOC students do not attend face-to-face classes. There is one appointment that UOC students can attend in person voluntarily (the opening session at the beginning of the semester) and another that is compulsory depending on the courses they are taking (the exam or validation test at the end of the semester).

Since its foundation, a compulsory course on digital literacy has been offered to students in all programs and has evolved in parallel with students' needs. Currently, this course is aimed at meeting the basic ICT competences outlined in the Bologna declaration (Guitert & Romeu, 2009): searching for information on the Internet, producing digital information, disseminating digital information, acquiring communication skills in an online environment, understanding the basics of digital technologies, planning and managing a virtual project, acquiring a civic digital attitude, and acquiring team-working skills in an online environment.

In order to develop our research, we selected the students of the ICT competences course during the first semester of the 2009-2010 academic course as our research population given that

- all of our new students have to take the compulsory ICT competences course, so it gave us access to a research population of 3,000 students;

- most in their first semester at the UOC have the same experience in studying in an online university.

Our final sample is made up of 1,036 students that completed the first survey and 398 of the first phase respondents that completed the second survey. The margin of the sampling error is 3.11% in the case of the first survey and 5.01% ($p = q = 0.5$) in the case of the second one, both with a 95% confidence margin .

Data Gathering Tools

As mentioned in the previous section, the data-gathering process was divided in two main phases.

Phase 1 first online survey.

The first phase of the project was based on the adaptation of a survey designed by the BCIT partners. The original survey was created in a three-step process: A question inventory was created, then it was reviewed for content validity, and finally it was pilot-tested for usability. The results of the pilot test were used to assess reliability (Bullen et al., 2011).

Later on, the BCIT partners created different items basing them on the research questions. They also synthesized the characteristics of the Net Generation basing them on a review of the literature. That review identified the following characteristics (Bullen et al., 2011): digitally literate, connected, multitasking, preference for experiential learning, need for structure in learning, preference for group or teamwork, preference for images over text, social, community-minded, and goal-oriented. To avoid students' response predisposition about the Net Generation characteristics, the corresponding items were randomly scattered throughout the survey.

It is important to note that the items dealing with the characteristics of the Net Generation were a subset of the survey and were scattered throughout the survey.

The BCIT survey was translated to Spanish and the terminology was adapted to the UOC's educational model and in an online format. The adapted survey was divided into five sections.

- The first section was related to general information about participants, such as gender, year of birth, and which program they were taking.

- The second section analysed their habits relating to who asks for help.

- The third section was related to the tools they use to communicate with peers and instructors.

- The fourth section analysed their communication habits with classmates and instructors and their study habits in individual and group activities.

- Finally, the fifth section took a look at the temporal dimension of studying (time they spend studying one simple course, time to finish their program, time planning, etc.).

All sections were in the original survey except the fifth one that will not be analysed in this paper. A six-point Likert scale was used for all survey questions. Content validity of the adapted version of the survey was reviewed by the BCIT partners and three experts from the UOC. In order to estimate the reliability of the survey's scale, the Cronbach's alpha coefficient was calculated. This coefficient demonstrated that the internal consistency of the scale applied was good ($\alpha = 0.891$).

Our students completed the survey once, and we included a final open text question in which students that would be interested in participating in the next phase would provide us with their email addresses.

Phase 2 online survey.

In order to gather more detailed information regarding students' perception about their use of ICT in academic, social, and professional activities, the BCIT partners designed another survey and an interview to be carried out in person or by telephone.

The survey was shorter than the first one and divided in 3 sections in order to find out students' perception about their own use of ICT. The interview contained 13 questions about their use of ICT at the university and their overall perception about technology (Bullen et al., 2011).

Taking into account that the UOC is a fully online university and the extension of the first survey's sample, we decided to combine both survey and interview in one online survey, taking the most important questions of the interview and converting them to

open text questions in our online form.

The UOC's second survey had three sections.

- Demographic information: Taking into account that the survey was anonymous and in an online form, we needed to gather once again their demographic data.
- General use of ICT: In order to gather information regarding their perception about ICT and how they use it, it had some closed and open text questions.
- Use of ICT in academic, social, and professional activities: In the same way as in the previous section, this one is based on two types of questions, but this section had more open text questions than the other one.
- The last section consisted of only one open text question regarding their perception about the Net Generation phenomenon.

All closed questions of the second survey were based on the Likert scale-items and order list questions. Since the surveys were modified for the UOC case, validity and reliability were reviewed as well. All research partners and four UOC research fellows reviewed the survey's content validity prior to its application and the Cronbach's alpha coefficient was also calculated on the Likert scale-items ($\alpha = 0.734$; the internal consistency of the scale was acceptable).

This survey was administered online to the students that completed the final question of the first phase of the survey.

Data Analysis

In order to analyse the data gathered, we divided the samples of the two surveys into Net Generation students (born in 1982 or later) and non-Net Generation students (born before 1982). In the case of the phase 1 survey, there were 11 items dealing with Net Generation characteristics.

The ANOVA test was conducted to test for the significance of group differences between generation (independent variable) and specific generational characteristics (dependent variable). This test was chosen because it is commonly used for assessing statistical differences between groups..

Given the magnitude of the sample (1,306 students), the size of the effect was not calculated for the already mentioned test.

In the case of the phase 2 survey, data was analysed using frequencies. Three hundred and ninety-eight of the 1,036 students that completed the first survey also completed the second survey.

All tests were calculated using the Statistical Package SPSS in its 20th version and the responses of one of the second survey's open questions were quantified (Bardin, 1997) in order to determine their perception about their belonging to the Net Generation;

however, some of the students' written testimonials were used to complement the quantitative data.

Results

If we take into account the age distribution of our students during the two phases of the research, some differences between the two can be observed.

A total of 1,036 students completed the first project's survey which was approximately 35% of the students in the course, thus having a representative sample of the population. The percentage (279) of those born in 1982 or later was 26.9, and 73.1% (757) were born before. This first part of the sample could be classified as the Net Generation and the rest as the non-Net Generation.

During the second phase of our research, 398 students (of the 1,036 of the first phase) completed the second survey. Thirty-four percent (135) of these were born in 1982 or later and 66% (263) were born before. So, the distribution between the two generations is more equal than the subjects that completed the survey in phase 1.

Net Generation Characteristics and the UOC Students' Perception about the Net Generation Label

If we analyse the responses of the different items of the phase 1 survey, we can see that most of our students do not fit in those claims in the literature regarding Net Generation characteristics.

As can be seen in Table 1, a comparison of the two groups on the 11 items revealed some differences in a few items, but most of them were not statistically significant. The following is a summary of the results for each of the 11 items, grouped based on characteristic and expressed in terms of each corresponding item in the survey.

Table 1

Items of the Phase 1 Survey Regarding Net Generation's Characteristics: Comparison Between the Two Groups

Item/Net generation characteristic	Mean (Net gen. students)	Mean (Non-Net gen. students)	ANOVA (F)
I am comfortable using computers, the Internet and other information and communication technologies for a variety of purposes. / Digitally literate.	5.26	5.38	2.957, p>0.05 Not statistically significant
I feel like I am always connected to friends because of technologies such as cell phones and the Internet./ Connected.	3.91	3.64	4.606, p=0.03. Statistically significant
I am used to doing several tasks at the same time. / Multitasking.	4.47	4.50	0.853, p>0.05 Not statistically significant
I prefer to learn by exploring and trying things out by myself. / Preference for experiential learning.	4.22	4.42	4.363, p>0.05 Not statistically significant
I prefer to get clear instructions and information before I try something new. Need of structure in learning.	4.35	4.55	3.612, p=0.04 Statistically significant
I prefer to work in groups when doing my schoolwork. / Preference for working in groups.	4.72	4.60	1.803, p>0.05 Not statistically significant
I enjoy reading. / Enjoy reading.	5.13	5.26	3.753, p>0.05 Not statistically significant
I enjoy meeting new people. / Being social.	5.06	4.83	6.886, p=0.009 Statistically significant
I have clear goals in life. / Goal-oriented.	4.87	4.95	0.875, p>0.05 Not statistically significant
I get involved in projects and activities that make a difference to society. / Community-minded	4.35	4.23	0.578, p>0.05 Not statistically significant

As can be seen in the results presented above, our Net Generation students only present a little more predisposition to be connected and to meet new people than the non-Net Generation ones. Otherwise, there are some characteristics that seem to be more evident in non-Net Generation students, contrary to what the literature claims.

Analysing the open question regarding students' perception about the Net Generation phenomenon in the second survey, we can see that it has not had so much impact on them.

Only 37.64% of non-Net Generation students that completed the second survey know the meaning of this term (99 students from the 263 non-Net Generation students that participated in phase 2). Otherwise, 51 of the students that know the term don't agree with it: "I don't agree with the Net Generation label; I'm 44 years old and I'm using my smartphone and the Internet every day…"; "That term is irrelevant: I'm using ICT since I was 15 years old and I don't feel like a digital immigrant at all!"; "… since I'm studying at the UOC, I'm using the Internet daily, so I don't feel excluded from the digital era".

In the case of Net Generation students, only 20.74% (28) that completed the second survey have heard the term; 79.25% (107) of them did not know the meaning of the Net Generation label. We can see a very low impact of this terminology among them, because 20 of these students did not feel identified with the term: "I use the Internet but I'm not using it 24/7, so I don't feel like a part of this generation"; "I think I'm not part of this generation. When I was at high school, I looked up information in the encyclopaedia and, sometimes, I still go to the library"; "… I only search the Internet when I need information for my courses at the UOC."

Use of ICT in Academic, Social, and Professional Activities

Analysing the data of the second survey, no significant differences between the two groups regarding the devices they use to study at the UOC can be perceived; most used a desktop computer and a portable computer. Nevertheless, it is possible to appreciate some differences in the distribution in the use of these devices: Net Generation students distribute its use more equally (48.7% of them use a desktop computer more and 47.1% a portable computer) than the older ones (59.7% of them use more a desktop computer and 36.71% a portable computer), so it is possible to deduce that the older students feel more comfortable using a desktop computer to study.

In order to find out their perception about their use of ICT for academic, social, and professional activities, we asked them to arrange in order their use of ICT according to these three types of activity. In Graph 1, the distribution according to their age can be observed.
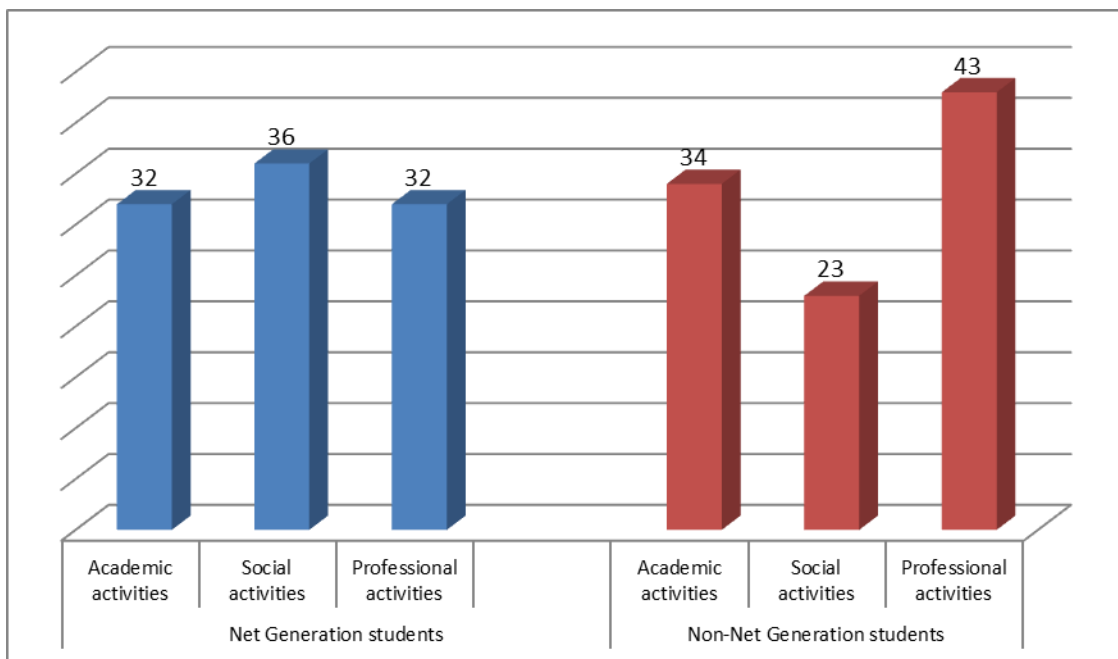
Graph 1. Percentage of use of ICT in academic, social, and professional activities.

As can be seen in Graph 1, Net Generation students arrange in order the use of ICT equally regarding the three types of activities, so we can say that they have an integrated vision of the use of ICT.

The only remarkable difference between the two groups can be seen in the case of the use of ICT for professional activities. This difference can be explained with respect to their professional status: It seems obvious that the older students are more professionally established than the younger ones, so the professional use of ICT is more important for them.

We can get more information if we analyse how much time they spend using ICT in these three types of activities.
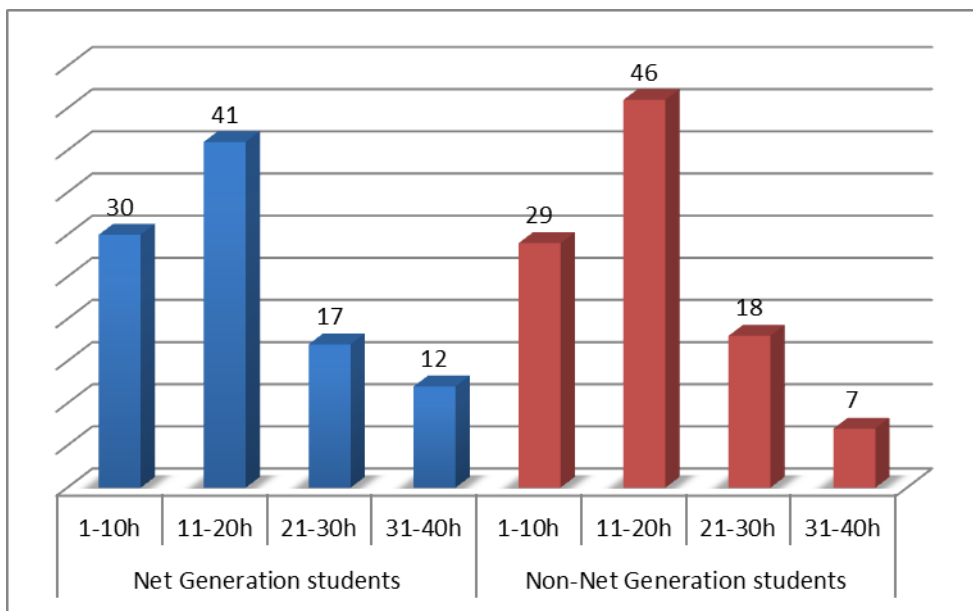
Graph 2. Differences between the two groups in percentage of hours spent using ICT for academic activities.

As Graph 2 shows, the two groups spend mostly the same time using ICT for academic activities, showing very few differences between them. This can be explained by the fact that they are studying at the same university with the same ICT based methodology, but it seems to reject the claim about increasing the use of ICT for studying in the case of Net Generation students.

Turning to the use of ICT in social activities, the distribution is shown in Graph 3.
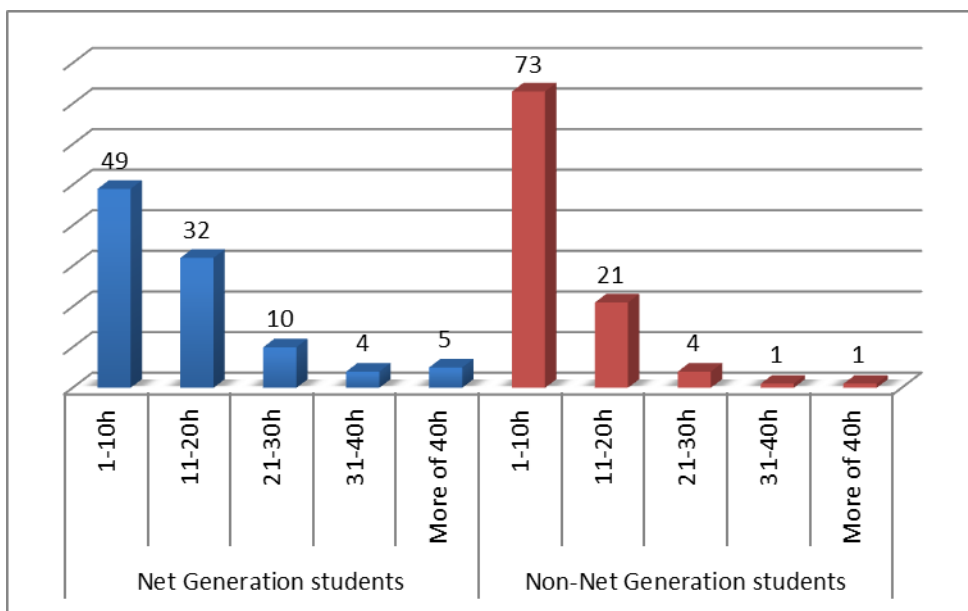
Graph 3. Differences between the two groups in percentage of hours spent using ICT for social activities.

As can be seen in Graph 3, the two groups are not intensive users of ICT in social activities, because few of them use it more than 20h per week. But the results are less dispersed in the case of non-Net Gen students: They seem to use less ICT for social activities, but the difference is not clear enough to support the literature claims about how intense the Net Generation's social use of ICT is.
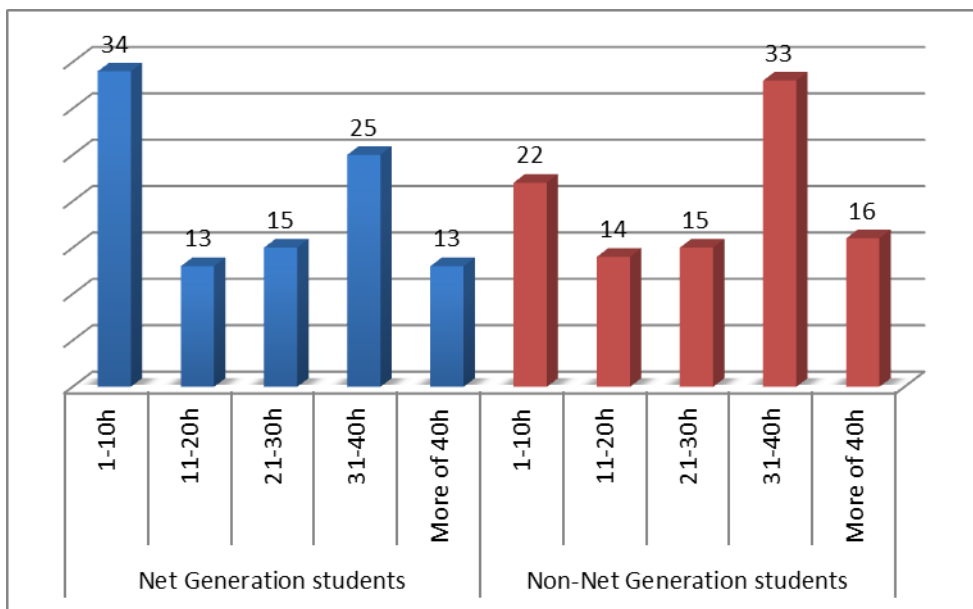
Graph 4. Differences between the two groups in percentage of hours spent using ICT for professional activities.

As can be seen in Graph 4, there are some differences in the use of ICT for professional activities. In the case of non-Net Generation learners, the most rated period of time is 31-40 hours per week which is the same as a 40 hour a week job. This can be explained with the more established job situation of the older learners that we explained earlier.

If we analyse the reasons why our students use ICT for studying at the UOC, we can see the following results.
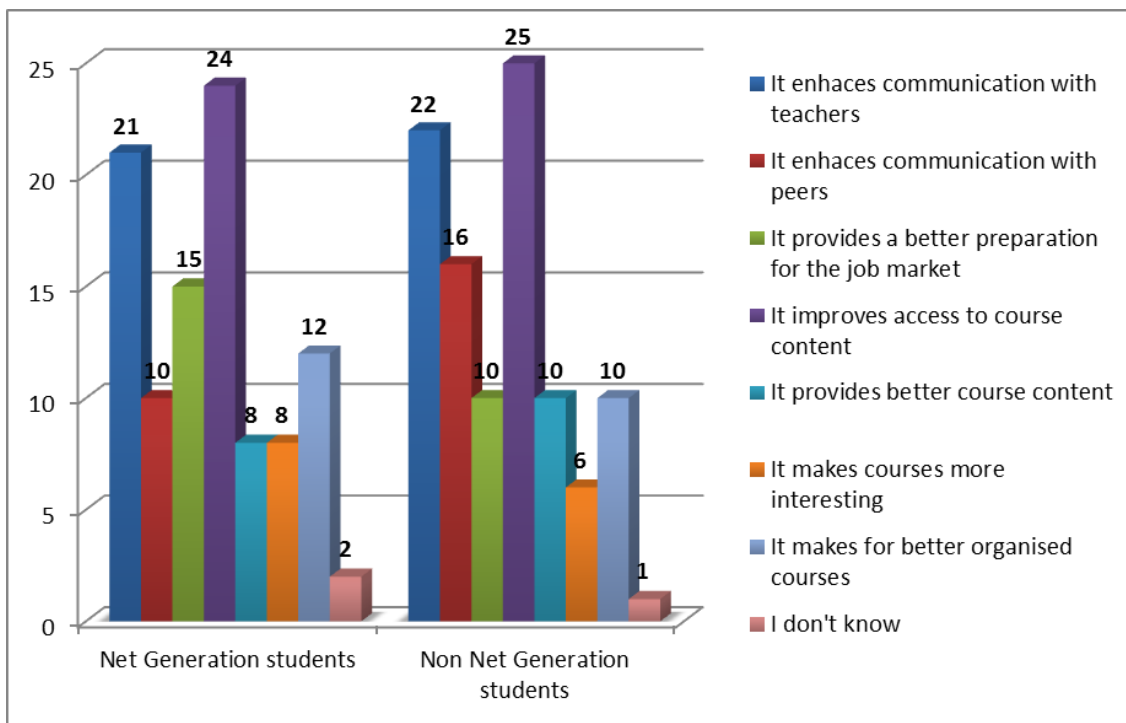
Graph 5. Reasons why our students use ICT for studying at the UOC in percentage.

As shown in Graph 5, both groups think that the main reason for using ICT to study at the UOC is the improvement of access to course content, so they find that access to the content is essential to study at the university.

The same happens for the second reason: Both groups perceive the enhancement of communication with the teacher as a core reason for studying online; this last statement is coherent with our university's teaching methods, based on the continuous communication between students and teachers.

Regarding our students' use of ICT in their social and private lives, our research is consistent with the following results.
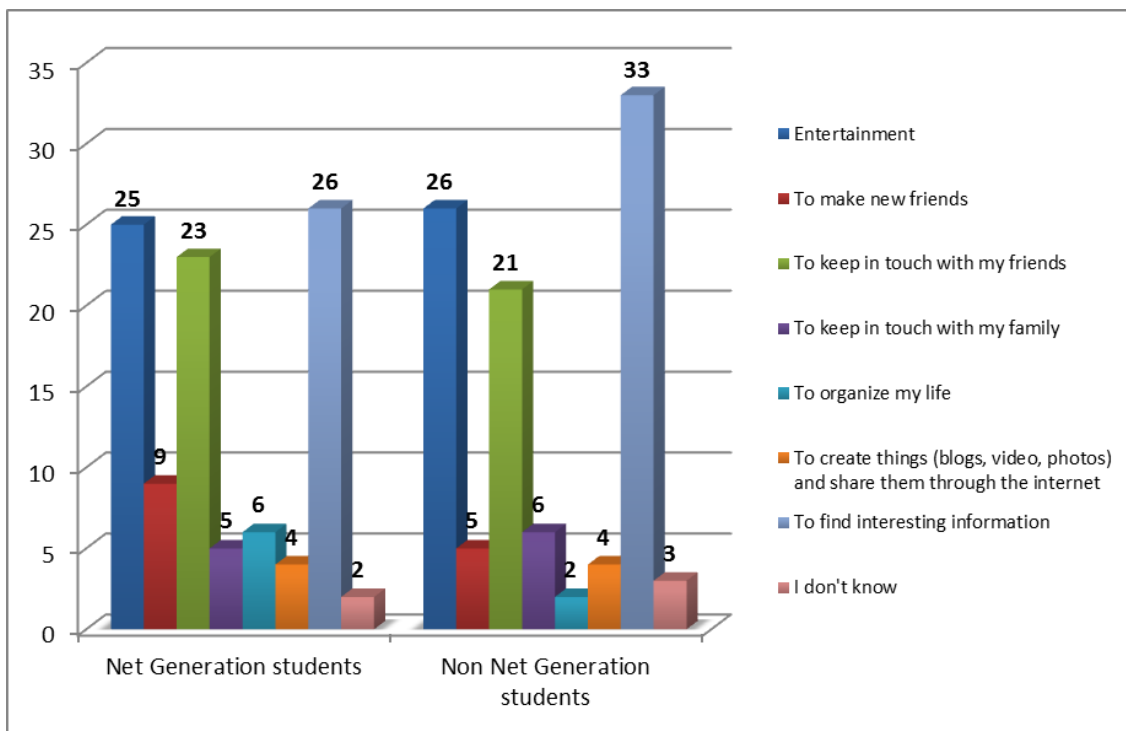
Graph 6. Percentage of use of ICT in their private/social lives.

As can be seen in Graph 6, the three highest rated uses of ICT are the same in the two cases, but the difference between them is higher in the case of the non-Net Generation learners in that the most highly rated use is the search of interesting information. The data shown seems to reject the fact that Net Generation students are more interested in social activities than the others, and, surprisingly, non-Net Generation learners seem to use the Internet more to create and share multimedia information.

Conclusion

Nowadays, "the new generation speaks ICT" trend is openly questioned. There are many studies that seem to refute the claims about this generation, and, as the years go by, even many of the labels used are changing, and "the distinction between digital natives and digital immigrants will become less relevant" (Prensky, 2009, p. 1).

Our research supports the necessity to break the generational line between our students: Based on the analysis of the data, we can generally affirm that there is very little difference between the characteristics of Net Generation and non-Net Generation learners at the UOC. In fact, we did not find consistent evidence to support most of the claims about the Net Generation's special characteristics. So, our findings are consistent

with the conclusions of other researchers (Kennedy et al., 2008; Bennett, Maton, & Kervin, 2008; Guo et al., 2008; Bullen et al., 2011, 2012; Selwyn, 2009; Margaryan, Littlejohn, & Vojt, 2011; Schulmeister; 2008; Karsten & Roth, 2009).

The only statistical evidence found about Net Generation characteristics was the case of being connected and showing a preference for social activities, but if we analyse the data, we can see that these differences are not significantly great (the means of the two groups in these items are 0.27 and 0.23 respectively). In fact, we have just found some evidence that seems to contradict what the literature claims with regard to some of the Net Gen characteristics (need for structure in learning, for example). One of the main characteristics mentioned in the literature is digital literacy, and this can be refuted as a Net Generation characteristic in our research as well: The fact that the very little difference between the two groups is not statistically relevant reveals that there is almost no difference in their digital literacy and it could be caused by other factors. This finding seems to be supported by students' opinion since 70% of our students had no idea of the Net Generation label and 56% of the students that knew about it do not feel comfortable with this label.

Taking into account the difference between the UOC's Net Generation students and non-Net Generation ones regarding their use of ICT in academic and social activities, our findings seem to support the irrelevance of the age factor: We could not find any general and significant difference between the two groups in the vast majority of items. This does not occur in the case of professional activities: There is 11.30% more of non-Net Generation students that use ICT for professional activities and spend more than 30 hours using it in this context. This result can be explained due to the fact that young students are less integrated in the labour market. In fact, some of the older students' statements regarding their feelings about the Net Generation label in the survey point to their intensive use of ICT in their professional activities: "I don't feel like I am part of the Net Generation, but I use ICT a lot in my job; I don't know how it could be done without ICT". In our opinion, the intense integration of ICT in the labour market could be one of the factors that helped the overlapping of the digital divide. While some students learned to use ICT in their social and academic activities, older students had to be retrained in order to use ICT in their professional activities. Then, when older students had to use ICT to study at the UOC, they were sufficiently digitally literate to carry out online learning activities.

The analysis of the data gathered demonstrates that the difference among our students is produced more by their use of ICT than by their age. In the UOC's case, student use of ICT improves during the ICT competences course, in which students get introduced to a specific competence of our university: ICT use and application in an academic and professional context. Taking into account that digital literacy is an important part of the ICT competences course and it helps to overcome the digital divide, we have to focus, due to these findings, on students' other characteristics and their preferences about learning online.

Some authors (Oblinger & Oblinger, 2005; Prensky, 2009; Ferreiro, 2006) highlight the need of a new educational paradigm to train Net generation students: "they need new learning environments due to their multidirectional communication processes; a reformulation of the curricula is needed, using Web 2.0 tools and collaborative learning as a way to help these new students to build their own knowledge" (Ferreiro, 2006, p. 50). Our findings directly refute these claims; in fact, all of our students (Net Generation or not) are able to develop the same kind of activities in the same learning environment. Neither the survey results nor our teaching experience give us an indication that an age distinction is needed. In our ICT competences' course, all students learn to work collaboratively using Web 2.0 tools and we have not encountered any age-related differences. We agree that universities have to redesign their learning activities, but not to train students with particularly new characteristics, but to adapt to information and knowledge society needs.

In order to improve our course, and based on our students' preferences in the use of ICT in academic activities, content has been redesigned in a more innovative and accessible way and we have improved teacher communication strategies.

The results of this paper and other findings of the Digital Learners in Higher Education research project (Bullen et al., 2012) support the need for a deeper analysis of student profiles in the use of ICT, moving away from the Net Generation discourse. Taking into account this fact and being aware of the limitations of our research, we are planning the following further research.

- To determine if there is any significant difference between face-to-face and online universities regarding Net Generation characteristics, we plan to increase the research sample with our institutional partners.

- Based on BCIT's findings (Bullen et al., 2012), to determine a paradigm of student profiles in the use of ICT. This research will be based on the literature review about the use of ICT in higher education contexts and the design of a common data analysis method, in order to extract similar information that allows the combination of each partners' findings.

Finally, we can affirm that our students do not fit in the Net Generation profile. In fact, older students show the characteristics of this generation claimed by the literature because, on analysing their habits, they can be labelled as ICT users more than digital immigrants.

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The Influence of the Openness of an E-Learning Situation on Adult Students' Self-Regulation

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Abstract

This article presents empirical research conducted with French speaking adults studying for a diploma. Their training took place mainly in e-learning. The goal of this research was to identify and explain the processes of influence existing between two specific dimensions: the degree of openness of the components of the e-learning situation and students' self-regulated behaviors in the management of these components. This research was based on the socio-cognitive theory of self-regulation (Bandura, 1986; Schunk & Zimmerman, 2007; Zimmerman, 2002) and on a theoretical definition of the notion of "openness" (Jézégou, 2005). It applied the "actantial model" (Greimas, 1966; Hiernaux, 1977) for analyzing data collected while using a specific validated instrument of assessment of openness (Jézégou, 2010a). The main results of this empirical work are the role played by three psychological dimensions in the influence processes identified. More empirical study is required to confirm their validity.

Keywords: e-learning; openness; environmental self-regulation; self-regulated behavior; need for autonomy; need for social affiliation

Introduction

The emerging French research on self-directed learning assigns a double dimension to the concept of learner self-direction, within a socio-cognitive perspective (Brewer, 2010; Carré, 2003, 2010; Cosnefroy, 2011; Jézégou, 2010b). The first is self-determined motivation (an autonomous, authentic free will to learn) while the second is self-regulation (the exercise of agentic, self-controlled learning activity). The term "double" is used because of an interdependent relationship between these two dimensions (Carré, 2003; Cosnefroy, 2011; Deci & Ryan, 2000; Schunk & Zimmerman, 2007). This self-direction or psychological control is not directly observable. It manifests itself through learner behaviors whose characteristic is to be both self-determined and self-regulated (Carré, 2010; Jézégou, 2010b). Certain environmental factors (educative conditions) may promote or hinder these behaviors (Cosnefroy, 2011; Deci & Ryan, 2000; Hiemstra, 2000; Vallerand, Carbonneau, & Lafrenière, 2009; Zimmerman, 2000). The empirical research synthesized in this paper centered only on "environmental self-regulation", one of the three forms of self-regulation in Zimmerman's socio-cognitive model (2002). Its goal was to identify and to explain the influence exercised by the degree of openness of an e-learning situation (environmental factors) on environmental self-regulated behaviors of adult students.

The article first presents the essential features of the theoretical framework linked to the object of this empirical research. It presents the definition of "openness" proposed by Jézégou (2005) and the instrument "GEODE" she constructed to assess the degree of openness of an educative environment (Jézégou, 2010a), notably of e-learning. The main aspects of environmental self-regulation resulting from Zimmerman's work of this specific form of self-regulation in learning are then described, followed by a presentation of the actantial model (Greimas, 1966; Hiernaux, 1977; Piret, Nizet & Bourgeois, 1996) used for analyzing the data collected from these adult students. The influence of the degree of openness of the components of the e-learning situation on the students' self-regulated behaviors in the management of these components is presented. The possible role of the three psychological dimensions in the influence processes identified is discussed.

Openness and Environmental Self-Regulation: Theoretical Framework

For nearly 50 years, the theory of self-directed learning has been the subject of much research, following the pioneering works of Houle (1961), Knowles (1975), Long (1975), Tough (1967), Hiemstra (1976) and Guglielmino (1978). In France, a socio-cognitive model of self-directed learning has been gradually elaborated on this basis (Carré, 2003; Carré & al, 2011). It uses the two key psychological concepts of self-determined motivation and self-regulation to better understand both agentic learning processes and environmental conditions (Carré, 2003; Carré & Fenouillet, 2009; Cosnefroy, 2011; Jézégou, 2010b). The empirical research presented in this article used this approach in order to elucidate the educative dimensions that are favorable to self-directed learning.

The Essential Features of the Socio-Cognitive Theory of Self-Regulated Learning

This socio-cognitive paradigm (Bandura, 1986, 1999) takes the position that human behaviors are not primarily influenced by environmental components, as stipulated in the behaviorist approach or the determinist current in sociology. Nor do they depend solely on internal or personal characteristics as stated in current dispositionalist psychology. According to the socio-cognitive paradigm, behaviors (**B**) are part of a system of reciprocal causality between personal characteristics (**P**) and environmental components (**E**). These three dimensions are subject to reciprocal interactions in variable and contingent importances to conditions, activities and temporalities:
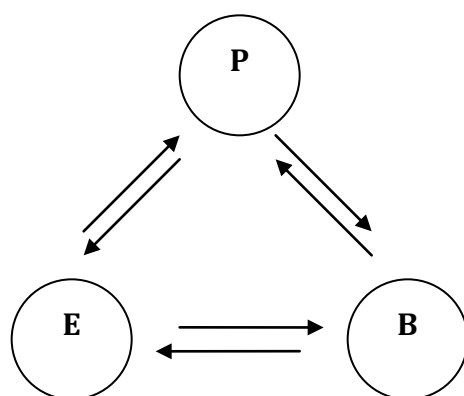
Figure 1. The model of triadic reciprocal causality (Bandura, 1986).

The weight of these three dimensions is not always the same, nor do they necessarily act at the same time. However, the development or the modification of one of them will cause a change in the system of their interactions, as circumstances vary from one individual to another.

The learner's self-regulation follows this triadic reciprocal causality model (Zimmerman, 1989). In its broadest sense, it refers to the control the learner exercises on his or her own cognitive processes by anticipating and preparing procedures, estimating them, and adjusting them according to effects or the observed results (Boekaerts, Pintrich & Zinger, 2000; Corno, 2001; Cosnefroy, 2011; Schunk & Zimmerman, 2007; Zimmernan, 2002).

The empirical research synthesized in this paper concerned a specific form of learner self-regulation identified by Zimmerman (2002): "environmental self-regulation". It studied the influence of the degree of openness of the components of a specific e-learning situation (environmental dimension) on adult students' self-regulated behaviors in the management of these components (behavior dimension). This can be illustrated as follows.
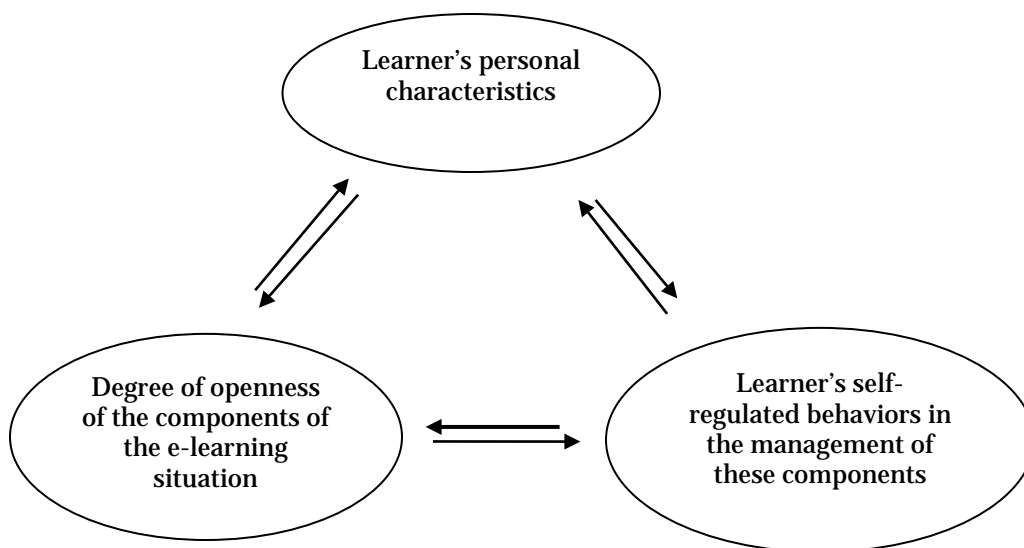
Figure 2.   The triadic reciprocal causality model applied to the empirical research presented in this article.

The "Openness" of a Distance Learning Environment: A Definition and a Validated Instrument for Assessment

The expression "open and distance learning environment" was considered in France as not well-established in theory and was endowed with a fuzzy semantics until the beginning of the 2000s. Such criticism concerned the term *open*. This term usually referred to opportunities to get access to distance education by digital technologies of information and communication. It was also connected with distance education flexibility mainly impacting spatiotemporal aspects such as timing, place, rhythm of distance learning. Since 2001, several French researchers in education have decided to characterize the essential features of the notion of openness of a distance learning environment (Collectif de Chasseneuil, 2001; Jézégou, 2005). A first definition of openness was proposed by a collective of 14 researchers : "an organized and targeted educational environment which takes account of the learner's uniqueness in his or her individual and collective dimensions, supported by complementary learning situations in terms of places, timing, educational resources, human and technological mediations" (Collectif de Chasseneuil, 2001, p. 177). In proposing this definition, the intention of the collective authors was to move away from engineering concerns centered on technological aspects to thinking of the design of open and distance learning environments as a combination of different modalities, spatiotemporal aspects, tools of communication, and collaboration or human resources. In so doing, it indirectly questioned the educational conditions necessary to promote the expression of the learner's self-direction.

A further and second French definition answered this question, while providing a theoretical basis for the notion of openness: "openness refers to a set of flexible and empowering educative environments whose main property is to provide freedom of choice to learners so that they can exercise control over their training processes and learning situations" (Jézégou, 2005, p. 103). This definition emphasizes the importance of providing the learner with opportunities for personal decision making (Hiemstra & Brockett, 1991; Hiemstra, 2000) and self-determination (Deci & Ryan, 1985) in the choice of various components of the learning situation. GEODE (*Grille d'Evaluation de l'Ouverture D'un Environnement éducatif*) is a validated French-speaking instrument which assesses the degree of openness of a distance learning environment, notably of e-learning (Jézégou, 2010a). It includes a matrix of 14 components where it is possible to provide to learners freedom of choice. These components are regrouped into three categories: (1) spatiotemporal, (2) pedagogical, and (3) the components linked to the educational mediated communication.

Table 1

The Three Categories of GEODE Components (Jézégou, 2010a, p. 89)

Categories of components	Components
Spatiotemporal	access, timing, place, rhythm of learning
Pedagogical	objective, progress, sequence, method, format, content, evaluation of learning
Educational mediated communication	course documents, tools of communication/collaboration, human resources

GEODE proposes an assessment protocol which includes a data collection method and calculation basis. It enables scoring each of the 14 components and categories, as follows.

Table 2

The Typology of Openness (Jézégou, 2010a, p. 94)

Degree of openness (%)	Typology
100 ≥ score > 90	highly open +
90 ≥ score > 80	highly open
80 ≥ score > 70	highly open -
70 ≥ score > 60	fairly open +
60 ≥ score > 50	fairly open
50 ≥ score > 40	fairly open −
40 ≥ score > 30	barely open +
30 ≥ score > 20	barely open
20 ≥ score > 10	barely open -
10 ≥ score	closed

This instrument was implemented to assess the degree of openness of the 14 components of the e-learning situation in the heart of the empirical research presented in this paper.

Environmental Self-Regulation: Theoretical Grill for Analysis

Socio-cognitive research on learner self-regulation has mainly developed in North America. In France, it has begun to emerge in recent years (Brewer, 2010; Cosnefroy, 2011; Jézégou, 2008, 2011). Internationally published works place great emphasis on two forms of self-regulation: (1) cover self-regulation, (2) behavioral self-regulation. "Cover" self-regulation is exerted by the learner on his or her emotional, socio-affective, and motivational states. "Behavioral" self-regulation is the learner's control exercised over his or her own learning behaviors. As shown in the Figure 3, Zimmerman (2002) has proposed a third form of self-regulation: environmental self-regulation.
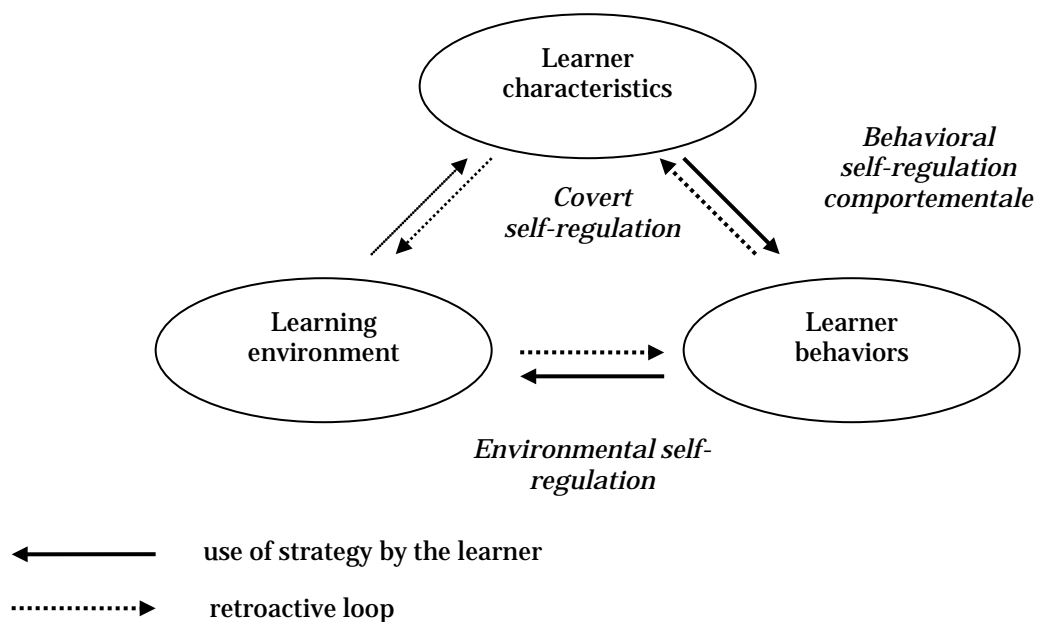
Figure 3. The triadic forms of self-regulation (Zimmerman, 2002, p.71)

Research in the field has tended to neglect this third form of self-regulation. It refers to the control the learner exercises on the management of the various environmental components to create a situation conducive to his or her learning. Although Zimmerman (2002) has identified this third form, he has not made it more explicit. However, he proposes a succinct grill of analysis for environmental self-regulation. In it, environmental self-regulation is considered in two main categories of behaviors. The first category refers to learners' behaviors of adjustment to the formal conditions linked to the different components of the learning situation. These conditions are predetermined and imposed by the designer of the learning situation and/or by the trainer. The second category corresponds to proactive or reactive behaviors in the creation of informal conditions of these components. In proactive self-regulation, the learner chooses his or her goals and elaborates specific action plans, while reactive self-regulation refers to the overcoming of obstacles which hinder the achievement of a goal, by pursuing particular actions. Zimmerman has limited this proposition for the study of self-regulated environmental behaviors (adjusted, proactive, or reactive) to the way the learner manages the three components of place, timing, and human resources. However, a learning situation can not be reduced to so few components. A more detailed analysis has been proposed (Jézégou, 2008, 2011) which suggests studying the way the learner manages the 14 components of GEODE in order to dispose a situation conducive to his or her distance learning.

The Main Results of the Empirical Research

The empirical research presented in this article was conducted in 2011 with 27 adults studying for a higher engineering degree at a French research and educational institute (*Groupe des Ecoles des Mines*). Their training took place mainly in e-learning. These students lived in France and worked in companies, while studying for a higher level of qualification. Nine of them were women. Their mean age was 36 years. A qualitative methodology was used to collect and analyze data, respecting ethical principles of confidentiality and anonymity. The students volunteered for individual web-telephony recorded interviews. The same open-ended questions were asked to all interviewees. These questions notably invited them to express themselves on their objectives and on their specific actions for managing each of the 14 components of the GEODE. The actantial model invented by Greimas in the 1960s was used to analyze the semantic structure of the 27 interviews.

A Qualitative Methodology Based on the Actantial Model

The actantial model is inspired by French linguistic structuralism originally developed by De Saussure (1913), Merleau-Ponty (1942), and Levi-Strauss (1949). This current of research proposes to interpret and analyze material collected in terms of oppositions, contrasts, and hierarchical structures as they might reflect mental characteristics or organizing principles. The actantial model (Greimas, 1966; 1983; Hiernaux, 1977; Piret, Nizet & Bourgeois, 1996) enables identification of the structures of meaning that guided perceptions and behaviors by breaking the narrative discourse into seven "actantial roles". The main three are (1) the subject, the narrator of the story; (2) the object, what the subject is directed toward; and (3) the actions undertaken by the subject to reach this objective. Object and actions can be highlighted (positive mode) or depreciated (negative mode) by the narrator. The narrative discourse often contains four additional actantial roles: (4) the helper, helps the subject reach the desired object; (5) the opponent, hinders the subject in his or her progression; (6) the positive receiver, takes advantage of the achievement of the objective and the highlighted actions by the narrator; (7) the negative receiver, takes no advantage of the depreciated action by the narrator. In its fullest form, the "actantial schema" (Piret & al., 1996) resulting from the analysis can be represented as follows.

Helper

Receiver +

Subject   **Actions +**   **Object +**

              Actions -   **Object -**

Opponent

Receiver -
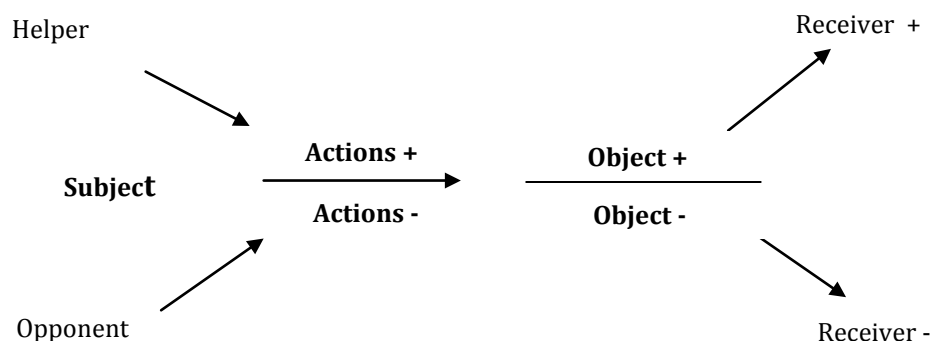
Figure 4. The "actantial schema" in its fullest form (Piret et al., 1996, p. 84).

This method enabled identification of the objectives these adult students had through their self-regulated behaviors in the management of the 14 components of the GEODE, and their specific actions linked to these behaviors were particularly outlined. Comparison of individual actantial schemas showed that the students had common objectives and ways of acting which could be separated into two concomitant phenomena. The first was the adjustment of students to the formal conditions of the temporal and pedagogical components of the e-learning situation. These components had a low degree of openness. The second phenomenon was the creation, by the students, of informal conditions in the management of three components: the format (learning alone or in a group), the digital tools of communication/collaboration (forums, chats, wikis, or email), and the human resources. These components had a high degree of openness.

Low Degree of Openness and Students' Behaviors of Adjustment: Explicative Hypothesis

The training process was governed by a continuous control of knowledge from individual documents produced by students. The successive deposition of these documents should be carried out in a dedicated space of the e-learning platform, according to a schedule determined in advance by the teachers. This schedule imposed the rhythm of distance learning, according to a sequential logic connected to the module studied in a given period. Each of these modules and sequences corresponded to learning objectives defined in the assessment standards. In addition, they referred to a pedagogical method and course supports pre-determined and imposed by the teachers. These factors explained why the temporal and the pedagogical components (except "the format"), the component of "course documents" of this situation of e-learning, had a low degree of openness. Therefore, they did not offer a choice to students.
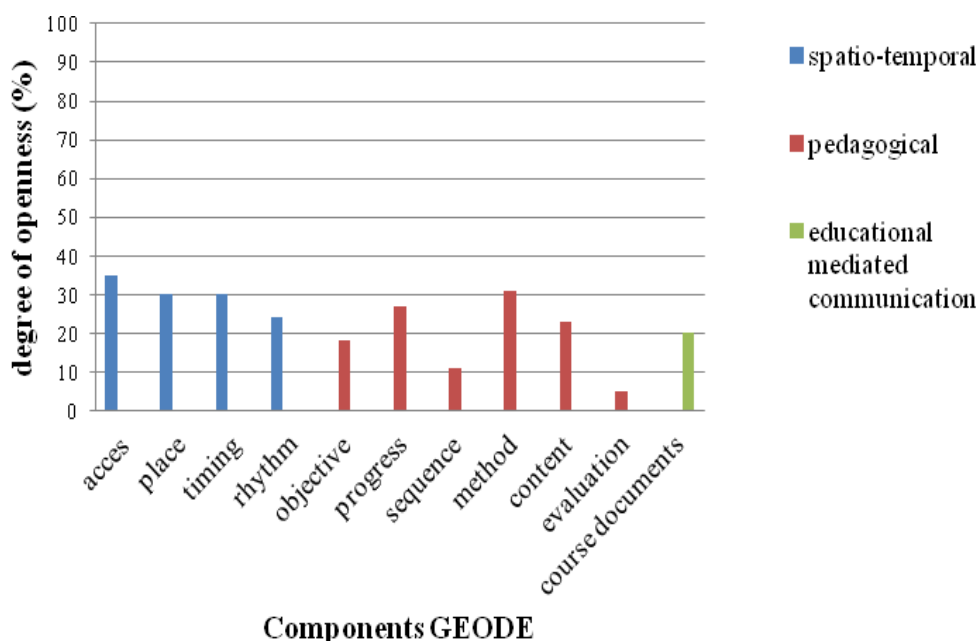
Graph 1. The eleven components presented a low degree of openness.

Students perceived the formal conditions linked to these components of their e-learning situation positively. According to them, these temporal and pedagogical conditions, imposed by the teachers, supported their distance learning by "inciting them to work". They interacted with all of these formal conditions by adjusting their behaviors. The following two synthetic meaningful actantial schemas illustrate the logic linked to these adjusted environmental self-regulated behaviors.

Schedule imposed by
teachers **+**

To adjust oneself to the
rhythm of distance
learning fixed in the
schedule **+**

To oblige oneself to respect the
imposed schedule and effectively
manage the rhythm of his or her
distance learning **+**

Student

To set oneself the rhythm
of his or her own distance
learning **-**

To adopt a random rhythm
being subjected to different
events and circumstances of
his or her professional and
personal life **-**

No schedule imposed
by teachers **-**

Objective, progress,
sequence and
method imposed
by teachers **+**

To adjust oneself to the
formal conditions
linked to these
components **+**

To satisfy requirements for
growing his or her chances to
pass the exam **+**

Student

To set oneself
conditions linked to
these components **-**

To fail in the examination and
not obtain the diploma **-**

Objective, progress,
sequence and
method not imposed
by teachers **-**

Figures 5 & 6. **Two synthetic meaningful actantial schemas illustrated students' adjusted environmental self-regulated behaviors.**

The students intentionally accepted a "dependence state" in order to optimize their chances of graduating. The organismic integration theory offers a hypothesis to explain this phenomenon (Deci & Ryan, 1990; Gagne & Deci, 2005): It states that such intentionality involves a process of internalization in which a learner identifies with significant external regulations, assimilating and personally approving them. So, this process could explain the reason why students readily adopted behaviors of adjustment. Thus, although they perceived their e-learning situation as mainly controlled by teachers, they developed a system of interpretation of external control in terms of gains for themselves, accepting and adjusting to the formal conditions of this situation. This hypothesis can be illustrated as follows.
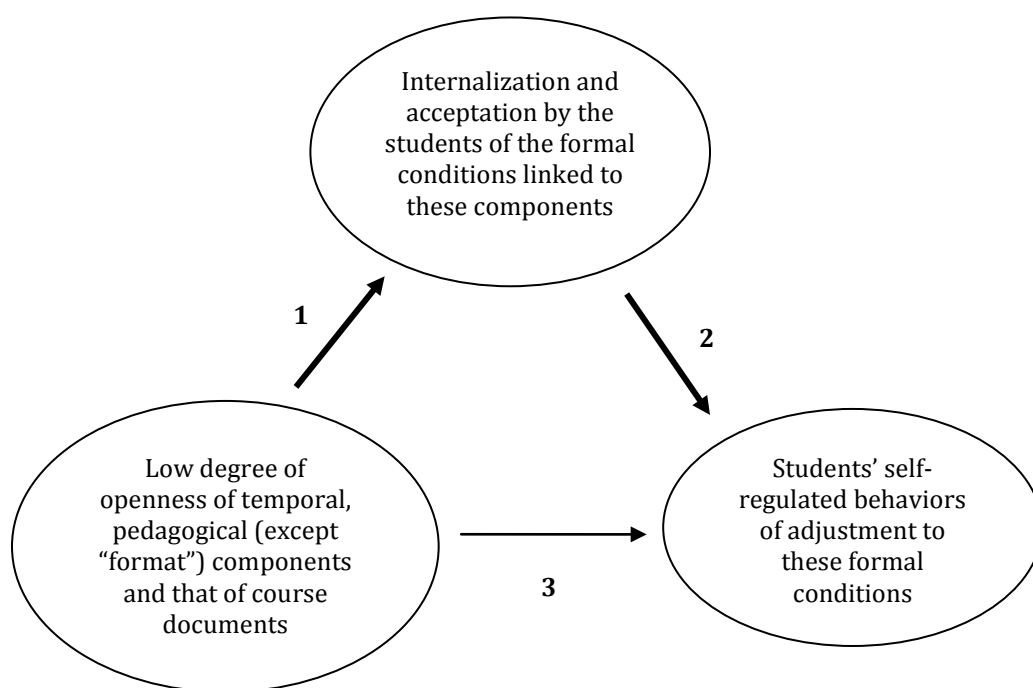
Figure 7. The mediated role of internalization and acceptance by the students of formal conditions linked the eleven components with a low degree of openness.

These behaviors of adjustment were not self-determined. According to the theory of self-determination (Deci & Ryan, 1985), self-determined behaviors are linked to personal choice of activity in achieving a goal. Concerning the students of this empirical research, their behaviors were mainly influenced by the formal conditions (external factors) linked to the temporal and pedagogical components of their e-learning situation. They could refer to an extrinsic motivation drive by an external regulation (Deci & Ryan, 1985; Vallerand & Blanchard, 1998; Vallerand & al., 2009). The students would adopt adjusted behaviors to obtain a recompense (diploma required), and in order to avoid the failure of not being qualified. The best strategy would be, according to

them, to adjust to the formal conditions predetermined by the designer or the teacher of the e-learning situation.

A High Degree of Openness and Proactive Self-Regulated Behaviors: Explicative Hypothesis

No constraint was imposed on students by teachers in the management of three components: the "format" (to learn alone or in groups), the tools of communication/collaboration (email, discussion forum, chat), and human resources (teachers, other experts, or peers). These components had a high degree of openness.
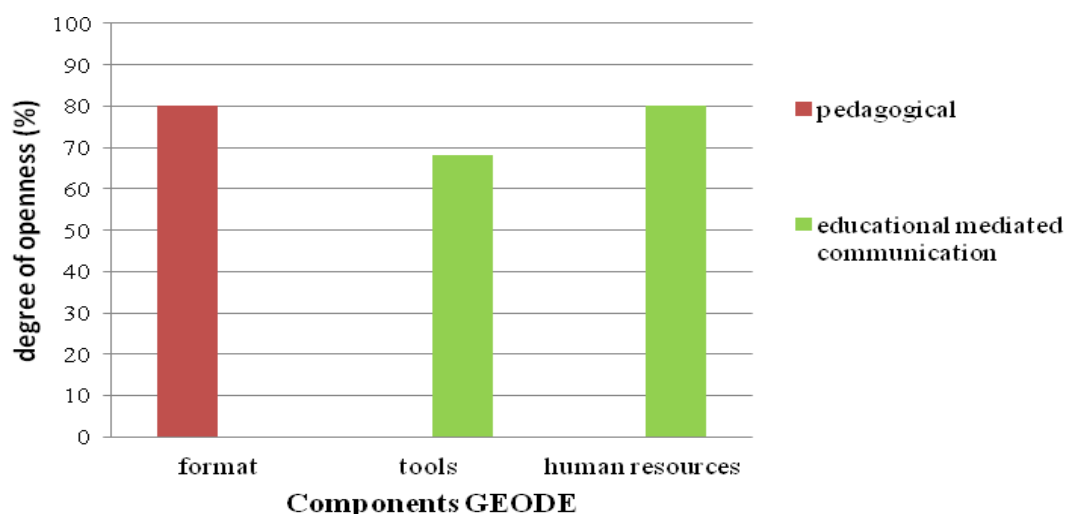
Graph 2. The three components presented a high degree of openness.

Students were free to use the tools available to them on the e-learning platform (essentially a forum of discussion and email) or to request help from teachers or peers. In addition, virtual private classes were also made available on the platform. Teachers did not have access to these classes. Students prioritized the tools that were not subject to control from teachers: their personal email, free web-telephony, or virtual private classes. In addition, they sought help from others in their circle of personal acquaintances (family, friends, or work-colleagues) rather than teachers. The most meaningful result from the analysis of their narrative discourses is illustrated by the actantial schema in Figure 8.

Freedom to choose format, tools
of communication/collaboration
and human resources **+**

Other students participating in
the group of discussion and
collaboration +

To discuss and collaborate in
small groups with other
chosen students, using
informal tools, without the
intervention of the teachers **+**

To construct an informal system of
mutual aid and support optimizing
his or her own individual distance
learning to obtain the diploma **+**

Student

To adjust oneself mainly to
communicational and
collaborative modalities,
controlled by the teachers **-**

Essentially use the formal system
of mutual aid and limiting thus,
his or her chances of success to
obtain the diploma **-**

No freedom to choose format, tools
of communication/collaboration
and human resources **-**
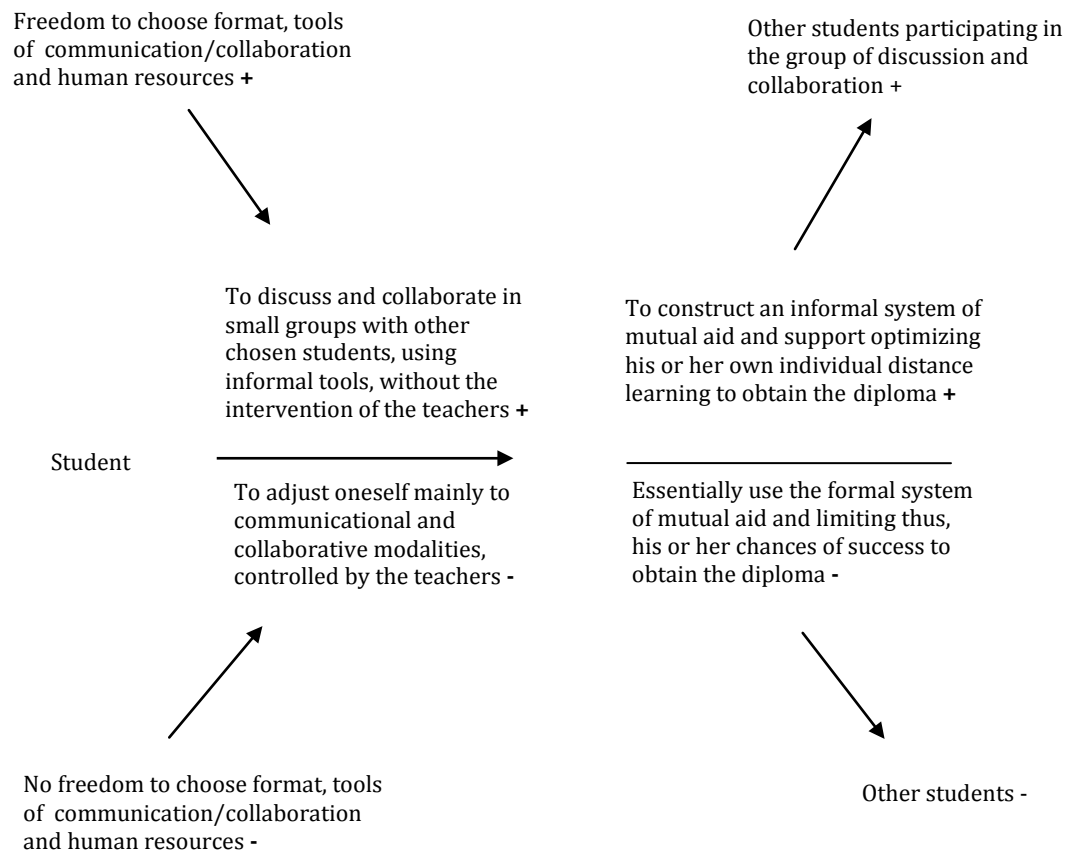
Other students -

Figure 8. **Synthetic meaningful actantial schema illustrated students' creative
environmental self-regulated behaviors.**

Students demonstrated self-regulated behaviors by the creation of informal conditions
in the management of these three components. Such behaviors would derive from the
co-existence of two processes of influence.
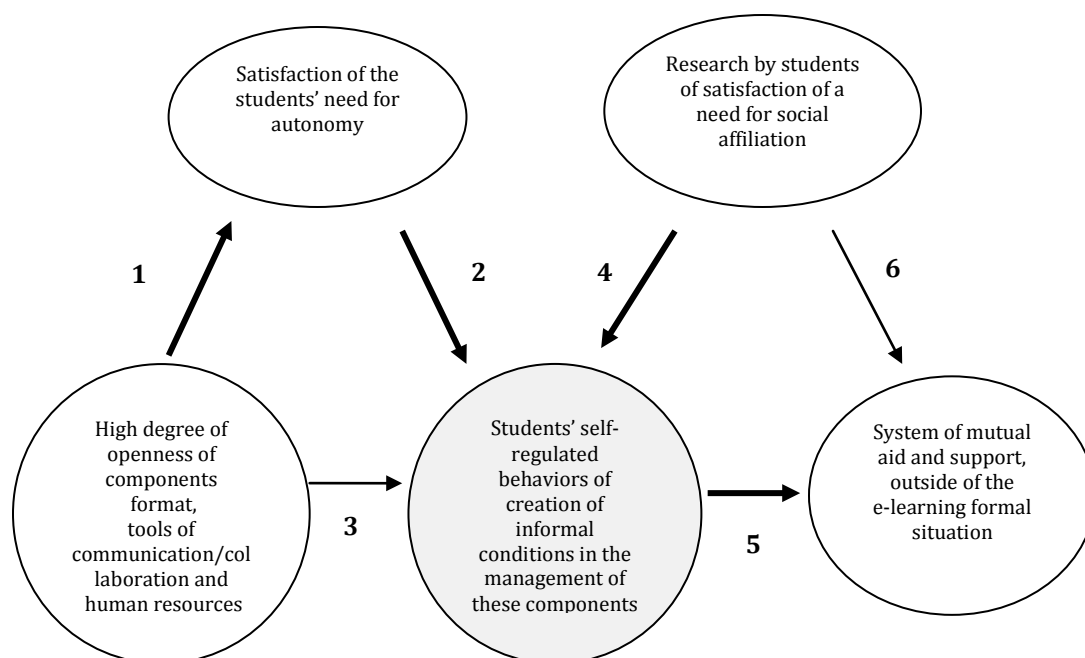
Figure 9. The two influence processes linked to students'self-regulated behaviors of creation of informal conditions in the management of format, tools of communication and human resources.

This figure illustrates a double hypothesis, explaining the students' behaviors. A high degree of openness of these three components is predicted to influence these behaviors by satisfying students'need for autonomy. According to cognitive evaluation theory (Deci & Ryan, 2000, 2007; Laguardia & Ryan, 2000; Vallerand et al., 2009), autonomy is a fundamental human psychological need; it occurs in all activities, such as learning. Every human tries to satisfy this need in their interactions with their environment. This need is expressed through the sensation of freedom of choice and action, and also as the author of his or her decisions and acts. Thus, the liberty of choice offered to these students would have contributed to satisfying their need for autonomy and promote these behaviors as the informal conditions of these three components were created. These behaviors would have enabled them to build a system of mutual aid and support, outside the formal situation of e-learning and beyond the pedagogical control of the teachers, mainly by using the private virtual classes. Simultaneously, these behaviors were also motivated by the search for satisfaction of a need for social affiliation. This need is expressed by the feeling of being interconnected, belonging to a community, while being useful to others and taking profit for oneself (Deci & Ryan, 2000, 2007; Laguardia & Ryan, 2000, Vallerand & al, 2009). According to the cognitive evaluation

theory, this psychological need is also fundamental and universal. Students would have tried to fill it by building a system of mutual aid and support.

This double hypothesis would show that these students were capable not only of grasping the liberties of choice offered to them by the teachers, but also of creating, individually and collectively, the informal conditions that develop a situation conducive to their distance learning. These self-regulated behaviors would be both self-determined and proactive. Indeed, according to the cognitive evaluation theory (Deci & Ryan, 2000, 2007; Laguardia & Ryan, 2000; Vallerand & al, 2009), satisfaction of the needs for autonomy and for social affiliation facilitates self-determined behaviors. The situational motivation linked to these behaviors would be extrinsic in identified regulation (Deci & Ryan, 1985): The students considered themselves as autonomous when implementing their own decisions; they valued them and considered them significant for attaining their goal, thus optimizing the success of their individual distance learning. These behaviors were also proactive: The students were focused on a goal as they developed actions to enhance their distance learning.

Conclusion

The coexistence of adjusted and proactive self-regulated behaviors allowed students to reach their purpose: to be successful in their distance learning and to obtain the diploma. On one hand, they adjusted to the formal conditions of the temporal and pedagogical components, such as those imposed by their teachers, in this way ensuring the success of their distance learning. On the other hand, they grasped some of the liberties of choice offered to them by the teachers in order to create the informal conditions of their e-learning situation, these conditions also participating in their project. The existence of these two joint phenomena needs to be verified with other groups of students participating in similar e-learning situations. Thus, the explicative hypothesis proposed on the role of three psychological dimensions in the influence processes identified also could be tested by future empirical research.

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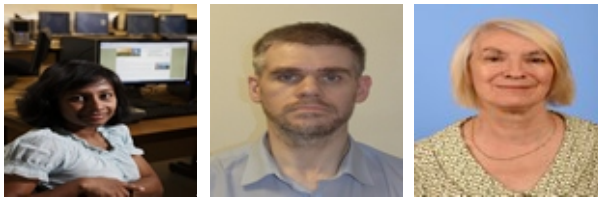
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Abstract

Massive open online courses (MOOCs) are a recent addition to the range of online learning options. Since 2008, MOOCs have been run by a variety of public and elite universities, especially in North America. Many academics have taken interest in MOOCs recognising the potential to deliver education around the globe on an unprecedented scale; some of these academics are taking a research-oriented perspective and academic papers describing their research are starting to appear in the traditional media of peer reviewed publications. This paper presents a systematic review of the published MOOC literature (2008-2012): Forty-five peer reviewed papers are identified through journals, database searches, searching the Web, and chaining from known sources to form the base for this review. We believe this is the first effort to systematically review literature relating to MOOCs, a fairly recent but massively popular phenomenon with a global reach. The review categorises the literature into eight different areas of interest, introductory, concept, case studies, educational theory, technology, participant focussed, provider focussed, and other, while also providing quantitative analysis of publications according to publication type, year of publication, and contributors. Future research directions guided by gaps in the literature are explored.

Keywords: MOOC; massive open online course; massively open online course; systematic review; connectivism

Introduction

Distance education has a long history, with correspondence courses making use of reasonable cost universal postal services for the delivery of study material to learners and for submission/return of assignments by/to students (Casey, 2008). Further developments of distance education have appeared with each new communication technology: radio, television, video recorders, home computing. The latest development, that of the Internet (including very recently the mobile Internet), has similarly been adopted by many existing higher education providers but has also supported the emergence of a new model dubbed a massive open online course (MOOC(s)), the term coined in 2008 to describe an open online course to be offered by the University of Manitoba in Canada. A range of both topics and platforms have since emerged and the term was described as "the educational buzzword of 2012" by Daniel (2012) reflecting widespread interest in the concept. MOOCs are widely discussed across a range of media, including blogs and the specialist and popular press, however this includes "thinly disguised promotional material by commercial interests … and articles by practitioners whose perspective is their own MOOC courses" according to Daniel (2012).

This paper seeks to classify academic research relating to MOOCs, based on a systematic review of the existing peer reviewed MOOC literature. Search techniques for papers related to MOOCs are considered and a corpus of papers identified, then a grounded research approach is presented from which a classification of the works emerges.

Background

Since the early days of computing, academics have shared digital content (Lane & McAndrew, 2010) and recently there has been much interest in the sharing of open educational resources (OER), particularly relating to higher education, which has also become an important resource base for teachers and learners (Adams, Liyanagunawardena, Rassool, & Williams, 2013). In 2001 the Massachusetts Institute of Technology (MIT) launched its pioneering OpenCourseWare (OCW), with the aim of publishing materials from all its courses permanently on the open Web, with licenses allowing its use, modification, and redistribution. Since then many other established universities have joined the movement such as the Open University of UK through the OpenLearn project and the Open Learning Initiative by Carnegie Mellon University. OER were made available for two purposes: Learners could access the material directly and, hopefully, learn from it; educators could use the material as part of their own teaching (as produced or by amending it themselves). A significant proportion of these OER, however, were of limited use since they were usually produced in order to be a specific part of a larger educational experience within a specific educational framework. This limitation was particularly frustrating for many aspiring learners attempting to use them directly, but could also cause problems when used naively by educators (Liyanagunawardena, 2012; Weller, 2007). The concept of open access to learning was

taken in a different direction with the introduction of the massive open online courses or MOOCs (Fini, 2009).

A MOOC brings together people interested in learning (or "students") and an expert or experts who seek to facilitate the learning. Connectivity is usually provided through social networking, and a set of freely accessible online resources provides the content or the study material. Furthermore, they generally have no prerequisites, fees, formal accreditation, or predefined required level of participation (McAuley, Stewart, Siemens, & Cormier, 2010). Participation in a MOOC is completely voluntary and is dependent on the interested individual. The collaborative space of a MOOC can span across many different platforms and technologies. For example, MOOC participants may create their own blog posts discussing aspects of the MOOC in different spaces and/or may use microblogs such as Twitter to express themselves. "Connectivism and Connective Knowledge", an online course offered through the Learning Technologies Centre and Extended Education at the University of Manitoba and facilitated by George Siemens and Stephen Downes (Downes, 2008), is considered the first MOOC. This online course had 25 paid enrolments (for credit) with around 2,200 non-credit, non-fee paying students. It used the principles of connectivism (Siemens, 2005) and unlike the traditional form of online learning was not primarily relying on resources posted through a learning management system (LMS) [1].

More recently MOOCs have developed within international co-operative partnerships such as Coursera (www.coursera.org), a partnership of 62 world class universities (as of April 11, 2013) led by Stanford University, and edX (www.edx.org) which includes the Massachusetts Institute of Technology, École Polytechnique Fédérale de Lausanne, The Hong Kong University of Science and Technology. Udacity (www.udacity.com), P2P University, and Futurelearn (the UK Open University's MOOC platform) are other related platforms. The numbers registering for MOOCs have reached 160,000 in the case of a 2011 Artificial Intelligence online course offered by Stanford University (Rodriguez, 2012).

With the increasing uptake and interest in MOOCs, it has become a popular topic in the educational press such as the Time Higher Education Magazine article (Corbyn, 2012), which presents an account of running a MOOC. Likewise there are many blog posts relating to MOOCs, posted from a variety of viewpoints including course leaders, participants, and outsiders (for example http://mooctalk.org chronicles the experience of a mathematician leading a MOOC in late 2012).

Academic papers on MOOCs began to appear in the peer reviewed literature (such as journals, conference proceedings, and professional magazines) in 2008 (Downes, 2008), with an increasing number of papers appearing each year since. This phenomenon is similar to many other technologies that created interest in academic communities. For example, Twitter appeared as a micro-blogging tool in 2006 and the literature on Twitter has grown exponentially from three papers in 2007 to hundreds of papers in 2011 (Williams, Terras, & Warwick, 2013).

Method

Data Collection

Researchers use different methods to identify papers to consider for a literature review (Ellis 1989; Ellis & Haugan, 1997): Methods include searching in databases or search engines and chaining from known research papers. For a systematic review it is important that the methods of identifying papers are described and justified, and that the approach can be re-applied by others (Fink, 2010). The aim of this study was to locate and analyse MOOC related academic literature to provide an understanding of developing research areas, methods applied in research, and topics lacking published research.

Relevant papers were identified through a series of search efforts, using an approach based on the methods used in other systematic reviews including two studies of literature related to the microblogging system Twitter (Gao, Luo, & Zhang, 2012; Williams, Terras, & Warwick, 2013). Papers were classed as relevant if their primary focus was to explore the concept of a MOOC or the implications for higher education, report on experiments with MOOCs, or compare MOOCs with other educational approaches. There was insufficient statistical data across the papers found to undertake a meta-analysis (Fink 2010).

Firstly, the search terms and boundaries to be used were established. Initially two search terms (and their plurals) were selected:

• MOOC

• Massively Open Online Course

However it was identified that some authors used "Massive" instead of "Massively" (for example Kop, Fournier, & Mak 2011) and so the third term (and its plural) was added:

• Massive Open Online Course

The search period was limited to the period from the year in which the first MOOC was run (2008) to the year this study started (2012). Where possible the search was limited to titles and abstracts to reduce the workload of manual filtering of irrelevant papers.

Secondly, following the approach of Gao, et al. (2012), a number of academic journals in the disciplines of educational technology and distance education were selected for a preliminary search (Table 1). These journals were *The British Journal of Educational Technology*, *Distance Education*, *American Journal of Distance Education*, and *Journal of Online Learning and Teaching*. The search returned a small number of papers in one of these journals, but on detailed examination none of these were relevant

for this systematic review. For example Roderick (2008) was predominantly about connected learning in digital spaces, and massively multiplayer online role-playing games were discussed as an example of connectivity. We believe that even though the search terms were used within inverted commas as phrases, the search algorithm may have returned articles such as this by comparing single search terms.

Table 1

Search Results - Selected Academic Journals

Journal name	Search results	Relevant	Date
British Journal of Educational Technology	0	0	10/12/2012
Distance Education	16	0	10/01/2013
American Journal of Distance Education	0	0	30/11/2012
Journal of Online Learning and Teaching	0	0	30/11/2012

Thirdly, the same search terms were then used to search various academic databases: ISI Web of Knowledge, ProQuest (ERIC, British Education Index and Australian Education Index), JSTOR (education titles), IEEEXplorer, and Scopus (Table 2). A number of the articles returned were unrelated to this study, for example papers returned included some on "Multiple Optical Orthogonal Code Sequences" and some on "Management of Organizational Change"[2], both of which were abbreviated to MOOC.

Table 2

Search Results - Selected Academic Databases

Database	Search results	Relevant	Date
ISI Web of Knowledge	5	2	17/11/2012
ProQuest	6	6	30/11/2012
JSTOR (education titles)	95	0	30/11/2012
IEEEXplorer	1	1	30/11/2012
Scopus	39	12	04/12/2012

Fourthly, the same search was conducted using the Google Scholar search engine with 94 results (November 21, 2012). From these results only 33 were found to be relevant. However, the same search repeated on Google Scholar later (on January 08, 2013) only resulted in 25 results suggesting that some articles previously found were not online and/or Google had changed its search algorithms. For example, the first result returned by the search done on the 21st November 2012 was the article by Fini (2009); but the recent search that returned only 25 results did not contain this article. Presentations and papers that did not discuss MOOCs as the primary concern of the paper were discounted after a careful reading of the abstract.

In order to improve the coverage of relevant publications to be included in this review, the chaining technique of Gao, et al. (2012) was used: consulting the reference lists of papers that were already in the corpus to locate other relevant work. This resulted in the addition of one more article to the corpus. Google Scholar searches were also performed for each of the articles in the corpus to identify other articles that had referenced them (forward referencing). This resulted in the addition of one more conference paper. During December 2012 two additional papers were identified: one in the *Communications of the ACM* and another in the *Journal of Interactive Media in Education*.

The data collection process resulted in the identification of 45 distinct articles – 17 from journals, 13 conference publications (including one poster conference presentation), 10 academic magazine articles, 3 reports, and 2 workshop presentations.

Data Classification/Analysis

Articles were classified both quantitatively and qualitatively. The quantitative analysis was used to classify the papers according to the publication year and the type of publication in which the article appeared. Papers were qualitatively classified using open coded content analysis, a technique used by the two studies of literature relating to Twitter (Gao, et al., 2012; Williams, Terras, & Warwick 2013). Initially the first author read each of the papers to identify themes, types of inquiry employed, and the future research directions indicated. These classifications were refined in an iterative manner by all authors reading and re-reading articles, and considering alternative classifications and stratifications.

Results

Quantitative Details

The first MOOC related paper was published in 2008, with again just one paper identified in 2009, seven papers in 2010, 10 in 2011, and 26 in 2012. Clearly an increasing pattern in the number of articles published on MOOCs can be seen from Figure 1.
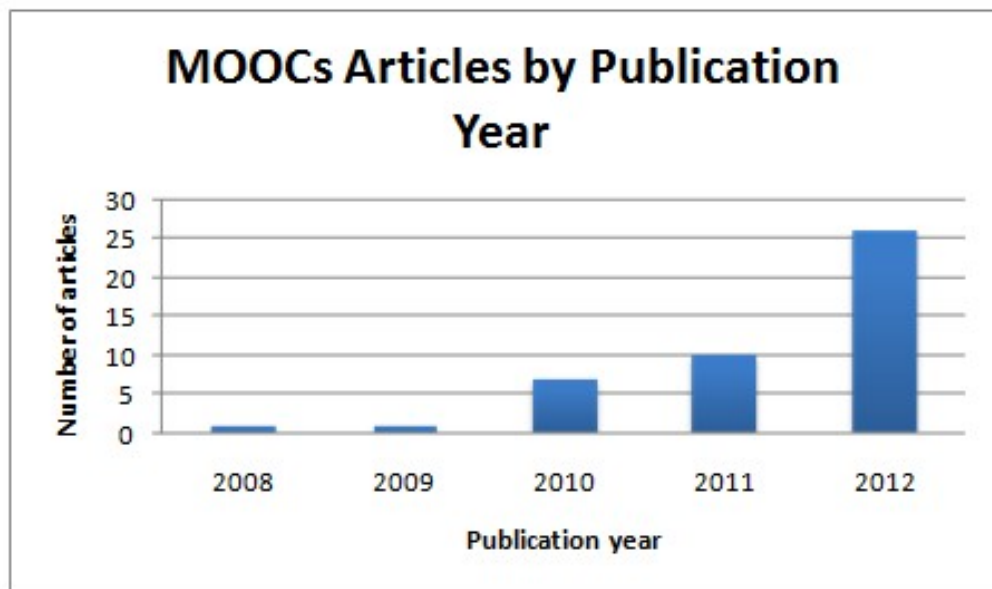
Figure 1. Articles by publication year.

The majority of identified articles published to date are in journals (17 papers), with a smaller number of articles appearing in conference proceedings and magazines (13 and 10 respectively). Figure 2 diagrammatically presents the percentage of papers in each type of publication.
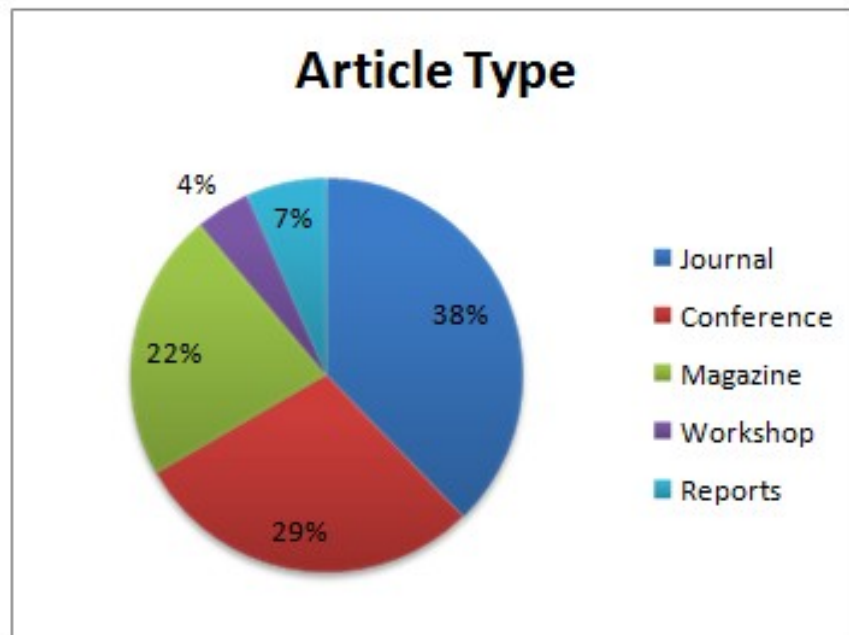
Figure 2. Article classification by publication type.

Figure3 illustrates the separation of articles by publication type and year. From 2009 to 2012 there is a gradual increase of the number of journal articles and conference papers. It is noticeable that the first magazine article about MOOCs appeared in 2011 and the following year there is a fourfold increase, reflecting the recent general interest in MOOCs.
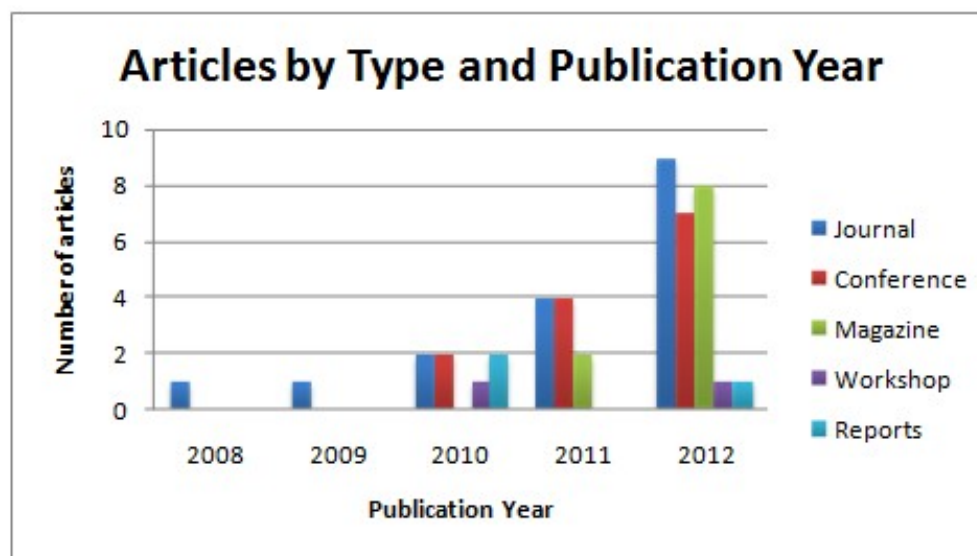
Figure 3. Articles by publication year and type.

It is noticeable that while many of the publications identified only had one article on MOOCs, exceptionally among the journals the *International Review of Research in Open and Distance Learning* published six articles on MOOCs, while the *European Journal of Open Distance and E-Learning* published three. *Communications of the ACM* published the highest number of magazine articles (three) while *eLearn Magazine* and *Learning Solutions* magazine published two articles each. *The International Conference on Networked Learning* published three articles on MOOCs, two in 2010 and another in 2011.

A list of authors with more than one article being reviewed here are presented in Table 3. Kop has the highest number of publications (five) in the review while deWaard, Hogue, Koutropoulos, and Rodriguez have four each. It can be seen that the authors with more than three publications have worked in teams and several such teams can be identified from co-authorship, for example Kop and Fournier; de Waard, Abajian, Gallagher, Hogue, Keskin, Koutropoulos and Rodriguez; Mackness, Mak, and Williams.

Table 3

Contributors with Multiple Publications in the Review

Author	No. of articles	Details
Kop	5	Kop & Fournier 2010; Kop 2011; Fournier, Kop & Sitlia 2011; Kop, Fournier & Mak 2011; Kop & Carroll 2012
deWaard	4	deWaard 2011; deWaard, Abajian, Gallagher, Hogue, Keskin, Koutropoulos & Rodriguez 2011;

		deWaard, Koutropoulos, Keskin, Abajian, Hogue, Rodriguez & Gallagher 2011; Koutropoulos, Gallagher, Abajian, deWaard, Hogue, Keskin, & Rodriguez 2012
Hogue	4	deWaard, Abajian, Gallagher, Hogue, Keskin, Koutropoulos & Rodriguez 2011; deWaard, Koutropoulos, Keskin, Abajian, Hogue, Rodriguez & Gallagher 2011; Koutropoulos, Gallagher, Abajian, deWaard, Hogue, Keskin & Rodriguez 2012; Koutropoulos, & Hogue 2012
Koutropoulos	4	deWaard, Abajian, Gallagher, Hogue, Keskin, Koutropoulos & Rodriguez 2011; deWaard, Koutropoulos, Keskin, Abajian, Hogue, Rodriguez & Gallagher 2011; Koutropoulos, Gallagher, Abajian, deWaard, Hogue, Keskin & Rodriguez 2012; Koutropoulos, & Hogue 2012
Rodriguez	4	deWaard, Abajian, Gallagher, Hogue, Keskin, Koutropoulos & Rodriguez 2011; deWaard, Koutropoulos, Keskin, Abajian, Hogue, Rodriguez & Gallagher 2011; Koutropoulos, Gallagher, Abajian, deWaard, Hogue, Keskin & Rodriguez 2012; Rodriguez 2012;
Abajian	3	deWaard, Abajian, Gallagher, Hogue, Keskin, Koutropoulos & Rodriguez 2011; deWaard, Koutropoulos, Keskin, Abajian, Hogue, Rodriguez & Gallagher 2011; Koutropoulos, Gallagher, Abajian, deWaard, Hogue, Keskin & Rodriguez 2012
Fournier	3	Kop & Fournier 2010; Fournier, Kop & Sitlia 2011; Kop, Fournier & Mak 2011;
Gallagher	3	deWaard, Abajian, Gallagher, Hogue, Keskin, Koutropoulos & Rodriguez 2011; deWaard, Koutropoulos, Keskin, Abajian, Hogue, Rodriguez & Gallagher 2011; Koutropoulos, Gallagher, Abajian, deWaard, Hogue, Keskin & Rodriguez 2012
Keskin	3	deWaard, Abajian, Gallagher, Hogue, Keskin, Koutropoulos & Rodriguez 2011; deWaard, Koutropoulos, Keskin, Abajian, Hogue, Rodriguez & Gallagher 2011; Koutropoulos, Gallagher, Abajian, deWaard, Hogue, Keskin & Rodriguez 2012
Mak	3	Mackness, Mak & Williams 2010; Mak, Williams & Mackness 2010; Kop, Fournier & Mak 2011
Mackness	3	Mackness, Mak & Williams 2010; Mak, Williams & Mackness 2010; Tschofen & Mackness 2012
Bell	2	Bell (2010a); Bell (2010b)
Levy	2	Levy 2011; Schrire & Levy 2012
Williams	2	Mackness, Mak & Williams 2010; Mak, Williams & Mackness 2010

Publication Topics/Themes

The articles embraced a wide-range of themes relating to MOOCs; an initial list included[3]:

- agency

- connectivism

- actor network theory

- dangers

- learner experience

- pedagogies

- technology

- trends

Most papers included some introduction to the term MOOC and a history of the concept. The majority of articles were primarily concerned with the concept of MOOCs, discussing challenges and trends, while other themes generally appeared within only one paper except for the concept of connectivism and its implications. The themes were re-stratified into the following categories.

1. Introductory: explaining aspects of MOOCs.

2. Concept: encompassing discussion papers on topics such as the threats and opportunities of MOOCs for Higher Education and its existing institutions.

3. Case studies: examining one or more MOOCs (including papers studying the same course running in different years and papers studying different courses).

4. Educational theory: considering the pedagogic approaches used.

5. Technology: presenting details or consideration of the software and hardware used.

6. Participant focussed: considering aspects related to the learners participating in MOOCs.

7. Provider focussed: considering aspects related to the provider of the MOOC, including the course creators and leaders.

8. Other: this category was introduced to cover the two articles that did not come under any other category. These were Esposito (2012), which discussed ethical

issues in using data generated through a MOOC, and Frank (2012), which presented the author's views on alternative ways to run MOOCs.

The articles were then individually re-considered and assigned to the categories which reflected the contents; many articles were assigned to more than one category. Table 4 shows the spread of these categories.

Table 4

Article Categorization

Category	Articles
Introductory	McAuley, Stewart, Siemens & Cormier 2010; Koutropoulos & Hogue 2012; Rodriguez 2012; Bremer 2012; deWaard 2011; Kop & Carroll 2012; Masters 2011; Roberts 2012; Mahraj 2012; Daniel 2012; Hyman, 2012
Concept	Martin 2012; Bull 2012; Kirkwood 2010; Ardis & Henderson 2012; Bonino 2012; Vardi 2012; Mehaffy 2012; Anderson & McGreal 2012; Butin 2012; Mahraj 2012; Mehlenbacher 2012; Anderson & McGreal 2012; Hyman, 2012
Case Studies	Bell 2010a; Bell 2010b; Bremer 2012; deWaard, Abajian, Gallagher, Hogue, Keskin, Koutropoulos & Rodriguez 2011; deWaard,Koutropoulos, Keskin, Abajian, Hogue, Rodriguez & Gallagher 2011; Downes 2008; Fini 2009; Fournier, Kop & Sitlia 2011; Kop & Fournier 2010; Kop 2011; Kop, Fournier & Mak 2011; Kop & Carroll 2012; Koutropoulos, Gallagher, Abajian, deWaard, Hogue, Keskin, & Rodriguez 2012; Levy 2011; Mackness, Mak & Williams 2010; Mak, Williams & Mackness 2010; Roberts 2012; Rodriguez 2012; Stewart 2010; Schrire & Levy 2012; Vihavainen, Luukkainen & Kurhila 2012
Educational Theory	Bell 2010a; Bell 2010b; Butin 2012; Cabiria 2012; deWaard, Abajian, Gallagher, Hogue, Keskin, Koutropoulos & Rodriguez 2011; deWaard,Koutropoulos, Keskin, Abajian, Hogue, Rodriguez & Gallagher 2011; Downes 2008; Kop & Fournier 2010; Kop, Fournier & Mak 2011; Mackness, Mak & Williams 2010; Mak, Williams & Mackness 2010; McAuley, Stewart, Siemens & Cormier 2010; Rodriguez 2012; Stewart 2010; Tschofen & Mackness 2012
Technology	Anderson & McGreal 2012; Fini 2009; Kop, Fournier & Mak 2011; Kop & Carroll 2012; Mak, Williams & Mackness 2010; McAuley, Stewart, Siemens & Cormier 2010; Rodriguez 2012; Vihavainen, Luukkainen & Kurhila 2012
Participant focussed	Chamberlin & Parish 2011; Kop & Fournier 2010; Kop 2011; Kop & Carroll 2012; Koutropoulos, Gallagher, Abajian, deWaard, Hogue, Keskin, & Rodriguez 2012; Levy 2011; Mackness, Mak & Williams 2010; Mak, Williams & Mackness 2010; Stewart 2010
Provider focussed	MacIsaac 2012; Mahraj 2012; Sadigh, Seshia & Gupta 2012
Other	Esposito (2012); Frank (2012)

Case Studies

Across the articles classified, 21 had a case study element, and in total 13 different MOOCs were studied.

- CCK08 - Connectivism and Connective Knowledge: the first MOOC offered from the University of Manitoba (Canada) in 2008.

- CCK09 - Connectivism and Connective Knowledge: a later version of CCK08 offered in 2009.

- CCK11 - Connectivism and Connective Knowledge: a later version of CCK08 offered in 2011.

- CritLit - Critical Literacies: a 2010 course blending 'critical thinking' and '21st century literacies' offered by the National Research Council of Canada.

- CS1 - An introductory programming course from the University of Helsinki (Finland) based on an apprenticeship model.

- CS101 - An introductory computer science course, from Udacity.

- CS221 - A course on artificial intelligence offered by Stanford (US).

- EduMOOC - Online Learning Today... and Tomorrow: offered by the University of Illinois (US) in 2011.

- FSLT11 - First Steps in Learning and Teaching, a 2011 course offered by Oxford Brookes University (UK) .

- Future of Learning - an education course: offered by the University of Frankfurt (Germany), in 2011.

- MobiMOOC - Mobile learning: offered by the Institute of Tropical Medicine Antwerpen (Belgium) in 2011.

- PLENK2010 - Personal Learning Environments, Networks, and Knowledge: a 2010 course offered by Athabasca University (Canada).

- Qual MOOC - Qualitative Research Methodology: Kibbutzim College of Education, Technology and the Arts, Israel proposed to be run in 2012.

The MOOCs CCK08, CCK11, CritLit, and PLENK2010 have designers and deliverers in common. Of the case study papers, one (Rodriguez, 2012) compared different MOOCs (including CCK08, PLENK2010, MobiMOOC, EduMOOC, Stanford CS221, and CS101 from Udacity); two (Kop 2011; Kop, Fournier, & Mak, 2011) considered PLENK2010 and one other MOOC (CritLit and CCK11, respectively); and another (Bell 2010a) considered

CCK08 and CCK09; the remainder focussed on single MOOCs. Table 5 shows the number of articles studying each MOOC and the number of articles studying each as the single central case study. The related MOOCs (PLENK2010 and CCK08) were the most studied. MobiMOOC is the only other course to be considered in more than one paper.

Table 5

Articles with MOOCs as Case Studies

Name of the MOOC	Total no. of articles	No. of articles as single central case
PLENK2010	8	5
CCK08	7	5
CCK09	1	0
CCK11	1	0
MobiMOOC	4	3
Future of Learning	1	1
CS1	1	1
Qual MOOC	1	1
EduMOOC	1	0
CritLit	1	0
CS101	1	0
CS221	1	0
FSLT11	1	1

The majority of case studies have used multiple methods for data collection in line with the general practice of case study research (Yin, 2003). In most case studies online surveys were used to collect data from participants in the MOOC(s). SurveyMonkey (www.surveymonkey.com) and LimeSurvey (www.limesurvey.org) were popular tools used in survey data collection. Four studies considering PLENK2010 as a case used multiple surveys (active participant survey, lurker survey, and end course survey). Researchers also reported collecting data via email interviews, focus groups, Moodle log data, discussion forum data, blogs, and observations. Three articles reported the use of techniques based on virtual ethnography and another used narrative inquiry as their research approach.

Researchers' role.

Seven of the case study articles defined the researcher's role in relation to the study. In two of these instances the researcher was described as a learner in the MOOC, in another two as a participant, and in the remaining three as an observer. The demarcation (if one really exists) between a learner and a participant in a MOOC is not clear, and may well simply be a matter of differing nomenclature.

Participants.

The majority of the participants in the case study research were people who had participated in the MOOC under consideration. Two articles also included data collected from instructors.

Classes of MOOC

Rodriguez (2012) classifies MOOCs into two categories: connectivist MOOCs (c-MOOCs) and AI-Stanford like courses. He associates courses similar to AI-Stanford predominantly with cognitive-behaviourist approaches and c-MOOCs with connectivist approaches. By comparing multiple case studies Rodriguez (2012) claims that courses similar to AI-Stanford have a more individualist learning approach while c-MOOCs have a more social approach to learning. He also shows the different roles played by facilitators in each type of MOOC. Daniel (2012) on the other hand discusses cMOOCs and xMOOCs, which he claims are a bifurcation of MOOCs. He refers to "xMOOCs now being developed by elite US institutions that follow a more behaviourist approach" (Daniel 2012) but does not provide a definition. It is probable that both Rodriguez (2012) and Daniel (2012) are similarly classifying MOOCs but using the two different labels for the same thing: "AI-Stanford like courses" and "xMOOCs". However, our systematic review has shown that there is a gap in the scholarly literature in defining these different types of MOOCs.

Limitations

The aim of this study is to develop a classification of academic research relating to MOOCs, based on a systematic consideration of the existing peer reviewed MOOC literature. Other materials such as blog posts and unpublished reports are not included in this review. Blog posts always present difficulties for authors of reviews in determining the credibility of the posts: There are few studies on how researchers use blogs (Shema, Bar-Ilan, & Thelwall, 2012); the transient nature of blogs means that they are difficult to suitably include in a systematic consideration. It should be noted that the same search terms applied above used in Google Web search returned over 50,000 items and used in a Google Blog search resulted in 570 results (December 04, 2012), however these items are not analysed here. Daniel (2012) includes references to such resources. Inclusion of such resources in a systematic review is contentious as they are often highly subjective and have rarely been critically reviewed by peers. The question of whether such resources should be included in a systematic review needs further methodological consideration in the literature, but at present it is unusual due to issues of credibility.

Articles published in languages other than English were not considered for this review. When searching forward references using Google Scholar, the authors came across publications that referenced articles in the review but were published in other languages

such as Chinese. Because of this, the authors believe that there could be articles that would have been included in the review were they published in English.

Discussion

This analysis seems to reflect the growing interest in MOOCs. However, most research has investigated the learner perspective, with a significant minor focus on the institutional threats and opportunities. The lack of published research on MOOC facilitators' experience and practices leaves a significant gap in the literature. Mak, et al. (2010) suggest that there has been unacceptable behaviour (for example, forceful intellectual debates, feelings of participation being demanded, and rude behaviour) from some MOOC participants, which has led other participants to cease posting on forums. The possible cultural differences of participants in MOOCs and their MOOC experience would be an interesting avenue of research in relation to cultural tension in MOOCs. Many studies that used data generated from MOOCs have limited their qualitative analysis to postings on a formal LMS and a sample of other sources (such as blog posts) due to the volume of data (Kop, 2011; Kop, & Fournier, 2010). Inevitably this leaves out potentially useful data on Twitter, blogs, and other social media spaces. For example, Liyanagunawardena (2012) shows that there is a significant use of external communications (other than the official LMS discussions) to support learner groups in traditional, blended, and online distance education settings.

Despite many research studies using publicly available data from a MOOC for research purposes, only a few papers have considered the ethical aspects of such use. This may well be due to a lack of good guidance and best practice examples on the general question of the use of data from online social media and similar sources for such research (Zimmer, 2010). This opens up a new avenue of research leading to MOOC participants' (both students' and facilitators') views on the ethical issues of using the data generated by them on a MOOC for research and a researcher's role in the MOOC. However this topic is discussed by MOOC participants and observers in blogs such as Robbins (2013).

Many studies have presented participant demographics and it was observed that a large majority of participants were from North America and Europe. There were very few participants, if any at all, from Asia and Africa with a few from South East Asia (deWaard, Abajian, Gallagher, et al., 2011; Kop, 2011; Koutropoulos, et al., 2012). This is hardly surprising due to the possible barriers of access to online learning that can be presumed in those parts of the world, both technological and linguistic (see Liyanagunawardena, 2012 for a discussion of the similar problems in the introduction of online learning in Sri Lanka). However, a number of Asian and African learners participated in MobiMOOC (Koutropoulos, et al. 2012). There are two plausible reasons: It could be that the course content of the MobiMOOC (mLearning) is of more interest to learners from those regions or it could be that mLearning is significantly more

accessible in those places. deWaard, Koutropoulos et al. (2011) report that 77.5% of the participants in their survey had used mobile devices to access the course even though it was not required, indicating that the flexibility offered by mLearning is attractive for those MOOC participants. This shows the potential for exploring the possibility of mLearning MOOC provision in the developing world, both for increasing and widening participation.

As discussed already, some of the researchers who used data generated through MOOCs have limited their qualitative analysis due to the large volumes. Regarding MOOC participant approaches, Fini (2009) similarly argues that

> people seem to be torn between the time-saving advantage offered by the 'Daily' solution [an email message sent daily by the facilitators with a summary of the topics of the existing conversation] and the multi-faceted, time-consuming alternative represented by direct access to unfiltered information.

Due to the large volumes of data generated by the 'massive' number of students engaged in a MOOC, being up-to-date with the ongoing discussions can be challenging or even overwhelming. Exploring the strategies used by students who continue to be active participants in a MOOC could provide some insight into possible solutions to the information overload in a MOOC environment for both other MOOC learners and for MOOC researchers. In fact, Milligan, Margaryan, and Littlejohn (2013) show that all but one active participants of Change11 MOOC have participated in previous MOOCs and question whether a learner has to learn how to learn in a MOOC. While many MOOC participants struggle to keep going "there's some people who are everywhere you turn in the Change11 MOOC: there's this group of people who are inspirational, just phenomenal the way they just keep going and they know their way around it" (Milligan, Margaryan, & Littlejohn 2013). Confidence gained after successful participation in one MOOC together with network effects where people start building communities and networks in one MOOC then moving together onto another MOOC may result in more previous MOOC participants taking up other MOOCs.

It is acknowledged that MOOCs have high withdraw/dropout rates (Koutropoulos, et al., 2012); however, data on completion rates of MOOCs are not readily available. According to Jordan's (2013) collated completion rates for 24 MOOCs (as of March 11th, 2013), the highest completion rate achieved was 19.2% on Functional Programming Principles in Scala, a MOOC offered by Coursera in 2012. The majority of MOOCs had completion rates of less than 10%. There is very little known about the experiences of non-completing MOOC participants (Koutropoulos, et al., 2012). This would be an interesting and useful avenue to explore further in future research, though engaging those who have started but not finished an educational course in research into the reasons for their non-completion is likely to be difficult.

Motivation is identified as an important contributor to student engagement in a MOOC by Milligan, Margaryan, and Littlejohn (2013). One can speculate about an individual's motivation to participate in a MOOC: the desire to achieve an academic credential at a reduced cost, personal enrichment, and/or self satisfaction. However, why individuals participate in MOOCs has yet to be explored. It would be valuable to learn about the actual motivations in place, the percentage of participants taking up MOOCs for those reasons, and to know how those motivations might vary from one course or discipline or even provider to another.

Recognition for MOOCs and their accreditation is another area of debate. MOOCs run by educational technology companies such as Coursera and EdX provide the option to pay for certification. For example, Coursera offers proctored exams for a fee, which will earn (if successful) certification. On the other hand, most MOOCs offer badges for completion of either the full course or each unit (or week of work, for example OLDSMOOC by the Open University). Some MOOC-offering institutions and/or instructors provide a Statement of Accomplishment for successful students. However, these generally do not carry college credits. Recently, the American Council on Education recommended five Coursera courses for college credit (Coursera, 2013) while a California bill is seeking credit for students taking faculty approved courses online (Levin, 2013). However, given that existing in-person "closed book" examinations are subject to cheating (Shimbun, 2011) and that at least one enterprising IT worker in the US successfully outsourced his own job to China (Kim, 2013), the challenges of validating the assessments of MOOC participants are clear.

Conclusion

MOOCs have created wide interest as a change agent in higher education, and the peer-reviewed research literature on them is growing but still limited. Many articles published to date have discussed empirical evidence from case studies, the influence on higher education structure, or educational theory relating to MOOCs. While there is research into the learner perspective, neither the creator/facilitator perspective nor the technological aspects are being widely researched (or at least such research has not yet been published). MOOCs generate a plethora of data in digital form for interested researchers. However, this volume has so far limited researchers to analysing only a tiny portion of the available data, restricting our understanding of MOOCs. There are further interesting research avenues such as cultural tensions within courses and the ethical aspects of using data generated by MOOC participants still to be explored.

Notes

1. However, it is worth mentioning that prior to the wide acceptance of a LMS as the medium to publish course content, institutions used television broadcasts. For example, many people who were not engaged in the Open University courses watched various Open University programs telecasted, particularly when video recorders became cheaply available. This unregistered informal accessing of educational materials reduced when the Open University main broadcasts stopped and course materials were delivered primarily through the post (on CD and DVD) and later via online delivery. Similar closure happened when early adopters of online provision of course content through the open web closed off access by placing it behind authentication restrictions in LMS (such as Moodle and Blackboard) (Goldberg, 2001).

2. Automatic fuzziness in search engines may also have reported "Management of Change" (MOC) results, particularly given the overlap of "Management of (Organizational) Change" MOOC/MOC terminology (Kohil & Kumar, 2011).

3. The initial full list included: Agency, Apprenticeship, Autonomy, Case study, Chaos theory, Cloud computing, Comparative, Connectivism, Actor Network Theory, Dangers, Educational theory, Ethics, Framework, Futures, Higher education, Information science, Introductory, Learner experience, Learning analytics, Opportunities, Pedagogies, Retention, Support, Technology, Trends, Opinions, and Reviews.

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The Preferred Learning Modes of Online Graduate Students[1]

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Abstract

This paper reports on a research project aimed at identifying the preferred approaches to learning of mature students in an online graduate programme. Interest in this issue was generated by the positions taken by certain theorists who argue for less focus on interaction and collaboration as the basis for learning in the online environment. They contend that the learner as an individual should be acknowledged. A questionnaire, operationalizing four learning modes, was used to solicit responses from graduate students. The modes were independent learning, instrumental learning, interactive learning, and collaborative learning. Factor analysis confirmed the four as student preferred learning modes. In addition it allowed for the emergence of specific attributes of each. While instrumental learning emerged as a strong factor, the most dominant construct emerging was a dimension of collaborative learning. It is envisaged that the findings of the study can inform the design of online teaching-learning strategies for this category of students.

Keywords: Independent learning; instrumental learning; interactive learning; collaborative learning; mature graduate students; online learning

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[1] An earlier version of this paper was presented at the AACE 2011 World Conference on e-Learning.

Introduction

Perspectives on online education over the last several decades have focussed more on learning as an activity that entails interaction and collaboration (Henri, 1992; Haughey & Anderson,1998; Hendricks, 2012) than as an individual activity. Notwithstanding this consensus, there are those who hold reservations about this perspective. For example, Annand (2007) contends that requiring students to engage in social interaction conflicts with learner autonomy, given the capacity for self-pacing that the new digitized media allows students of the post-industrial era (p.1). Asunka (2008), based on his study of online learning in a higher education institution of sub-Saharan Africa, contends that less emphasis should be placed on online discussions and group activities and more on those activities that require individual responses to assignments and exercises (p. 12). Dixon, Dixon, and Siragusa (2007) offer a similar perspective. Drawing on the findings of their study among adult learners, they conclude,

> ... the majority of students preferred to work alone and felt that they possessed learning styles that did not necessarily lend themselves to collaboration. They appeared to want to take greater responsibility for their learning as adults and this did not include working with peers. (p. 213)

The University of the West Indies Open Campus (UWIOC) began its online offering of postgraduate programmes in January 2010, drawing its intake primarily from the populations of the 15 English-speaking countries supporting the University. Notwithstanding the apparent tension between the perspectives cited above, the teaching-learning space for these programmes is designed to support interaction and collaboration in the learning process as well as to build the capacity of individual students to function as independent learners. The thinking informing this approach to the design is that ability to engage in shared learning and being able to take responsibility for one's own learning should be viewed as complementary rather than mutually exclusive.

Prior to the start of their programme, students are required to participate in a three-week non-credit orientation course that is designed to support newly admitted students to

- monitor and evaluate their learning;
- produce academic writing that meets accepted standards for work done at the postgraduate level;
- source, evaluate, and use information to meet the requirements of a given task, assignment, or research undertaking;
- interact with other learners in a manner that facilitates shared learning.

The formal credit programmes, like the orientation course, are conducted in a web-based learning management system and are built around the following core features:

- fully developed self-study materials with accompanying resources and built-in activities for self-assessment,
- links to other sites to facilitate student-initiated searches,
- required interaction throughout the study period among the learners and between learners and group facilitators,
- learner participation in specially-designed collaborative activities,
- continuous assessment with informational feedback.

The programmes are delivered over three 13-week trimesters in a calendar year.

This study was undertaken to determine whether the preferred learning modes of graduate students of the UWI Open Campus are consistent with those that underpin the design of the online learning environment.

Significance of the Study

While the academic and research literature provides important perspectives to guide practice, this researcher holds the view that practice must also be informed by data emerging from the context in which it is taking place. This study is intended to yield findings that provide greater insight into the learning preferences of mature graduate students of the English-speaking Caribbean. It is also envisaged that it will contribute to the body of principles applicable to the design of online teaching and learning systems in socio-cultural contexts similar to the one in which the study is being conducted.

Literature Review

This study is designed around four principles of learning. As mentioned above, two of them, interactive learning and collaborative learning, are the ones that many analysts and practitioners consider to be most relevant for online learning. The third, independent learning, is included for reasons cited above, even though it is not given as much prominence as the other two in the literature. Instrumental learning is being added. As will be discussed later, an outlook on learning as being instrumentalist is considered to be embedded in the didactic strategies employed in traditional classroom-based instruction. This researcher has previously acknowledged the challenge that online practitioners face in addressing the reliance on top-down approaches that characterise the learning experience of some mature students (Kuboni, 2009).

Instrumental Learning

Many analysts in the field of adult education hold the view that instrumental learning can undermine efforts to facilitate meaningful learning. Hyland and Merrill (2003), for

example, are concerned that "imagination and creativity are often stifled in the pursuit of behaviourist learning outcomes or instrumental employability" (p.169). Devos (2002), looking specifically at learning in the workplace, highlights the work of Marsick and Watkins (1990) who, she claims, have contributed to moving the discussion away from "a narrow instrumentalist approach", which she sees as reflecting "the limits of behaviourism".

Rust (2009) takes a more micro perspective. In outlining the tenets that, in his view, should inform assessment practices in the adult education sector, he cautions against instrumentalist approaches and calls for a greater emphasis on "assessment for learning rather than assessment of learning". He explains further,

> [T]he balance of current practice has shifted too far towards the summative assessment of students and attempts to measure what they have learnt at given points, linked to the awarding of grades and/or marks. This arguably leads to instrumentalism by students ...Instrumentalist students are likely to adopt a "tick box" mentality, moving on to the next unit or module without seeing any connection between past and future learning. (p. 124)

Instrumental and/or instrumentalist learning: An explanation.

Instrumentalist learning derives from a philosophical base, while instrumental learning has its origins in Skinner's theory of behaviourism. Nonetheless, in the context of this study, both are regarded as carrying the same core meaning.

One dictionary definition views instrumentalism as "a pragmatic theory that ideas are instruments that function as guides of action, their validity being determined by the success of the action."[2] When applied to learning what emerges is an understanding of an activity that is basically utilitarian, and intended to ensure the successful completion of a particular task rather than the development of the learner. A similar view can be detected in instrumental learning, which has its origins in Skinner's operant or instrumental conditioning. The core attribute of Skinner's learning theory that resonates within instrumental learning is the attainment of desired outcomes through the use of appropriate conditioning techniques. Operant or instrumental conditioning holds that a behaviour may be elicited and ultimately strengthened if that behaviour is followed by some appropriate reinforcing stimulus (Gray, 1996).

For the purpose of this study, the term being used is *instrumental learning*.

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[2] http://www.thefreedictionary.com/instrumentalism

Independent Learning

As stated earlier, independent learning does not occupy a prominent position in the literature on online learning given the capability of the web-based environment to support social interaction. Some would argue though that one's ability to engage in shared learning with others depends not only on facilitating environmental factors, but more importantly on one's ability to take responsibility for and manage one's own learning. It is in that context that it was considered appropriate to investigate the extent to which this approach to learning was a feature of the learning mode of the participants of this study.

The notion of the independent (or autonomous) learner can be traced to two main contexts. In one instance, it features in the field of adult learning, in particular through the related concepts of lifelong learning and self-directed learning (Candy, 1991; Merriam, Caffarella, & Baumgartner, 2007). In open and distance learning, it gained prominence as a key attribute for distance learners in the era when distance education was targeting a mass, widely distributed audience through the use of the second generation technologies, which offered limited scope for interactivity (Laurillard, 1993; Postle, 2002). The reality of physical separation, both from the teaching institution and from other learners, necessitated the development of learner qualities that would allow for self-management and the capability to take responsibility for one's learning. The work of two theorists stands out in this regard.

Wedemeyer, who originally conceptualised independent study as applying to both the "internal" and "external' student", ultimately acknowledged its significance in open and distance learning and in that context offers the following explanation:

> Independent study consists of various forms of teaching-learning arrangements in which teachers and learners carry out their essential tasks and responsibilities apart from one another, communicating in a variety of ways … Independent study programs offer learners varying degrees of freedom in the self-determination of goals and activities. (1975, p.11)

Moore's theory of independent learning and teaching is clearly located in the context of what he refers to as "distance teaching". Moore holds that a distinction needs to be made between "two major classes of learning environment", namely "contiguous situations", where teacher and learners are in close physical proximity to one another, and "distant situations" where they are separated and where some other form of communication is required to bridge the gap. Moore asserts that the influence that the distance exerts requires that learners accept a high level of responsibility for their learning and that this is a core characteristic of an autonomous learner (1973, pp. 663-664). As noted earlier,while most theorists focus on learning in the online environment as an interactive activity, others contend that the focus should be on individual activity

(Dixon et al., 2007; Asunka, 2008; Annand, 2007). Indeed Anand goes further and asserts that it is the qualities of independence and autonomy that are to be emphasized. While the advocates of social interaction point to the capability of the interactive technologies of the environment to support learning through interpersonal interaction, Anand draws attention to the digital technologies that, in his view, provide a stronger case for a focus on independent learning. Specifically, he contends that the digitized media make it possible for learners to take over some of the instructor roles and to adopt "new forms of learning through searching, evaluating, managing and retrieving material" (2007, p. 1).

While not minimising the importance of the debate outlined above, it should be noted that other theorists propose an understanding of online learning as a multi-dimensional construct. Hong and Jung (2011), in their three-phased study, identify five clusters of distance (including online) learning competencies, namely study vision, cognitive and meta-cognitive skills, interaction abilities, identity as a learner, and management skills. With regard to the second cluster, they explain that it embodies skills that demonstrate, inter alia, an ability to plan and regulate one's learning, select methods according to one's preferred learning styles and circumstances, and make adjustments in one's studies when failures or shortcomings are apparent (p. 31). All of these attributes can readily be recognised as being consistent with independent learning. The authors apply the label "interaction abilities" to the third cluster. All of the foregoing perspectives on independent learning, whether viewed separately or as part of a set of learning capabilities, have contributed to the approach taken to the design of this study.

Interactive Learning

The role of interaction in learning at a distance was an area of focus for theorists and practitioners even during the industrialization era (Daniel & Marquis, 1989; Moore, 1989). However, the introduction of the interactive ICTs has allowed for a greater focus on interpersonal communication (Cookson & Chang, 1995; Wagner, 1994; Shackleford & Maxwell, 2012), and more specifically on the role of social interaction in the act of learning (Kaye, 1992; Rovai, 2002). Nichani (2000), in making his case for an online learning community, supports the view advanced by Brown and Duguid (2000) who assert as follows:

> Despite the tendency to shut ourselves away and sit in
> Rodinesque isolation when we have to learn, learning is
> a remarkably social process. Social groups provide the
> resources for their members to learn.

Using the term collaborative learning in a manner synonymous with the phrase interactive learning in this paper, Hendricks (2012) provides various interpretations to explain the nature of learning that takes place in a social context. Taking as his starting point, the constructivist view, which holds that knowledge is built socially through inquiry and reflection, he describes collaborative learning as follows:

> [It] allows for student interaction with more capable peers and less capable peers in order to master critical concepts or skills using language as a necessary tool to negotiate and renegotiate meaning/knowledge. (p. 41)

In a similar vein, Ryle and Cumming (2007) draw attention to the role that social interaction, dialogue, and reflection play in the creation of new knowledge and deep learning.

Many theorists use the context of the community, and more specifically the learning community, to present their perspective on interactive learning. Yang, Yeh, and Wong (2010), for example, posit,

> In a community, meaningful learning is achieved by interaction, and people share individual resources, elicit challenging questions and provide constructive feedback so as to enhance personal intellectual growth. (p. 288)

While, as was mentioned earlier, the introduction of the interactive technologies would have influenced the emergence of this enhanced focus on learning through interaction, one cannot overlook the simultaneous thinking at the psychological/philosophical level that was not necessarily tied to the advances in technology but which also influenced the growing interest in the social dimension of learning. The theorists who were spearheading this outlook in the latter part of the twentieth century were doing so against the backdrop of increasing doubts about the appropriateness of the objectivist, behaviourist view of learning (e.g., Jegede, 1991; Duffy & Jonassen, 1991).

Thus, Jonassen, Davidson, Collins, Campbell, and Haag (1995) assert, "Constructivist environments engage learners in knowledge construction through collaborative activities that embed learning in a meaningful context and through reflection on what has been learned through conversation with other learners" (p. 13).

An important point to note about the perspectives advanced by Jonassen et al. is the seamless connection that they make between learning (namely meaning-making) at the level of the individual learner and at the group level. For them meaning-making involves both internal and social negotiation. Thus they explain, "We debate, wrestle, and argue with ourselves over what is correct, and then we negotiate with each other over the correct meaning of ideas and events" (p. 12).

Collaborative Learning

In much of the literature of open, distance, and online learning, the term collaborative learning often carries the same interpretation as interactive learning (see for example, Hendricks, 2012). While acknowledging that the two are often used interchangeably, the position adopted for this study is that the meaning of collaborative learning can be regarded as extending along a continuum from learning in a social context to

engagement in some collaborative activity intended to yield a defined outcome. This latter notion of collaborative learning is reflected in the explanations provided by two noted theorists in the field. Kaye (1992), tracing the origin of the term *collaborate* back to its Latin root co-labore, meaning to work together, views collaborative learning as any learning that takes place as a result of people working together (p. 2). Harasim, Hiltz, Teles, and Turoff (1995) state, "Collaborative learning refers to any activity in which two or more people work together to create meaning, explore a topic or improve skills" (p. 30).

For Haythornthwaite (2006), it is working towards a common goal. She elaborates as follows:

> Collaboration ... models the way work unfolds outside classrooms. It can emulate and train for future workplace practices, including learning how to share ideas, voice opinions, work on a team, and manage projects. It gives individuals experience in project and group management. Moreover, during their collaboration, students are also doing the important work of learning how to do all this online and gaining skills in online communication and group management. (p. 10)

Also to be noted is the work of Jahng (2012) whose focus is the way problem-solving activities are handled in small groups. She contends that collaboration in a problem solving activity demands complex learning skills for engaging in constructive arguments as well as proposing alternative solutions to reach a consensus for the best solution (p. 2).

The introduction of the social software technologies into the practice of online education has heightened interest in and commitment to the notion of collaborative learning. Citing Allen (2004), Anderson (2008) notes their heightened capacity to support human interaction, decision-making, planning, and other higher level activities. Against that background, he asserts, "Social software provides scaffolding that allows individuals or groups to share, extract, and organize new knowledge and build social relationships" (p. 173).

Also acknowledging these capabilities are den Exeter, Rowe, Boyd, and Lloyd (2012) who cite several earlier works that draw attention to the potential of wikis, blogs, podcasts, and other social software for supporting social interaction and collaborative learning (p. 217).

It is these perspectives on learning that informed the design of this study.

Research Questions

In light of the foregoing, this study was based on the following research questions:

- What are the preferred learning modes of UWI Open Campus graduate students?

- Are students' preferred learning modes consistent with those that inform the design of the online teaching space?

Methodology

Research Design

The study was based on an online survey conducted among the 2011 and 2012 cohorts of graduate students of the University of the West Indies Open Campus, with a questionnaire being used as the instrument for data collection.

Questionnaire Design

The questionnaire was built around the four modes of learning described earlier. A first version was developed and informally tested with 21 students of the 2010 cohort. In this initial instrument, the four learning modes discussed above were reduced to three with instrumental learning and independent learning being combined and their representative items developed to reflect a continuum from one to the other. The combined construct was given the name *individualistic* learning. Based on the responses as well as feedback from peers, this decision was reversed, since it was felt that by merging two, one ran the risk of contaminating the original constructs. By keeping them separate, one could ensure a higher probability that all four would be operationalized in a manner that reflected as close as possible their respective conceptual understandings as advanced in the literature.

The questionnaire was based on a four-point rating scale, ranging from *strongly agree* to *strongly disagree.* A four-point rather than a five-point scale was used to minimise the possibility of respondents tending towards the neutral middle option and thus not committing themselves to a clear position. At the same time, recognising that some respondents may feel that their specific position was not considered, an open-ended question was included that allowed respondents the opportunity to give expression to any partial and/or intermediary views they may have that could not be picked up in the scale provided.

Following are select items from each of the four categories.

Independent learning

- You like flexible course materials that allow you to add your own content.

- You are capable of assessing your own work.

Instrumental learning

- You think that all work should be graded.

- You want the facilitator to respond to your queries as soon as possible after they have been posted.

Interactive learning

- Bouncing ideas off your fellow students helps you to clarify your own thoughts.

- You are comfortable raising counter arguments in a discussion.

Collaborative learning

- You are open to adjusting your input into the overall group activity in order to improve the final outcome.

- You like working with team members to solve problems that come up while doing a project.

In total, 37 closed items were developed in the four categories. Items related to each learning mode were kept together and the categories were presented in the order given above. The questionnaire began with three demographic items, and ended with two open-ended questions, one of which was described above. The second asked respondents to add any other comments they wished to make.

Sampling

Purposive sampling was employed. Since the first cohort of students was used to test the preliminary draft, all students of the second and third cohorts, totalling 189 students, were targeted for administering the revised version. The two cohorts were considered to be sharing the same basic characteristics, even though, at the time of the survey, each had been in the programme for different periods of time. They were deemed equal since all came from the same broad population. In addition, both cohorts had participated in the three-week orientation course described earlier.

Data Collection Procedures

The questionnaire was administered separately to each of the two cohorts during the period May to June 2012, using the web-based tool *Survey Monkey.* The link was distributed by blind copy email to ensure that each individual student received it anonymously. Two reminders were sent to each group. Students were advised that the exercise was completely confidential.

Data Analysis Method

Factor analysis, based on the principal components method of extraction, was used to identify the underlying factors within the main questionnaire items. An independent samples *t*-test was used on the same data to determine whether there was any significant difference between the two groups in the study.

Findings and Discussion

Of the 189 students to whom the questionnaire was distributed, 86 or 45% responded. The majority were in the combined age group 31 - 50, with almost equal numbers in each of the sub-groups. Approximately 75% described themselves as professionals (Table 1).

Table 1

Demographics of Respondents

Gender			Age					Occupation					
Male	Female	N R	20 - 30	31 - 40	41 - 50	Over 50	N R	Prof	Admin	Tech	Cler	Other	N R
6 (7%)	79 (92%)	1	10 (11%)	34 (39%)	32 (37%)	9 (10%)	1	65 (75%)	9 (10%)	3 (3%)	-	7 (8%)	2

As noted earlier, the sample comprised two subsets of respondents representing the two cohorts of students. The results of the independent samples *t*-test showed that there was no significant difference between the two cohorts on seven of the eight factors yielded by the analysis.

Factor analysis conducted on the responses yielded 11 factors, of which Factors 1 – 8 were retained and the other three discarded (Table 2). A factor was retained if three or more items loaded strongly on it. An item was considered to have loaded strongly if it obtained a factor score of 0.50 or higher.

Using these criteria, nine of the original 37 closed items were discarded. Of these items four each were from the original independent learning and instrumental learning categories, and one from interactive learning. The notion of learning embedded in these items did not appear to be representative of respondents' understandings of their learning preferences. Some of these items loaded weakly on more than one factor. Two examples are, *You are capable of assessing your own work*, which loaded below 0.50 on two factors, and *You work according to a well-organized study plan that you have developed for yourself,* which loaded on three factors. The two items that loaded on Factors 9 and 10 respectively were also discarded. Even though both obtained high factor scores, each was the only item associated with that factor.

Table 2

Factor Analysis of Items Loading Above .50

Questionnaire item	Original construct	Factor loadings							
		1	2	3	4	5	6	7	8
You are capable of working with team members to develop strategies for carrying out a project	Collaborative learning	.938							
You are capable of working in a team to create and implement a project	"	.923							
You like working with team members to solve problems that come up while doing a project	"	.899							
You are comfortable working in a team to do an assignment set by the course coordinator	"	.886							
You do not feel insecure when one member of the team stands out above	"	.703							

everyone else.								
You prefer when the facilitator provides explanations 'live' rather than in the discussion forum	Instrumental learning		.826					
You feel frustrated when facilitators expect you to work out answers with little or no assistance from them.	"		.648					
Oral interaction is more beneficial when studying online than written interaction.	Interactive learning		.637					
You think you should be provided with model answers after you have done an essay.	Instrumental learning		.604					
You welcome guidelines that give you alternative approaches for doing an assignment	"		.503					
You want to be able to set your own objectives when provided with a broad overview of the course.	Independent learning			.870				
You want to be able to develop your own ways of achieving the objectives that you set.	"			.866				
You like flexible course materials that allow you to add your own content.	"			.615				
You are open to adjusting your input into the overall group activity in order to improve the final outcome.	Collaborative learning				.740			

When a team member critiques your contribution to the group effort, you can take it in stride.	"				.736				
You can openly admit an error when another group member brings it to your attention.	Interactive learning				.578				
You are comfortable raising counter arguments in a discussion	Interactive learning					.718			
You are not afraid to openly challenge the views of your facilitator in a group discussion.	"					.662			
You are comfortable holding a point of view that is different from what the majority thinks	Independent learning					.621			
Doing the session and reading review questions is an important aspect of your study of the course.	Instrumental learning						.752		
You have an organized way of making notes when you study.	Independent learning						.648		
You think that all work that you submit to the group facilitator should be graded	Instrumental learning						.632		
You are able to use comments about your assignments to improve your approach to future assignments.	Independent learning							.739	
You can start a discussion and invite your facilitator to join	Interactive learning							.600	

in										
You understand the course content better when there is a group discussion.	"								.597	
Your perspective on a particular issue usually changes as a result of your participation in a group discussion.	Interactive learning									.743
Bouncing ideas off your fellow students helps you to clarify your own thoughts.	"									.611
You can come up with a way of looking at a topic that is different from the one used in the course materials.	Independent learning									.517

A review of the eight factors retained indicates that generally, notwithstanding some shifts, the factors were associated with items originally developed as variables of the same construct. In addition, that cluster of items could be considered as reflecting one dimension of the original construct. Thus, what the factor analysis did was not simply to increase the number of constructs from four to eight, but, more fundamentally, it allowed for the emergence of a mid-level set of attributes higher than the individual variables originally generated for each of the four constructs (see Table 3).

Table 3

Modified Construct Descriptions Extracted through Factor Analysis

Factor	Modified construct description	Shortened label	Reliability coefficient
1	Collaborative learning –likes participating in team work	Collaborative 1	0.915
2	Instrumental learning – needs to rely on the guidance of an 'expert'.	Instrumental 1	0.772
3	Independent learning – welcomes opportunity to set own goals	Independent 1	0.774
4	Collaborative learning – is comfortable accepting peer evaluation	Collaborative 2	0.733
5	Interactive learning – is capable of articulating own viewpoint in an exchange.	Interactive 1	0.619
6	Independent learning – maintains focus on the path to achieve desired outcomes	Independent 2	0.585
7	Interactive learning – draws on input from other agents to strengthen and/or improve own learning.	Interactive 2	0.563
8	Interactive learning – welcomes opportunity to engage with others to activate own cognitive processes.	Interactive 3	0.538

As noted above, there were also some shifts. Two such items are reviewed.

The item *Oral interaction is more beneficial when studying online than written interaction* was developed as a variable of the construct Interactive learning. After factor analysis, it loaded on Factor 2 with four other items that were originally developed as examples of instrumental learning. One can argue that a possible factor giving rise to this shift is that students consider oral interaction to be a more reliable means for them to communicate directly with and draw information from a credible source of knowledge.

The second, *You are comfortable holding a point of view that is different from what the majority thinks,* was originally developed as an attribute of Independent learning, but it loaded on Factor 5 with two other items, previously defined as variables of interactive learning. When viewed in relation to the other two, one notes that all three reflect an ability on the part of an individual to hold to one's perspectives when dialoguing with others.

Returning to Factor 2, the last item to load on that factor deserves further attention. *You welcome guidelines that give you alternative approaches for doing an assignment* was originally included within the instrumental learning category, and intended for reverse scoring. It was assumed that respondents who were tending towards instrumental learning approaches would not respond positively to this item. This was not the case. The relative strength of this item in this factor suggests that, very likely, students' thinking about their own approach to learning differed from the understanding implied in this item.

Even though one accepts the confirmation of the eight factors, one cannot ignore the weak reliability coefficient for three of them, namely Factor 6, labelled as a dimension of Independent learning and Factors 7 and 8, labelled as dimensions of Interactive learning. However there are grounds to support their retention.

With regard to Factor 6, it would appear that the initial decision to include the item *Doing the session and reading review questions is an important aspect of your study of the course,* in the instrumental learning category, may not have been very appropriate. A strong case can be made for it to be considered as an attribute of independent learning on its own strength. Moreover, it appears to share the same core attributes as the second item, *You have an organized way of making notes when you study*, which was initially categorized as independent learning. On the other hand, both of these appear to be in contradiction of the third item, *You think that all work that you submit to the group facilitator should be graded,* given a perspective that students who place heavy emphasis on grades are displaying an instrumentalist perspective on learning. It is likely that this inherent tension among the items accounted for the weak reliability score. Notwithstanding, the researcher is of the view that there is value in retaining the factor and the orientation of the first two items was used to name it.

With regard to Factors 7 and 8, one recalls that, in the review of the literature, it was noted that some theorists view all learning that involves interpersonal interaction as collaborative learning and do not attempt to distinguish between different levels or forms of the communication. Drawing on other sources, this researcher argued that a distinction could be made between the two, notwithstanding the areas of overlap. Thus, for the purpose of this study, the decision was made to generate two separate constructs.

It is evident however that the two components described as dimensions of collaborative learning emerged in a stronger position than the three described as aspects of interactive learning. However, the fact that Factors 7 and 8 (along with Factor 6) were

actually extracted suggests that the decision to maintain interactive learning as a construct in its own right was justified. For that reason, the dimensions of this construct, as reflected in Factors 7 and 8, are being retained.

The emergence of one dimension of collaborative learning and another of instrumental learning as Factors 1 and 2 is to be noted. It is likely that students do not perceive any inconsistency in having an equally strong preference for both these learning modes. However, on examination of the open-ended responses, one finds that the preference for the collaborative learning mode was not without some reservation. The following comments are to be noted:

> Group work is important in the online environment, but could be frustrating when one member tends to dominate and refuse valuable input from peers.

> I am comfortable working with group members ... [but] it is frustrating when your grade depends on others and they do not contribute the way that they should.

Other open-ended responses of some students appeared to reinforce instrumental learning approaches:

> I learn best when I have excellent and understanding support systems (group facilitators/tutors) when doing readings and assignments.

> Group facilitators need to provide more guidelines in having students master certain aspects of the course.

> I don't like challenging facilitators especially online because you see it reflected in your grades...

Overall, when viewed through the lens of the academically recognised learning modes, student learning preferences reflect a complex of approaches ranging from the constructivist to the behaviourist.

Conclusion and Recommendations

The constructs around which this study was built were more or less confirmed as the preferred learning modes of UWI Open Campus graduate students. Not only were these constructs confirmed but factor analysis was able to identify and reveal different dimensions embedded within each. Three issues emerging from the study warrant some attention.

The generation of the different dimensions of each of the original four constructs opens up scope for the development of more targeted teaching-learning strategies in the design of online learning environments. In this regard, the distinction made between interactive learning and collaborative learning in the design of the study and, thereafter, the wider range of dimensions emerging from these two separate constructs can be expected to allow for greater precision in defining the strategies best capable of facilitating each of these two learning modes.

The results of the study also seem to suggest that analysts and practitioners should be wary of elevating any single learning mode above another since the students themselves do not appear to be making that type of distinction. Specifically, the tendency to devalue instrumental learning behaviours in relation to others that are considered more appropriate may prove to be counter-productive. Designers of online learning spaces may find it more beneficial to use instrumental learning strategies as a platform to facilitate learner transition to more independent learning behaviours.

One positive of the results of the study is the strength of the two collaborative learning-related constructs emerging after factor analysis. It is clear that this learning mode is a significant part of the way UWIOC graduate students perceive the way that they learn. At the same time, their responses to the open-ended questions cannot be ignored. It can be argued that the "frustrations" they experience arise from their limited awareness of what is required when participating in collaborative activity. Thus, all tasks that students should engage in as they participate in collaborative activities should be more clearly articulated. Knowing what each participant must do and what each can expect of every other participant is a key aspect of successful collaboration.

Finally, there is need for a follow-up study to investigate if and how these preferred learning modes relate to one another as a basis for making decisions about the design of online learning spaces.

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Promoting Teachers' Learning and Knowledge Building in a Socio-Technical System
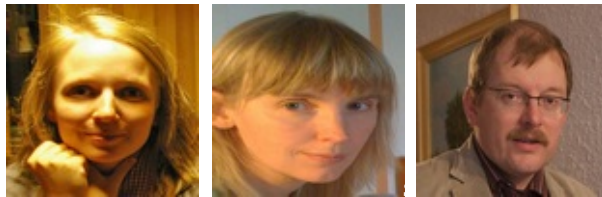
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Abstract

The study proposes a way in which the learning and knowledge building (LKB) framework, which is consistent with the knowledge conversion phases proposed by Nonaka and Takeuchi, supports teachers' informal and self-directed workplace learning. An LKB framework in a socio-technical system was developed to support professional development in an extended professional community. The LKB framework was implemented and formatively evaluated in the *in-service* course that prepares teachers for accreditation in an e-portfolio community. The extended community consisted of 16 participants, in-service teachers and domain experts. The evaluation considered (a) how the LKB practices of the framework became actualized among the community members and (b) what supported these LKB practices. Data were collected from log-files of the portfolio system. Correlation analysis and Bayesian dependency modelling revealed the way in which the bottom-up peer scaffolding from community members influences teachers' LKB practices. As a result, the study proposes that a socio-technical system might promote LKB in a professional community.

Keywords: Socio-technical system; portfolio; teacher development; learning and knowledge building; scaffolding

Introduction

This study describes and validates technologically supported learning and knowledge building (LKB) practices in an extended professional community. It substantiates the use of LKB practices as a vehicle for enhancing teachers' on-going professional development. The technology-supported LKB practices in the extended community are conceptualized as an example of the socio-technological system. The authors also propose forms of scaffolding that might promote LKB in such systems.

Currently, teachers' professional development is mainly provided in formal workshops, training courses, and conferences, but in order to benefit from learning experiences *in-situ*, professional development should be an on-going process in the workplace (Duncan-Howell, 2007). Professional development should focus on self-directed learning in the authentic settings that occur while planning, reflecting, and sharing personal learning experiences (Mushayikwa & Lubben, 2009); learning together with one's peers (Boyle, White, & Boyle, 2004); and participating at collaborative knowledge-building events (Scardamalia & Bereiter, 2003). A study by Marrero, Woodruff, Schuster, and Riccio (2010) indicated that teachers who participated in online courses and learnt together with peers found this form of learning more supportive than traditional professional development workshops. Online professional development may provide opportunities for integrating teachers' experiences as learners and teachers, claim Mackey and Evans (2011).

In this article the authors support the consideration that learning appears if there has been some significant change in an organization's 'groups', or a person's way of thinking, perceiving, or doing something (Harri-Augstein & Thomas, 1991). Learning is an internal and hardly observable change in teachers' beliefs through self-analysis, reflection, and competence development that does not necessarily have to be visible to others (Scardamalia, Bereiter, & Lamon, 1994). Knowledge building (KB), on the other hand is an external, individual, and socially shared knowledge construction process, which results in the formation of various forms of new cognitive artefacts that contain individual, group, and organizational knowledge (Scardamalia & Bereiter, 2003). The learning and knowledge building practices should be considered together in a professional learning context because they strengthen each other. In order to detect the learning of individuals and organizations, the change process itself – knowledge building, its results and cognitive artefacts – needs to be external and shareable. In self-directed LKB practices, individuals create the knowledge but are also influenced by, and can learn from, shared organizational and individual knowledge.

Many authors (Boyle, While, & Boyle, 2004; Huberman, 2001) believe that teachers' learning should be a social process. Hargreaves (1993) said that in order to avoid individualism and isolation in the teaching profession, professional learning should be conducted collaboratively. The current study focuses on an extended professional community established within the context of a school-university partnership for promoting teachers' accreditation. The community of practice concept defines

communities as groups of people who share a concern or a passion for something they do and who learn how to do it better as they interact regularly (Wenger, 1989). Learning in the community of practice takes place by gradual enculturation to the shared repertoire and understandings. The professional learning community is commonly believed to involve a group of teachers sharing and critically interrogating their practice in on-going, reflective, collaborative, inclusive, learning-oriented, growth-promoting ways (Stoll & Louis, 2007).

According to Hunter (2002), technology provides teachers with opportunities to collaborate with other teachers and experts outside of their schools. Duncan-Howell (2007) claims that technology supports the development of online communities of teachers, and if in the past the school was the community, then larger communities are formed now. She notes that members of online communities may come from different schools, resulting in a richer community and exposure to a variety of perspectives. Such online communities may support collaboration between the school and university as well, as proposed by Goodland (1994). Such partnerships promote the development of collaborative relationships and improvement of teaching skills and strategies and provide opportunities to update and improve pre-service teacher education programs.

The phenomenon in which human/computer interaction and human communication are systematically integrated is conceptualized as a socio-technical system (Herrmann, 2009). According to Weinberger, Fisher, and Mandl (2002), socio-technical systems bring people together to share information and to collaborate in an environment where scaffolding enhances collaboration and the sharing of individual and group knowledge. Herrmann (2009) also proposed that socio-technical systems could employ social software solutions for supporting learners to become members of communities, to conceptualize the understanding of their learning process, and to receive feedback.

In the current study, the technology support for teachers' LKB in the extended professional community is provided by the socio-technical system comprising social media and the professional community of teachers and educational specialists. There is a need to better understand how the technology-supported extended professional community, as a socio-technical system, promotes teachers' LKB. The role of scaffolding has been claimed to be important for facilitating self-regulated learning in technological environments (Pea, 2004). However, little is known about what kind of scaffolding appears in extended professional communities, and how it may facilitate LKB practices. The aim of this study is to explain how a socio-technical system promotes LKB practices in an extended professional community. The following research questions were formulated:

a) Which LKB practices do the community members perform and could the LKB practices of the framework become actualized among the community members?

b) How does a socio-technical system scaffold LKB practices in the extended professional community?

The Framework for Organizing Teachers' Learning and Knowledge Building Practices

For the systemic organization of teachers' LKB practices in the extended professional community, the elaborated knowledge conversion model, developed by Nonaka and Takeuchi (1995), is proposed in this study. The original model focuses primarily on knowledge creation and the transfer of knowledge between implicit and explicit forms and across individual and organizational levels, which makes the model relevant for this study. Knowledge conversion across individual and system levels could be used in the communities similarly as in organizations, assuming that both represent system level phenomena. Nonaka and Takeuchi (1995) describe four knowledge conversion stages (SECI): *Socialization* (S) between individuals using tacit knowledge then *externalizing* (E) it in individual reflections in an organizational context that builds the knowledge base for collaborative knowledge; *combination* (C)facilitates bringing tacit individual knowledge into explicit organizational knowledge and making it reusable for individual learning in *internalization* (I).

Self-directed and informal learning, as a form of professional development, is not well recognized or understood in the workplace (Lom & Sullenger, 2010). In the research and practice of knowledge creation, the individual as the carrier of the knowledge has been marginalized (Haag, 2010); although from the self-directed learning perspective, it is the individual's self-motivation that promotes knowledge building and learning. In the context of a teacher's continuous learning, the focus on self-directed learning (SDL) is important (Mushayikwa & Lubben, 2009) since professional development should arise from a teacher's own initiative (Van Eekelen, Vermunt, & Boshuizen, 2006). Nonaka and Takeuchi (1995) have not considered self-directed learning as a motivator of organizational learning at the individual level, but the authors argue that self-regulated planning, reflection, and activities that develop competence should be integrated into the externalization and internalization phases of the knowledge conversion model (Pata & Laanpere, 2008; Tammets, Pata, & Laanpere, 2011).

Socialization	**Externalization**
Communication between the members of the community	Publishing reflections Comments from community members to peers' reflection
Internalization	**Combination**
Monitoring community members' reflections and learning from them; Planning own competence development	Collaborative creation of learning resources Formulating community norms and visions

Figure 1. LKB practices in different SECI phases.

The authors propose that using the SECI phases for organizing teachers' LKB practices in an accreditation context enables the creation of a knowledge conversion process in the extended professional community of teachers and educators in which accreditation becomes part of lifelong learning (Tammets, Pata, & Laanpere, 2012). The exact descriptions of the LKB practices for supporting teachers' development in an extended professional community are discussed in the Results section, but Figure 1 illustrates the general LKB practices in different SECI phases.

Technology-Support for LKB in Teacher Professional Development

In the current study for organizing LKB practices in a teachers' professional community, the authors used a portfolio-based system that consists of e-portfolios that are shared in an online community. Several studies have highlighted the importance of the e-portfolio in teachers' professional development, because a portfolio can demonstrate compelling evidence of growth and competency (Abrami & Barrett, 2005). It may also serve as a medium for translating theory into practice (Hauge, 2006). In the e-portfolio, teachers may collect their learning materials, reflections, competence development, and other mainly profession-related content that can illustrate their professional journey over time. Acosta and Liu (2006) argue that an e-portfolio community may promote new and authentic collaboration and enable teachers to reflect and share their experiences; to become inspired by their peers' reflections; to support each other and work together with shared reflections (Acosta & Liu, 2006). We proposed that in the professional community, the e-portfolio community creates additional possibilities for organizing LKB practices. It can be a free platform not managed by any of the organizations. It

creates a space and adds structure to the extended professional community. In such a system, a community may have its own community knowledge that is stored and becomes accessible and reusable from the portfolio community (Tammets & Pata, 2012). A portfolio-based community as a socio-technical system promotes LKB by enabling the community members to (a) write external reflections on actions and share them within the community; (b) find and reuse those external reflections by learning from them, and for creating generalized community knowledge; (c) have collaboration and knowledge building about knowledge, competences, or actions with the community members; and (d) plan professional development based on shared social and community norms.

The role of scaffolds in facilitating self-regulated learning has been found to be a critical issue in online learning environments (Pea, 2004). Pea sees two threads in the scaffolding concept coming together, a social process and a tool/technology process, but the scaffolds are not found in the software; rather, they are functions of processes that relate people to the performances in systems over time. Inspired from these two dimensions of a scaffold, this study emphasizes two types of scaffolding: peer scaffolding and socio-technical scaffolding.

Peer scaffolding.

Several studies have emphasized that scaffolding is a social process. The term "scaffolding" was introduced by Wood, Bruner, and Ross (1976), who described scaffolding as a process that enables a child or novice to solve a problem, carry out a task, or achieve a goal which would be beyond his unassisted effort. In this study, the concept of a *peer* is seen in the context of an extended professional community where the peers can be the members of different communities in relation to a teacher's professional development. In this study the teachers from different schools and domain experts from different universities and teacher organizations are seen as peers in the professional community who could provide peer scaffolding to individuals from the professional community. In the current study, the authors differentiate between peers in an extended professional community: (a) a peer from a university (domain expert), (b) a peer from a teachers' organization (domain expert), and (c) a peer from a school (teacher). Pata, Lehtinen, and Sarapuu (2006) proposed the multi-actor scaffolding model - one in which the inter-relationships between verbal tutors and peer scaffolding, during a collaborative process, were outlined. According to this model, tutor and students frequently elaborate and replace each other's scaffolding acts in a collaborative situation. It was found that a tutor's dominating type of scaffolding encourages students to take a more passive role by interacting mainly with their tutor and to a lesser degree with their peers. However, if tutor and students elaborated each other's scaffolding acts, this might facilitate the students' productive discourse more than the tutor's scaffolding alone. In the current study, the role of different types of peer scaffolding on a teacher's LKB practices was of interest.

Socio-technical scaffolding.

Puntambekar and Hubscher (2005) have said that owing to advancements in technology, scaffolding is no longer restricted to interactions between a human expert and a learner. Such interactions have been extended to include the use of technological tools, resources, environments, and so on. An example of socio-technological scaffolding is the Knowledge Forum, developed to scaffold the knowledge-building framework (Scardamalia & Bereiter, 1994). This system guides educators in providing scaffolding for sharing ideas and thoughts within a networked database, making knowledge artefacts available for others to work on and to be elaborated further. In the Knowledge Forum, the weblog, forum, and the personal portfolio mediate the accumulated knowledge of the community, providing scaffolding for the community members.

Methodology

Research Design and Case Description

This study follows the case study methodology for data collection. Yin (1984) defined the case study as an empirical inquiry that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used. The case study method includes the following steps: (a) determine and define the research questions; (b) select the cases and determine data gathering and analysis techniques; (c) prepare to collect the data; (d) collect data in the field; (e) evaluate and analyse the data; (f) prepare the report. The same steps were followed in this study. Using the case study approach in this study demonstrates the current trends of research in education. As Creswell (2005) claims, case studies focus on real activities; therefore the case study approach was chosen for this research in order to get an insight into teachers' actual LKB practices in a technology-supported extended professional community.

The study was conducted in collaboration with the EU funded 7th FP project IntelLEO, whose aim is to explore supportive technologies for LKB practices of learners in extended organizations. In collaboration with the project, the study was designed to support teachers' LKB practices using a portfolio-based learning environment during an in-service training course. Partially web-based, the course supported the activities in the extended professional community. The community members could socialize and reflect on actions, initiate or participate in collaborative practices, learn from the reflections of others as well as from the community knowledge, and scaffold their colleagues. However, the formation of real professional communities takes a much longer time period than a three-month training course and admittedly this imposes a limitation on this study.

The environment for the professional community was designed on the open-source Elgg platform that is a portfolio-based community. Elgg supports individual development of the users with portfolio functionalities, such as writing entries in a personal weblog, uploading files, and development of materials with the collaboration tool. From the community-building aspect, Elgg supports creating communities, socializing in a forum, and co-developing materials with peers. The Elgg platform was used since Estonian teachers can use the analogical e-portfolio community "Koolielu" (http://koolielu.ee) for their professional community activities and for personal development. However, the authors chose not to use Koolielu directly because it does not enable automatic data-collection of user-activities at the level required in this study.

For encouraging the development of the extended professional community, the following course modules were designed.

(a) Topic: *Accreditation and e-portfolio*. Theoretical material concerning an e-portfolio in the accreditation context was required reading (*internalization*). Discussions about theoretical material (*combination*) were to be performed in the forum. Additionally participants were required to start preparing their accreditation e-portfolios (*externalization*). When needed, participants were required to use the forum to socialize by asking questions and expressing their uncertainties (*socialization*). This module supported the idea that a member of the extended professional community could prepare the professional development portfolio for authentic lifelong learning and use it in the accreditation or other types of certification/evaluation processes.

(b) Topic: *Competence-based education.* Theoretical material concerning competence-based professional development was required reading (internalization). Discussions about material (combination) were to be performed in the forum. Additionally participants were required to reflect on how they acquired one educational technology competence that was pre-defined by the domain experts. The guidelines for reflection were available to the community. Subsequently, participants were required to divide themselves into groups and collaboratively combine their individual reflections in 'shared knowledge'. As a result of this collaborative task, community members then formulated the kind of activities that could be performed for acquiring a certain competence and identified which resources might be supportive in this competence development process. This module illustrated that if individuals analyse and plan their own development in accordance with the competency standard and include evidence in the form of illustrative materials, the planning and analysis process is systematic.

(c) Topic: *SECI model as a theoretical baseline for teacher education.* The last module (b) was similar to the previous one (a) – reading and discussing the theoretical material was presented and individual reflections and collaborative tasks were performed. That module shaped and nurtured the idea of reflection in the community and a focus on theory-driven (SECI) teacher development.

All the activities in the modules are associated with some SECI phases and enable knowledge creation at the individual and community level.

Data Collection and Analysis

The data were collected from 16 participants in the study. Of these, 13 were experienced Estonian secondary school teachers who intended to prepare themselves in order to pass the accreditation process for reaching the next level in their career path and three were domain experts from the university and from the teacher's professional union. These participants constituted the members of this extended professional community. For analysing teachers' LKB practices and determining the scaffolding logging traces in the system was used for collecting the data.

Logging users' activities in the online system.

To validate if and how the planned LKB practices took place between the community members and to find an answer to research question 1, the study used log data for analysing the interactions in the system. A special activity-logging tool was developed as an add-in module for the Elgg-based portfolio system. The log contained all the data relating to the actions that the users performed in the system in an extended Activity Streams format. Each log record contained the username, action, object, time-stamp, and context (e.g., "username1 added blog post at 27th December 2011 17.06 p.m. to the community X page").

In the next phase, one researcher categorized all of the actions in the log-file, mainly based on the SECI phases. Teachers' (T) and domain experts' (O) socialization activities were categorized as S_T and S_O. Externalization activities were divided into *writing a blog entry* E(Entry)T or *commenting on a blog* E(Comment)T or E(Comment)O. Combination activities in the forum were categorized as C_T and C_O. In addition, the activity *view* was categorized as View T and View O and this included viewing the weblogs, forums, and materials. This type of approach supports analysing the peer scaffolding. Every comment and discussion thread was manually checked to see if the teacher's purpose was to collaborate or socialize in the forum. Internalization in this study was not measured. Log-information from the system indicated that teachers often just looked at the posts in the discussion forum, peers' blogs, or theoretical learning materials. In this study "the viewing within the system" is considered as an action of "viewing". The data was categorized and discussed with another researcher and in cases where the researchers had differing opinions the data was not categorized until both researchers reached agreement in their decision. The study did not analyse internalization and learning using the log data. It can also be assumed that cognitively one interaction in the system may involve more than one SECI activity. For example, while commenting on a peer's blog (E-phase), a teacher may also learn at the same time (I-phase).

A total of 1,789 occurrences of LKB practices were identified within 15 weeks. The interactions were counted and organized into the weekly frequency data matrix. Firstly,

the correlation analysis with SPSS 18.0 software was performed to identify associations between the interactions. Secondly, the web-based Bayesian dependency-modelling tool B-course (Myllymäki, Silander, Tirri et al., 2002) was used to model the dependencies and make assumptions about how the LKB interactions influenced each other as a system. The naïve causal dependency model was drawn, leaving aside (for the sake of simplification) the possibility that the dependencies could be caused by unmeasured variables. During the search 2,749,453 candidate models were evaluated, but the last 2,392,158 evaluations did not result in finding better models.

Results

LKB Practices in the Extended Professional Community

In order to establish the professional community, the practices from our LKB framework (Tammets et al., 2011, 2012) were adapted to the teacher accreditation context and embedded into the socio-technical system (Figure 2). The aim was to develop the systemic LKB practices that would support the creation of the community knowledge based on the sharing and accumulation of individual professional knowledge and experiences.
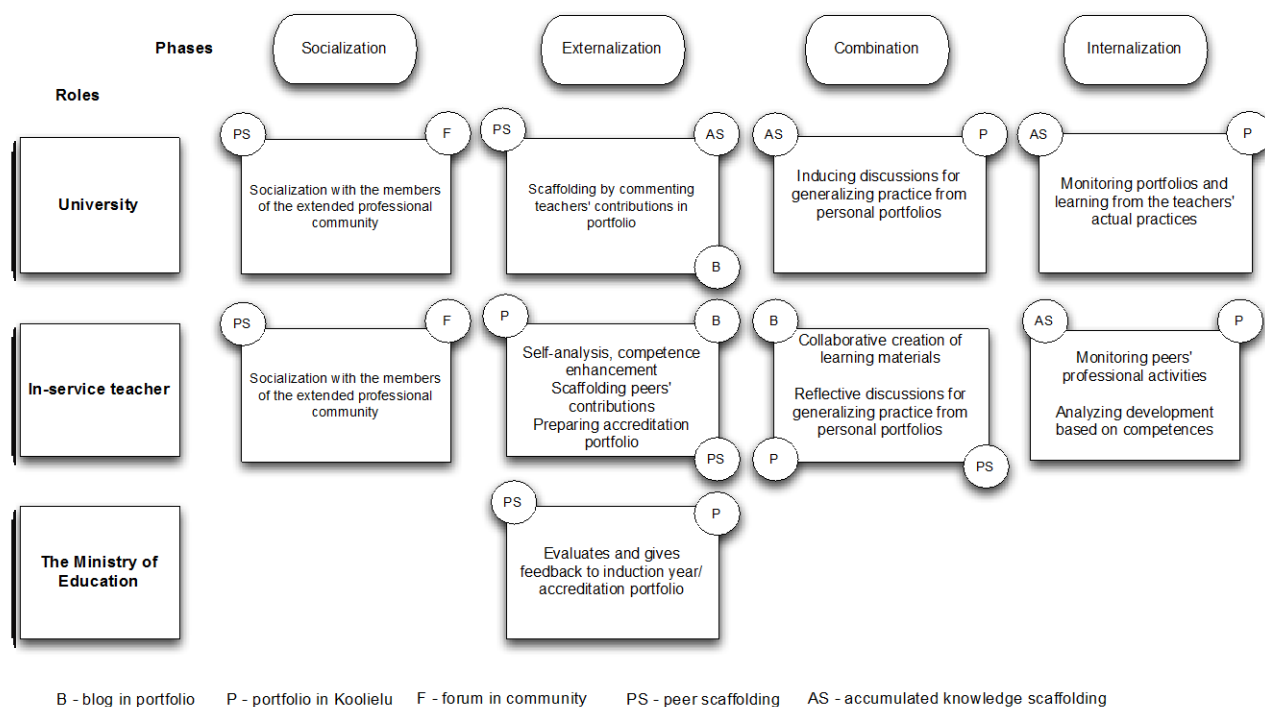
Figure 2. The technologically supported LKB practices in the extended professional community.

In the *evaluation phase* the LKB practices of the framework were analysed to determine if they could be systematically implemented among the community members. Based on the data from the log-files, the following were identified.

LKB practices that were actually carried out in the accreditation course community:

- Socialization - members socialized in the forum with the aim of finding support for their individual learning needs (technical advice, privacy issues, etc.) or for personal reasons.

- Externalization – externalization of the professional knowledge in the weblog through reflection. Teachers wrote a self-analysis based on their educational technology competency and evaluated their development. Their comments included reflection and they provided feedback to their peers as part of the externalization.

- Combination – the community members combined their individual reflections about the competency enhancement process with the joint generalization of how to achieve certain educational competences. Also, domain experts initiated discussions in the forum regarding the organizational norms associated with the accreditation process, in order to promote the teachers' knowledge construction and reflection.

- Internalization – teachers' individually analysed their competences based on the competency model, accreditation requirements, reflections on peers' weblogs, and feedback from the community members. They learned from their colleagues and from the community knowledge.

To determine the interrelationships between the practices of the community members, a correlation analysis of activity sequences was conducted (see Table 1). In the table, T or O behind the practices indicates teacher (T) or domain expert (O) and the letter in the bracket indicates the SECI phase.

Table 1

Correlation Analysis of LKB Practives

		View_T	View_O	E(Entry)T	E(Comment)T	E(Comment)O	S_T	S_O	C_T	C_O
View_T	r	1								
View_O	r	0.828**	1							
E(Entry)T	r	0.722**	0.626*	1						
E(Comment)T	r	0.651**			1					
E(Comment)O	r	0.822**	0.898**		0.691**	1				
S_T	r	0.650**	0.607*	0.874**			1			
S_O	r	0.641*	0.791**	0.662*		0.567*	0.750**	1		
C_T	r	0.789**	0.888**	0.571*		0.752**			1	
C_O	r						0.520*	0.525*		1

 * Correlation is significant at the $p < 0.05$ level (2-tailed); ** Correlation is significant at the $p < 0.01$ level (2-tailed)

The dataset was organized according to weekly LKB frequencies and was enabled to search for the correlations between the community members' different LKB practices so that predictions could be made as to how the LKB framework was functioning as a system. Correlation analysis indicated that the teachers' viewings of the blog and forum were significantly interrelated with writing the blog entry ($r = 0.722$), commenting on the community members' blog (0.651), socialization activities by peers ($r = 0.650$), and combination activities by peers (0.789). This may indicate that a teacher looks at what other community members have performed in the system and then performs different LKB practices (belonging to S, E, C, in the LKB framework). It also means that the knowledge created by other community members and shared as a community resource serves as community knowledge promoting other types of LKB. Correlation occurred between the socialization and externalization activities of teachers. Those teachers who socialized in the forum were very likely to write a blog entry as well in the same week (*r*

= 0.874). Writing a blog entry by the teachers was also interrelated with the teachers' collaborative group-based knowledge-building tasks (r = 0.571). These findings indicate, that in all the different LKB practices, the LKB framework suggested they had significant mutual correlations, allowing the community members to benefit from the mutual synergy between LKB practices in different SECI phases. The possible causal relationships among different LKB practices of the framework are discussed in the subsection below.

Scaffolding LKB in the Extended Professional Community

One of the research interests was to explain how different community members in the extended professional community – the teachers and the domain experts – could influence their peers' LKB. The correlation analyses (see Table 1) that do not allow detecting causal relations indicated that several teachers' and domain-experts' LKB practices in different SECI phases were correlated. For example, teachers' socialization activities were related to the domain experts' socialization (r = 0.750) and combination activities (r = 0.520). It may presumed that if a teacher socialized in the forum with community members, the domain expert also performed social communications, or, alternatively, proposed some of the discussion threads to prompt teachers' collaborative knowledge building in the forum. Teachers' viewing of blogs and forum entries were correlated with the domain expert's commenting on the teachers' blogs (r = 0.822) and the domain experts' socialization activities (r = 0.641). The domain experts' viewing of blog and forum entries was correlated with the teachers' writing a blog entry (r = 0.626), indicating that domain experts monitored community members' contributions. Teachers' blog entries were interrelated with domain experts' comments (r = 0.898). Teachers' blog entries were also interrelated with the domain experts' socialization in the forum (r = 0.663). Also domain experts' "views" of blogs and forum posts were correlated with teachers' socialization (r = 0.607) or combination-related (r = 0.888) discussions in the forum and domain experts' socialization in the forum (r = 0.791). Teachers' and domain experts' comments in the weblog were interrelated (r = 0.691), suggesting that these scaffolding actions may be mutually induced.

An assumption can be made from the results of the correlation analysis that teachers monitored each other in different SECI phases, and this might have prompted their LKB practices. Also, it was found that the domain experts in the extended professional community were closely monitoring teachers' LKB practices and providing scaffolding as well as trying to prompt teachers' to participate in different LKB practices. A correlation appeared between scaffolding activities (comments) of teachers and domain experts. It was assumed that the domain experts' comments might have also encouraged teachers to support their peers.

In order to validate some of these assumptions that were made based on the correlation analysis results, and systematically interpret the interrelations between LKB practices and scaffolding in a professional community, the authors investigated the causal

dependencies between the indicators using the B-course[1] analysis toolkit and Bayesian modelling (see Figure 3). Such a naïve dependency model can be used to explain how different activities might be causally interrelated and be influencing the community members' LKB. However, the naïve model considers dependencies as if no other variables had influence on the system. Therefore, these results may lose some of their explanatory power, since in a social system there are always some aspects that are not measured.
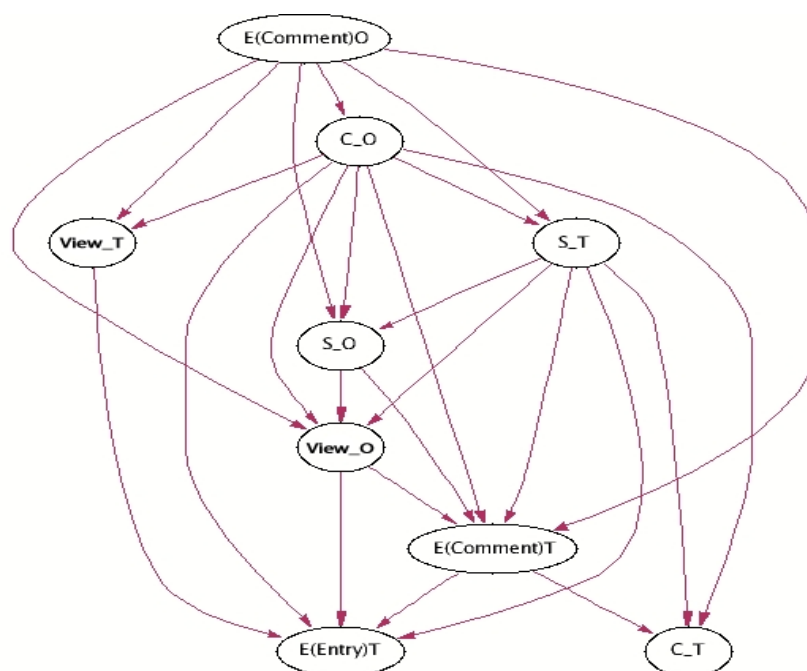
Figure 3.   Naive Bayesian dependency model for LKB practices.

The dependency model (see Figure 3) revealed the following causal interrelations (the abbreviations used are explained in the Data Collection and Analysis section). The domain experts' comments had no direct influence on prompting teachers' entries in the blog. The domain experts' comments (E(Comment)O) on the teachers' weblog entries caused the teachers to comment (E(Comment)T) on the weblogs. This may indicate that domain experts do not influence teachers' LKB practices directly, but they encourage community members to comment on their peers, and that the commentary influences them to write blog entries. The domain experts had more direct influence on the teachers' knowledge building in the combination phase. Teachers' combination activities (C_T) were dependent on domain experts' combination activities (C_O) in the forum. The teachers' blog entries were induced by several other teachers' LKB practices, for example, the teachers' socialization and combination activities in the forum.

Teachers' combination activities (C_T) were also dependent on teachers' socialization activities (S_T) and teachers' comments (E(Comment)_T) in the weblog. It can be assumed that teachers' socialization and comments in the weblog may prompt teachers to perform the knowledge building practices in the combination phase. However, there was no direct causal influence, neither between teachers' knowledge building in the combination phase and their reflections in the blog nor vice versa. Note that in the correlation analysis, a weak correlation was found between teachers' knowledge building in the combination phase and individual reflections in their blogs in the externalization phase.

The dependency model demonstrated how the LKB practices might be interrelated and supportive of each other and facilitate their validation in the LKB framework application in the professional community. The authors particularly found that the domain experts may have more direct influence on the combination activities in the forum, and they could indirectly influence teachers to comment on their peers' reflections in their blogs, which in turn might prompt individual reflections in the weblog. However, these results do not allow the assumption that domain experts and teachers would take similar roles in a naturally occurring professional community. There were some differences between the correlation analysis results and the dependency model; testing the probability of causal dependencies between different LKB practices, as part of the system in this specific naïve dependency model, did not support certain correlations that were found. In general, the results of the naïve dependency model may be considered as one of the more probable variants in how LKB practices might be dependent on each other.

Discussion

This section discusses how the socio-technical system can promote LKB (see Figure 3). Previously, Herrmann (2009) and Mandl and Fisher and Weinberger (2002) noted that the sharing of individual knowledge and collaborating on group knowledge as well as scaffolding to provide feedback for learning and promoting collaboration are all important in the socio-technical systems. The present study broadens the knowledge of how different learning and knowledge building practices and scaffolding might be interrelated in the extended professional e-portfolio communities. Using the example of a teachers' professional community, a description is provided to explain how a socio-technical system works systemically and to illustrate the purpose of different types of LKB practices and scaffolding.

Data based on the analysis of the log-files demonstrated how teachers' contributions are influenced by the contributions of the other members in the system. It was found in particular that the domain experts may have more direct influence on knowledge building in the forum, and they could indirectly influence teachers to comment on their peers' reflections in blogs that in turn might prompt individual reflections in the weblog. These findings are similar to those in the study of Pata et al. (2006). They found that in

the context of the student-tutor chatting in a synchronous environment, the influence that comes from peers who perform similar scaffolding acts as tutors might promote their peers' productive actions more than direct tutor-scaffolding. The peers' scaffolding in that study was promoted by the tutors' scaffolding activities, which is similar to the results found in the present study.
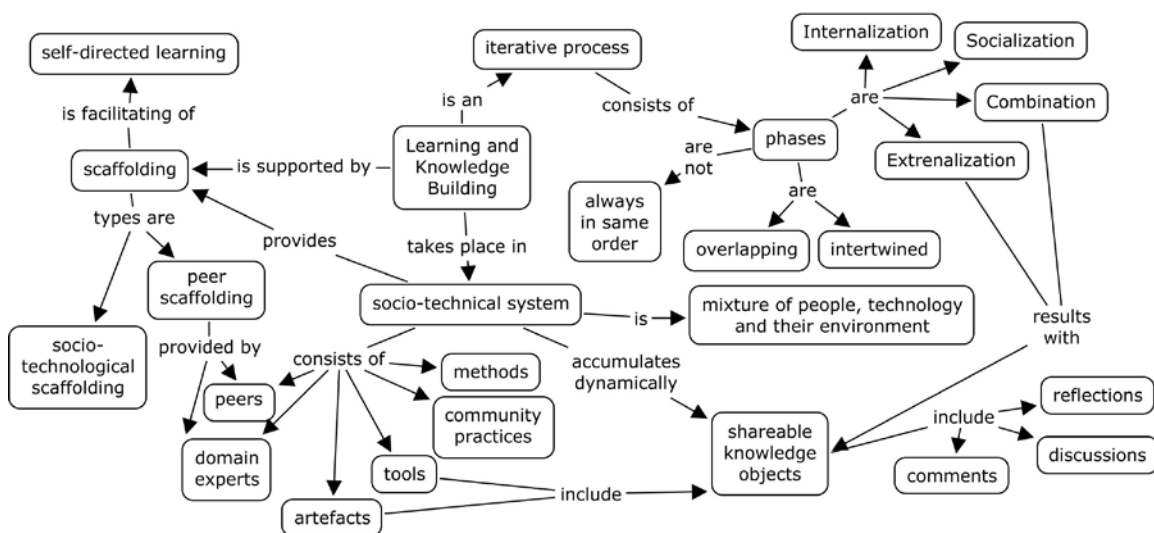
Figure 4. The LKB framework in the socio-technical system for teachers' professional development.

The synergy between different LKB practices has been described in the Results section. The results of the analysis of the log-files indicated that LKB practices for socialization, externalization, combination, and internalization are systemically intertwined and influence each other. Based on the collected data, the LKB framework highlights scaffolding elements that influence teachers' LKB. The current study distinguished two thoroughly intertwined scaffolding dimensions, social and technological, as was proposed by Pea (2004). Without community members the socio-technical system could not function (Lytras & Pouloudi, 2006). Interactions of individuals in the system and their contributions to the community knowledge resources are important for the socio-technical system. With their LKB practices, individuals create the dynamic flow of knowledge within the system between individual and organizational knowledge (Nonaka & Takeuchi, 1995), enabling peer-scaffolding and socio-embedded scaffolds for other community members. Through the LKB practices in the socio-technical system, the knowledge of teachers is created, combined, shared, stored, and accumulated. Knowledge accumulation as a socio-embedded scaffold is supported by different functionalities like weblog, forum, and learning resources. Accumulated knowledge becomes available to community members for learning or for knowledge-building purposes. Individual knowledge is combined and evolves into community-level

knowledge (Weber, Schoefegger, Ley, Lindstaedt, Bimrose, Brown, et al., 2009) and can be used, for example, in teacher training, when preparing in-service courses, redesigning curricula, or restructuring qualification systems. Community members' different types of LKB practices with community tools may provide different types of scaffolding. This study indicated that domain-experts' interactions directly influence teachers' knowledge building practices in the forum. However, the teachers' reflections in weblogs were more directly influenced by other teachers' comments in the blogs, rather than by the domain-experts' comments.

Conclusion

This study proposed how the technologically supported LKB practices in an extended professional community may be promoted by scaffolding. The study highlighted the importance of two types of scaffolding for facilitating LKB in the socio-technical system: (a) one performed by the peers and (b) one that appears as an accumulation of the community-generated knowledge and sharing it in the socio-technical system. Teachers' LKB should focus on the interactions between community members as scaffolds and emphasize the opportunities that technology provides, such as scaffolds for storing, reusing and sharing reflections, and organizing knowledge-building practices. These observations, which show how two types of scaffolding influence teachers' LKB, reiterate similar findings from previous studies of online communities (Pea, 2004; Lytras & Pouloudi, 2006; Pata et al., 2006). It is nevertheless worth considering that the current study revealed peer-scaffolding across different types of peers in the extended professional community; teachers placed a greater value on it and were more influenced by the scaffolding that came from the other teachers, not from the domain experts. The current study indicated that in the case where teachers' workplace learning is informal but they are expected to analyse their professional development and share their experiences, the support from similar peers is more valuable. This study assumes that scaffolds for LKB in a socio-technical system are intertwined because without technology or with a lack of human resources, teachers' LKB may not be promoted.

The extended professional community in the socio-technical system was studied during an in-service course, which did not reflect the spontaneous and authentic setting of a professional community of teachers. According to the course goals, the domain experts purposefully encouraged LKB practices of teachers, initiating the knowledge-building discussions, preparing some LKB tasks, and commenting on their reflections in the blogs. Such a training-community setting might not directly replicate an extended community where all the members – the domain experts as well as teachers – participate without external motivation.

Acknowledgements

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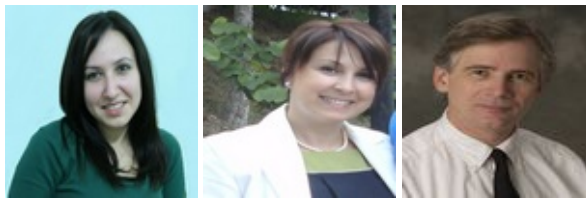
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Abstract

This study aimed to evaluate and redesign an online master's degree program consisting of 12 courses from the informatics field using a context, input, process, product (CIPP) evaluation model. Research conducted during the redesign of the online program followed a mixed methodology in which data was collected through a CIPP survey, focus-group interview, and open-ended questionnaire. An initial CIPP survey sent to students, which had a response rate of approximately 60%, indicated that the Fuzzy Logic course did not fully meet the needs of students. Based on these findings, the program managers decided to improve this course, and a focus group was organized with the students of the Fuzzy Logic course in order to obtain more information to help in redesigning the course. Accordingly, the course was redesigned to include more examples and visuals, including videos; student-instructor interaction was increased through face-to-face meetings; and extra meetings were arranged before exams so that additional examples could be presented for problem-solving to satisfy students about assessment procedures. Lastly, the modifications to the Fuzzy Logic course were implemented, and the students in the course were sent an open-ended form asking them what they thought about the modifications. The results indicated that most students were pleased with the new version of the course.

Keywords: Online program evaluation; CIPP model; evaluation; mixed methods research

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Introduction

The growth of the Internet, rapid development of technology, and great demand for higher education, lifelong learning, and content-delivery approaches have meant that educational institutions are now equipped with a variety of information and communication technologies (Sancar Tokmak, 2013). In 2000, Moe and Blodget predicted that the number of online education learners could reach as high as 40 million by 2025. One reason for the increased demand for online education is the expectation that in order to be successful, individuals must keep abreast of new technologies and information. Because online instruction offers a viable, more flexible alternative to time-consuming face-to-face education, educational institutions have endeavoured to offer online courses to meet society's demands for lifelong learning (Lou, 2004). However, online education differs from face-to-face education in many ways and thus requires different strategies to be successful.

Educators and other researchers have expressed numerous concerns about the quality of online education courses (Lou, 2004), and as researchers such as Thompson and Irele (2003) and Kromrey, Hogarty, Hess, Rendina-Gobioff, Hilbelink, and Lang (2005) have noted, as online courses flourish, meaningful assessment is essential for improving the quality of such offerings. Different types of evaluation models address different goals of learners and educators. Eseryel (2002) lists six basic approaches to evaluation – goal-based evaluation, goal-free evaluation, responsive evaluation, systems evaluation, professional review, and quasi-legal evaluation – and points out that researchers and other evaluators should be familiar with the different models and choose the one most appropriate to their aims. Hew et al. (2004) have categorized evaluation models as macro, meso, and micro, with "Context, Input, Process, Product (CIPP)" included in the category of macro-level evaluation as a useful model for answering important questions about online education programs. Bonk (2002) also advocates the CIPP model for examining online learning within a larger system or context.

CIPP is an evaluation model based on decision-making (Boulmetis & Dutwin, 2005). Since this study aimed to make decisions regarding the improvement of an online master's program, the study used the CIPP model within the framework of a mixed-methodology design. This process involved identifying the needs of stakeholders (learners, managers, and instructors), after which decisions were made as to how to improve the course, and students were surveyed regarding their perceptions about the changes made in the program.

Theoretical Background: CIPP Evaluation Model

CIPP was developed by the Phi Delta Kappa Committee on Evaluation in 1971 (Smith, 1980). Stufflebeam (1971a) describes evaluation according to the CIPP model as a "process of delineating, obtaining and providing useful information for judging decision alternatives" (p.267). In other words, CIPP is based on providing information for

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decisions (Stufflebeam, 1971b). Moreover, Boulmetis and Dutwin (2005) named the CIPP model as the best decision-making model.

According to Eseryel's categorization (2002), CIPP is considered a system-based model, while in Hew et al.'s categorization (2004), CIPP is considered a macro model. Each of the four different types of evaluation that comprise CIPP has an important role to play in a larger whole (Williams, 2000; Smith and Freeman, 2002), with the functions of each described by Stufflebeam (1971a) as follows:

a. *Context evaluation* serves planning decisions by identifying unmet needs, unused opportunities and underlying problems that prevent the meeting of needs or the use of opportunities;

b. *Input evaluation* serves structuring decisions by projecting and analyzing alternative procedural designs;

c. *Process evaluation* serves implementing decisions by monitoring project operations;

d. *Product evaluation* serves recycling decisions by determining the degree to which objectives have been achieved and by determining the cause of the obtained results. (p. 268)

Purpose and Research Questions of the Study

This study aimed to evaluate and redesign an online master's program consisting of 12 courses from the informatics field using the CIPP model. Four main research questions guided the study:

1. What are the needs of online master's program's students?

2. What strategies and activities have been planned to address the needs of students in an online master's program?

3. How should the online master's program be redesigned to better meet the needs of students?

4. What are the students' perceptions of an online master's program following course modifications?

Methodology

The study was implemented using a mixed methodology research design. According to Creswell and Clark (2007), mixed methodology research "involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative approaches in many phases in the research process" (p. 5). The present study consisted of three main phases of research design.

Quantitative and qualitative approaches were applied in consecutive phases, with the results of one phase influencing the process and application of subsequent phases. In the first phase, the needs of students in the online master's program were defined using the open- and close-ended questions of the CIPP survey. In the second phase, in-depth research was conducted about one course in the online program through focus-group interviews. In the third phase, an open-ended questionnaire was applied to identify students' perceptions about the new version of the program.

Sampling Procedure and Participants

Defining sampling procedures is an important step in research because it indicates the quality of the inferences made by the researcher with regard to the research findings (Collins, Onwuegbuzie, & Jiao, 2006). In this MMR study, criterion sampling procedures were applied during all phases, because the aim was to evaluate and redesign an online master's program. Thus, in Phase 1, study participants were comprised of 63 students taking part in this online program in 2010. The majority of students were male ($n = 52$). Students' ages ranged from 23 to 39. More than half of the students (60.4%) did not have full-time jobs. In Phase 2, the 10 students enrolled in the Fuzzy Logic course participated in focus-group-interviews, and in Phase 3, the 19 students who attended the Fuzzy Logic course during the same semester were sent a form containing open-ended questions about the modifications to the course; of these, 16 students completed and returned the forms.

Design of Online Master's Program (The Context)

The online master's program has been offered by the Institute of Informatics since 2006. The program consists of 12 courses: Fuzzy Logic, Introduction to Mobile Wireless Networks, Object Oriented Programming, Computer Architecture, Computer Networks, Multimedia Systems, Embedded Systems, Data Mining, Web-based Instructional Design and Application I, Human-Computer Interaction, Data Security, and Expert Systems. The content of each course was arranged by the institute's instructors.

The online master's program is a graduate program without thesis that lasts between four to six terms. In order to be accepted into the program, applicants are required to hold an undergraduate degree in Computer Systems Education, Computer Education, or Computer Education and Instructional Technology.

All courses were offered online through a learning management system (LMS). Students communicated with their instructors and peers via asynchronous tools (e-mail correspondence and a discussion board) and via synchronous meetings with instructors (video conferencing sessions via an electronic meeting tool) that lasted for one hour per week.

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Online Fuzzy Logic course.

The Fuzzy Logic course is run using synchronous and asynchronous tools as described above. Course content is accessed through LMS 7/24 and includes graphics and animation in addition to text.

Procedure

The study included a pilot as well as the main study. The pilot study was implemented during the 2009 summer school session to check the validity of the survey developed based on the CIPP model. The main study was initiated during the 2009 fall term, with data collection completed at the end of the 2010 spring term. The timeframe of the pilot study and main study is presented in Table 1.

Table 1

Pilot and Main Study Phases

	Phases	Period
Pilot study	Validity check of CIPP survey	2009 summer
Main study	Online master program evaluation via CIPP survey	2009-2010 terms (1 year)
	Decisions made according to the results of survey	
	Online Fuzzy Logic course evaluation	
	Decisions on necessary modifications	
	Modifications made to course material	
	Re-evaluation of online course	

The main study included three phases. In Phase 1, the CIPP survey was sent to all students enrolled in the online master's program. Of these, 60.3% returned the surveys. The results indicated that two courses in the program – Fuzzy Logic and Object Oriented Programming – did not completely meet the students' needs. Due to financial constraints, the program directors decided that initial improvements to the program should focus on the Fuzzy Logic course only. Accordingly, in Phase 2, a focus-group interview was conducted with the students of the Fuzzy Logic course in order to evaluate and redesign the course. The results of this interview were discussed with a group of graduate students attending a course on eLearning (CI-554, "Design and Delivery of

eLearning") offered through the Instructional Design and Instructional Technology program at Southern Illinois University (SIU), Carbondale, and their recommendations, along with the focus-group findings, were relayed to the director and coordinator of the online master's program, who later decided to implement cost-effective modifications. In Phase 3 of the study, modifications to the Fuzzy Logic course were implemented, and the students who took the course were sent an open-ended form to fill out pertaining to their thoughts about the modifications.

Instrumentation

The CIPP survey.

The CIPP survey used in Phase 1 of the study was prepared by the researchers based on two surveys in the literature (Stufflebeam, 2007; Shi, 2006) and was checked by two experts. The survey consists of two parts. Part 1 contains 5 questions pertaining to demographics of the participants, whereas Part 2 contains 19 statements about the online master's program with a 5-point-Likert scale (*strongly agree* to *strongly disagree*) as well as an open-ended question asking participants to select one course that needs further analysis and modification.

Wallen and Freankel (2001) state that researchers should focus on collecting reliable, valid data using instruments. For this reason, the researchers developed the instruments used in this study in consultation with experts in order to ensure content-related validity. Moreover, reliability of the instrument was checked by implementing a pilot survey with online master's program students.

Focus-group interview form.

The focus-group interview conducted in Phase 2 of the study consisted of semi-structured interview questions that were checked by two experts. The two main questions used were designed to obtain students' opinions about the instructional design of the Fuzzy Logic course as well as their suggestions for improving the course.

Open-ended questionnaire.

The questionnaire form used in Phase 3 of the study consisted of five open-ended questions designed to obtain students' opinions about the modifications to the Fuzzy Logic course. This form was checked by an expert, revised accordingly, and the revised version of the form was used in the study.

Data Collection and Analysis

Data was collected through a CIPP survey, including closed- and open-ended questions; a focus group interview; and an open-ended questionnaire. Descriptive analysis was applied to the data collected from the CIPP survey close-ended questions, whereas the data collected from the open-ended question was analyzed using open-coding analysis in line with Ayres, Kavanaugh, and Knafl (2003), with data categories of significant

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statements presented according to different themes. Intercoder reliability with regard to the emerging themes was rated according to Miles and Huberman (1994) and found to be 88%.

A focus-group interview was conducted by one of the researchers with 10 volunteer students. A supportive atmosphere for discussion was secured by providing each participant opportunities to participate. Focus-group interview results were discussed with the program managers and used as the basis for decisions regarding modifications to be made to the program.

Once the modifications had been implemented, an open-ended questionnaire was sent to all students taking the Fuzzy Logic course. Responses were iteratively examined for patterns and ideas. Collected data was examined for similarities and differences in student responses, and general themes were identified by one researcher and checked by another researcher.

Validity and Reliability

Efforts to ensure data validity are described below with respect to the different research activities.

Instrumentation: The CIPP questionnaire used in the study was developed by the researchers based on the literature, checked by experts, and implemented in a pilot study. The focus-group interview form and open-ended questionnaire were also verified by experts prior to implementation.

Data collection: In line with design-based research methodology, data was collected in a three-phase procedure in order to redesign the program under study. Data was triangulated through the use of a CIPP survey, focus-group interview, and open-ended questionnaire.

Data interpretation: All of the study findings were discussed with the program managers and course instructors. Moreover, to provide external validity, a group of graduate students enrolled in a course on Design and Delivery of eLearning (CI-554) offered by Southern Illinois University, Carbondale discussed the results of the CIPP survey and the focus-group interview results relating to possible course modifications.

Findings

Phase 1

CIPP needs assessment.

Needs of online master's program students were identified through a CIPP survey sent to all 63 students in the program. In total, 38 students (30 male, 8 female; age range, 23-29 years) returned the survey. The majority ($n = 29$) had Bachelor's of Science degrees, while the remaining 9 had Bachelor's of Arts degrees. When asked what reasons prompted them to register for the online master's program, the majority ($n = 32$) gave more than one reason. The most frequently cited reasons were "to improve themselves" ($n = 29$), "to provide career advancement" ($n = 23$), "for personal reasons" ($n = 18$) and "to secure new job opportunities" ($n = 18$), whereas the least-cited reasons were "a friend's influence" ($n = 3$), "family's influence" ($n = 1$) and "manager's influence" ($n = 1$). Students were also asked to assess their performance in the program, and the majority indicated their performance to be "middle-level" ($n = 18$) or "good" ($n = 17$), while a few assessed their performance as either "very good" ($n = 2$) or "bad" ($n = 1$). Importantly, no students assessed their performance as "very bad".

Students were also asked to select one course that they felt required further analysis and modification. Most students ($n = 17$) selected the Fuzzy Logic course, followed by Object Oriented Programming ($n = 9$), Data Mining ($n = 7$), Computer Architecture ($n = 3$), and Multimedia Systems ($n = 1$).

Findings of CIPP closed-ended questions.

The survey questions focused on five main areas, namely, course content, practical job training, instructors, feedback, and general issues. With regard to course content, most students ($n = 19$) reported that the course contained up-to-date information. However, 27 students pointed out that the course content did not place equal emphasis on theory and practice, and 16 students were undecided as to whether or not the course content emphasized personal work habits. With regard to practical job training, most students ($n = 31$) pointed out that practical preparation exercises helped them obtain expertise in specialized occupations, and 18 students stated that the practical job training activities were suited to their personal characteristics (i.e., abilities, needs, interests, and aptitudes). However, 30 students stated that the practical job preparation exercises were insufficient. With regard to course instructors, most students ($n = 33$) reported instructors to be helpful, cooperative, and interested in making the course a useful learning experience. However, most students ($n = 31$) reported that the instructors did not use the most appropriate instructional strategies, and most students ($n = 31$) also stated that when they encountered a problem related to the program, they did not receive immediate help from instructors and course assistants. With regard to feedback, most students ($n = 15$) were undecided about the feedback provided by instructors and

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teaching assistants, and 13 students pointed out they were unsure as to whether or not they were gaining sufficient knowledge and skills through the course. With regard to general aspects of the course (i.e., course materials, course length, student satisfaction), 28 students reported that the course materials were of sufficient interest; however, 25 students found the course to be too short, and 14 were undecided as to whether they were satisfied with the quality of the course.

Findings of the CIPP survey's open-ended question.

To obtain suggestions from students regarding improvements to the online master's program, an open-ended question was included at the end of the CIPP survey, to which 25 out of 38 students responded. Suggestions are presented below according to "themes" and the number of students mentioning them.

Content: Eleven students recommended that the content of the courses should be redesigned. They pointed out that the courses should contain more videos and graphics, and they advised taking into account material design principles when redesigning existing materials. Some students suggested that the courses should include more exercises and detailed information. Finally, students also emphasized that in some courses, the content was not presented in a logical order.

Interaction: Nine students indicated their dissatisfaction with student-student interactions, and they suggested that a social forum or chat room in which students and instructors can share knowledge should be added to the system to enhance these interactions. For the same reason, they advised conducting face-to-face meetings at the beginning, middle, and end of the semesters and extending the length of these meetings.

Sources: Six students pointed out that the system did not present sufficient sourcing, and they suggested that a resource page be provided so that interested students could obtain more detailed information. Moreover, two students suggested that instructors prepare videos and other documents related to the course content and incorporate these tools into the system.

Technical and usability problems: Five students complained about technical and usability problems that they said created distractions. They emphasized visual and audio problems encountered while watching the videos in the system as well as usability problems such as non-functioning buttons, inaccessible pages, and various mistakes in the "I forgot my password" section.

Recordings: Four students emphasized recording synchronous meetings and archiving them in the system. As one student stated, "I am working, and for that reason, I cannot participate in most of the synchronous meetings. The meetings should be recorded."

Instructors: Three students stated that the instructors did not seem to be interested in teaching in the online program. According to these students, during the synchronous

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meetings, most instructors just repeated the course content contained in the system and did not assess student performance.

Decisions made based on survey findings.

A large number of questions on the CIPP survey were answered as "undecided"; therefore, the program directors agreed that an in-depth study should be conducted. However, because of time limitations and cost-effectiveness, they decided that this study should focus on improving one course only. Since the Fuzzy Logic course was the most frequently cited by students as needing improvement, it was decided that the in-depth study should focus on this course.

Phase 2

In-depth needs assessment.

A focus-group interview was conducted, and written responses were analyzed and categorized into four groups of themes that were coded as follows: Suggested changes in course structure, suggested changes in course content, promoting instructor-student and student-student contact, solving technology-based problems.

Suggested changes in course structure.

Most students who participated in the focus-group interview sessions pointed out the need for *face-to-face meetings* to revise and reinforce the course content. They emphasized that these meetings would allow students to ask questions and would increase student-instructor contact. A great majority said that seeing midterm exam questions was essential for their success in the final exam and stated a preference for on-ground midterm exams conducted in a face-to-face format that would enable them to discuss the exam questions with faculty and other students after the exam was over. Some students said they found the requirements of the courses to be extremely high, adding that not having the opportunity to discuss the items covered with their instructors or peers following the weekly sessions put them at a disadvantage and decreased their chances for success.

Suggested changes in course content.

A great many students implied that the course content should include more examples and applications of the subject matter, stating that they were concerned about the difficulty in transferring the knowledge gained through the program to real life. Some students suggested that projects created by previous students be accessible somewhere in the system as a way of providing guidance in developing their own projects. The need to include detailed information on the subject matter in order to lessen difficulties and enhance comprehension was also mentioned. Moreover, students emphasized certain problems relating to presentation of the course content, namely, that the content was presented mostly in a text-based format, and they suggested that more content-related

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pictures, animations, and video clips be added. Students also complained about problems accessing existing video clips. Furthermore, students suggested that the course Web site list more resources and provide enhanced opportunities for file-sharing, which would allow them to follow the activities of other students. Students also recommended that they be divided into groups so that they could work cooperatively on projects and assignments.

Promoting instructor-student and student-student contact.

Students pointed out that faculty-student contact was inadequate, and some suggested arranging face-to-face meetings to augment faculty-student contact, which they felt was essential for succeeding in the course. They claimed that the information presented in the course material and chat sessions was inadequate for their success. Some students emphasized the need for an effective social-sharing environment that would enable them to contact their peers, adding that because they did not know each other, they could not conduct any joint activities (e.g., form groups, study together, share homework, or work collaboratively on projects). A few students stated that a social forum should be formed on the course Web sites and face-to-face meetings should be arranged to encourage student-instructor and student-student contact as a means of motivating them to study more, attend chat sessions, and complete the course. Other students asserted that adding new activities could enrich the course presentation techniques of instructors.

Solving technology-based problems.

Most students complained of technology-based problems related to loading of course content and materials, namely that an extremely long time was required for content loading.

SIU CI-554 graduate students' suggestions for improving Fuzzy Logic course.

CIPP survey and focus-group interview findings were discussed by graduate students attending the CI-554 E-Learning Class at Southern Illinois University. The graduate students identified three main issues for evaluators to consider, namely, those relating to lesson content, those relating to student and instructor interaction, and those relating to assessment. The following recommendations were reported to course managers:

- Create more activities that allow learners and instructors to synchronously interact online.
- Work with instructional designers, who not only can provide assistance with design and selection of media (such as video, animations, and images, as requested by students in the focus group), but who can also offer guidance in creating job-related activities and suggest ways to provide additional examples and resources.

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- Project-specific feedback should be obtained from students throughout the program and, in turn, students should receive frequent performance feedback. Students need the opportunity to reflect and correct problems.

- Consider increasing feedback to students during project activities by arranging formative peer-feedback that helps students improve their learning products without requiring excessive instructor time.

- Provide more opportunities for interaction. Considering that students specifically requested face-to-face interaction and a forum, consideration should be given as to how face-to-face opportunities can be provided. A threaded discussion forum could be implemented immediately.

- Feedback from focus-group participants suggesting the course requirements were too high could indicate that students do not understand the course requirements or that the organization of course content needs to be revised to be delivered in a consistent manner across modules.

- Take a closer look at the technological problems that students are having, and provide an FAQ on the course Web site to address the most common technical issues.

Decisions made based on suggestions.

Findings from the focus-group interview and the suggestions of SIU CI-554 eLearning graduate students were discussed in a meeting of the managers of the online master's program. Instructors and assistants also attended the meeting and provided their own opinions regarding the feedback relating to course improvement. Taking into account all the findings and suggestions, the managers decided to make certain modifications to the Fuzzy Logic course design. Here, it should be emphasized that time limitations and cost effectiveness were two important factors affecting these decisions. Table 2 shows the tentative plan presented to the managers based on the views and suggestions of students in the course, SIU graduate students, and course instructors.

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Table 2

Tentative Course-Revision Plan Based on Views and Suggestions

Suggestions	Plan
Face-to-face meetings (program students' opinions).	Face-to face sessions will be integrated.
Create more activities where learners-instructor interact online -synchronize- (graduate students' suggestions).	The course instructor will arrange synchronous meetings to discuss course activities with students .
More projects. Provide peer feedback for project assessments (graduate students' suggestions).	The instruction will be more project-based. Peer-feedback process will be included.
Eliminate superficial knowledge regarding subject matter and provide more examples (program students' suggestions).	Course content will be redesigned to be more detailed and contain more examples.
The course is heavily text-based. The number of visuals, animations, and video clips should be increased (program and graduate students' suggestions).	The number of visuals, animations, and video clips will be increased.
Limited access to video clips prepared by the instructors. Students should have access to the video clips throughout the semester (program students' suggestions).	Students will have access to video clips throughout the semester.
Limited resources. Instructor should recommend more resources (program students' suggestions)	Instructor will recommend more resources.
No sample project. Some projects from previous years should be placed on the course web page (program students' suggestions).	Some examples of projects from previous years will be added to the system.
Inadequate student-student communication. Student-student communication might be increased (program students' suggestions).	Each student will be guided in preparing a personal web page including their hobbies, likes, dislikes, etc.
Inadequate student-instructor communication. Student-instructor communication might be increased with face-to-face meetings (program and graduate students' suggestions).	Face-to-face sessions will be integrated.

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Phase 3

Modifications implemented.

Modifications were implemented in Phase 3 of the study. Course content was revised so that additional examples were embedded and the use of visuals, animations, and video clips was increased. Video clips were also made accessible throughout the whole semester, and, in line with student requests, some of the best projects from the previous year were placed on the course Web site. Student-instructor interaction was increased by arranging face-to-face meetings, and course assistants were charged with providing immediate feedback to students' email questions. Student-student interaction was increased by guiding students in preparing their own web pages including their hobbies, likes, dislikes, and so on and linking these web pages to the system so that students could interact with each other more. Face-to-face meetings were also arranged at the beginning of the semester and prior to each exam in order to answer students' questions, provide suggestions regarding assessments. Sample exam questions and a list of study resources were also added to the system. Finally, a midterm exam was added to the course evaluation procedures.

Re-evaluation of the Fuzzy Logic course design after modifications.

The Fuzzy Logic course was redesigned two months after the start of the spring 2010 semester, in which 19 students were enrolled. Data was collected, and infrastructure modifications were prepared by course assistants and the system administrator, an instructional technologist. The course instructor, an instructional designer, worked with the assistants and the system administrator during the modification process, and one of the researchers, an expert on the usability of web-based systems, provided additional guidance to the system administrator. In the spring 2010 semester, both the old and the newly redesigned versions of the course were presented to students, and changes in course design were announced to the students on an ongoing basis as additional projects, exercises, and homework were incorporated into the system.

At the end of the semester, all students in the course were sent a form with three demographic questions and five open-ended questions about the course. In total, 16 of 19 students completed the form and returned it to one of the researchers, a usability expert. The majority of students returning the form were males ($n = 13$). Moreover, the majority held Bachelor of Science degrees ($n = 14$), and the remaining two held Bachelor of Arts degrees. In assessing their performance in the course, 10 students rated their performance as either "not good" or "bad", and 6 of them rated their performance as "good". Data was evaluated using open-coding analysis, as follows.

Effects of the modifications on students' performances.

Of the 16 students who returned the forms, 15 answered the question "To what extent did the modifications to the course affect your performance? (Please mention both positive and negative effects.)" Of these, 11 students stated that the additional visuals,

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examples, and detailed information as well as the reorganization of the course content made the lesson more understandable and that the project-based course design increased their interest in the course content; however, two of these students stated that even though the modifications positively affected their performances, more examples should be included in the system. In addition, two students stated that the course modifications did not affect their performance and two students stated that they did not know whether or not redesigning the course affected their performance.

Modifications and their effects on student participation.

Thirteen out of 16 students answered the questions, "Which modification(s) positively or negatively affected your participation in the Fuzzy Logic course? Could you please provide the reasons?"According to nine students, the inclusion of examples of fuzzy logic used in real life, project-based course design, and additional visuals related to course content increased their motivation and participation in the course; two students stated that although project-based course design was good in terms of increasing participation, the complexity of the projects made them difficult to complete in a limited time; and two students stated that the modifications had neither a negative nor a positive effect on their participation.

Sufficiency of the modifications done for the Fuzzy Logic course.

Fourteen out of 16 students answered the question, "In your opinion, were the modifications made in the Fuzzy Logic course sufficient or not?" Of these, 11 stated that the modifications were sufficient and that the new system was better than the previous one; however, 10 of these 11 students emphasized that while the new design was adequate in terms of course content, there was insufficient visual material in the system. In addition, two students stated that the modifications were not sufficient, and, of these, one stated that only 10% of the modifications she had requested were implemented, that more visuals and examples were needed and that the informal language used in the content caused problems. Finally, one student stated that she did not want to comment on this question because she was not an expert on instructional design.

Suggestions for other modifications.

Fourteen out of 16 students answered the question, "Do you have any suggestions for improving the Fuzzy Logic course?" Of these, one student stated that the changes were sufficient; 10 stated that the modifications were good, but more visuals and examples could be added and the content could be reorganized to proceed step-by-step from basic to complex topics; and three students criticized the changes, stating that the projects were too complex and there were no clear explanations regarding course expectations.

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Applying the modifications to other courses in the online master's program.

Thirteen out of 16 students answered the question, "What is your opinion about making similar modifications in the other courses?" Of these, 11 students stated that the other courses should be redesigned with similar modifications. Moreover, they pointed out that although their different backgrounds made it difficult for them to understand the course content in the area of informatics, the modifications to the course — including more visuals, examples, and projects, eliminating jargon, and reorganizing the course content — made the content more understandable to them. In contrast, the other two students responding to this question said they opposed making similar modifications to the other courses; rather, they advised asking for the opinions of students and course instructors before redesigning the other courses, since every course would need specific modifications.

Discussion and Conclusion

The aim of this study was to evaluate and redesign a representative course from the online master's program consisting of 12 courses from the informatics field. The researchers chose to conduct an evaluation study in line with a context, input, process, product (CIPP) model, since this model is based on evaluating and redesigning programs by defining the needs of participants in terms of context, strategies, plans, activities, interaction, and assessment. Moreover, the CIPP model aims to help decisionmakers make improvements in programs (Boulmetis & Dutwin, 2005).

The online master's program was evaluated in three phases using a mixed-methods methodology. In Phase 1, the researchers prepared a CIPP survey instrument in line with relevant literature and vetted by experts and sent the survey to all students in the online master's program in order to define students' needs (Research Question 1). Analysis of the responses of the 38 students who returned the survey revealed three issues for decisionmakers to take into consideration in revising the program, namely, course content, interaction, and assessment. According to Willging and Johnson (2004), these issues, which are related to course quality, have an influence on dropout rates.

Since the students responding to the CIPP survey selected the Fuzzy Logic course for redesigning, and since cost-effectiveness is an important issue in e-learning program design, Phase 2 of the research began by defining students' specific concerns related to the Fuzzy Logic course (Research Question 1) through a focus-group interview conducted with students in the course. The findings indicated that the course content should be redesigned to include more examples, videos, and other visual material and that interaction should be increased through face-to-face meetings. The focus-group interview also made clear that students in the Fuzzy Logic course were not satisfied with the course assessment procedures and wanted more project-based assessments. With

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regard to the findings on course content, Garrison and Kanuka (2004) have emphasized blending text-based asynchronous internet technology with face-to-face learning as an emerging trend in higher education that is often referred to simply as "blended learning" (p.96).

The findings of the focus-group interview were presented to graduate students in an e-learning class at Southern Illinois University, who were asked to provide suggestions as to how the Fuzzy Logic course could be improved. A report prepared by the graduate students and sent to the researchers highlighted three main points to be addressed in redesigning the course, namely, content, interaction, and assessment.

This report and the focus-group interview results were subsequently presented to the managers of the online master's program, who, based on this information, defined strategies and planned activities to address the needs of the online master's program students (Research Question 2), as follows: arranging face-to-face meetings; conducting a midterm; making the course more project-based; increasing the number of visuals, including animations and video clips; presenting more detailed information about the course content; recommending more resources; making examples of projects from previous years accessible through the course management system; and increasing student-student interaction by helping students to develop personalized web pages and linking them to the system.

In Phase 3 of the study, the Fuzzy Logic course was redesigned according to the program managers' decisions. Instructors, course assistants, a usability expert and the Web site administrator worked together in redesigning the course (Research Question 3). Although not all of the suggestions or findings from the survey and focus-group interview were taken into account in redesigning the program, the instructors, working together with the course assistants, defined the examples, animations, video clips, and other visuals and selected two or three of the best projects from the previous year to be placed on the system. To increase interactions, face-to-face meetings with the instructor were arranged before the exams, and the course assistants were charged with providing immediate feedback to students' emails. In addition, personalized web pages that included information on students' hobbies, likes and dislikes, and so on were added to the system to increase interaction between students. To better meet students' needs in terms of assessment, the instructor redesigned the course to offer more project-based learning and took student performance into account in assessments.

Students were surveyed about the newly designed course using a form that included open-ended questions about the new course design (Research Question 4). A total of 16 out of 19 students returned the form. According to the findings, most students were pleased with the new version of the course. Students indicated that the additional examples and visuals, more detailed information, and reorganized course content made the lesson more understandable and that the project-based course design made the course more interesting than other courses. Moreover, 11 students stated that while they

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found the modifications sufficient, the course could still be improved through more visuals. When asked, "Do you have any suggestions for improving the Fuzzy Logic course?" most students again advised adding more visuals and examples. Furthermore, most students recommended that modifications similar to those made in the Fuzzy Logic course should be made in the other courses in the online program. Using a CIPP model and in line with design-based research, the other courses of the online master's program will be redesigned within the framework of future research.

It is believed that this study will be an example for the future research studies on the systematic evaluation of online courses. The CIPP model used in this study enabled the researchers to focus on content, input, process, and products of the online master's program from the perspectives of different stakeholders: students, instructors, and managers. It is also believed that this study might take place as a good research example in the online and distance learning literature in that it combined different perspectives in line with the CIPP model.

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Interaction, Critical Thinking, and Social Network Analysis (SNA) in Online Courses

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Abstract

This study tried to ascertain a possible relationship between the number of student moderators (1, 2, and 3), online interactions, and critical thinking of K-12 educators enrolled in an online course that was taught from a constructivist approach. The course topic was use of technology in special education. Social network analysis (SNA) and measures of critical thinking (Newman, Webb, & Cochrane, 1995) were used to research and assess if there was a difference in interaction and critical thinking between 1, 2, or 3 student moderators who facilitated a forum discussion of an assignment in an online course. The same course was repeated over three years. Each year either 1, 2, or 3 students moderated. The analysis indicated more discussion per non-moderating student with the three student moderated group. Using SNA we found that there was only one noticeable difference among the three groups which was in the value of network centralization. Using critical thinking measures the three student moderator group scored higher in five of the eight critical thinking categories. Variations in instructor presence in the online courses may have influenced these findings.

Keywords: Constructivism; critical thinking; distance education; online learning; peer facilitators; social network analysis; student moderators; teacher education

Introduction

As online teaching and learning becomes more prominent it is important to consider the effectiveness of various pedagogical approaches. Many in the field (Chang & Smith, 2008; Legg, Adelman, Mueller, & Levitt, 2009; Murphy, Mahoney, Chen, Mendoza-Diaz, & Yang, 2005; Murphy & Rodriguez-Manzanares, 2009; Payne & Reinhart, 2008) concur that the constructivist approach is well suited to the online format. Within this pedagogic frame there are educators and researchers who have students moderate/facilitate online discussions (Baran & Correia, 2009; Barnett-Queen, Blair, & Merrick, 2005; Hylton, 2007; Murphy et al., 2005; Thormann, 2008). Examination of literature about student moderation, critical thinking, and the constructivist approach in online learning provides a foundation for this research in which we used SNA and Newman et al's (1995) critical thinking measures.

Literature Review

Student Moderation

Use of student moderators in online courses has been shown to generate more frequent and in-depth communication on the part of students (Hara, Bonk, & Angeli, 1998; Seo, 2007; Poole, 2000; Thormann, 2008). Thormann (2008) reported that student moderation enhances student ownership of the content, increases participation, and broadens the discussion.

In a study by Barnett-Queen, Blair, and Merrick (2005) student-led discussions were viewed as encouraging more student-to-student interaction by undergraduates. However, some students in this study viewed the sparseness of instructor participation negatively. Poole (2000) found that student moderator presence increased posting frequency and length of posts and that students' self-reports suggest peer moderation helps to build a sense of community and shared responsibility. Similarly, the online education model of Murphy et al. (2005) incorporates student facilitators to enhance the development of an online community. Moderation can be positive for the moderator's learning as well since the moderator processes content on the level normally reserved for the instructor (Hara et al., 1998; Poole, 2000).

Since instructor presence in online forums may dominate a discussion and cause students to curb participation, student moderation may encourage freer discussion and analysis of ideas (Seo, 2007). Tagg (1994) suggests that the differing power relationships of student-student and student-instructor can benefit learning when student moderators are used, in that instructors and student moderators perform

complementary functions to create a welcoming learning environment and generate discussions.

Student Moderator Role

In a study to examine student collaboration, Wang (2009) found that student group work encouraged individual accountability and positive interdependence, but that external supervision by an instructor or facilitator benefited group learning by facilitating organization, interpreting, and synthesizing of information and ideas. Wang's discussion of the role of external supervision aligns with potential tasks student moderators can perform.

Hara et al. (1998) conceptualize the moderator role as fulfilling "starter-wrapper" duties, which include encouraging conversation through questions and statements and synthesizing peer contribution. Since students may be reluctant to respond to a complex or unpopular topic, the moderator initiates and supports discussions. Student moderators can encourage group interaction by validating contributions and linking postings, which allows students to learn from the contributions of others (Hara et al., 1998; Winograd, 2000). According to Tagg (1994), teacher validation of students' contributions is experienced as having a greater impact than peer validation, although the latter was effective as well.

Cifuentes, Murphy, Segur, and Kodali's (1997) definition of student moderation goes beyond the starter-wrapper role to include intellectual, social, and organizational roles. Intellectually, moderators can encourage participation by formulating questions and commenting on student posts. Socially, moderators facilitate discussion and help to maintain a welcoming learning environment. As organizers, moderators set agendas and monitor requirements. Student moderators often fulfill the role of synthesizing discussion across student posts, so that the time-consuming task of cross-group communication does not fall entirely on the instructor or other students (Tagg, 1994; Thormann & Zimmerman, 2012).

Fidalgo and Thormann (2012) studied interaction from an SNA perspective in two online courses, one taught by an experienced online teacher and the other by a novice. Student moderation was one feature that the experienced instructor used to promote student interaction. These researchers found that there was greater inclusiveness and a higher degree of centrality (distribution of power) in the course with student moderators. Tagg (1994) supports the notion of shared responsibility and explains that student moderators aid in distributing the labor of facilitation. An instructor is typically responsible for these duties in face-to-face courses, but peer-based moderation may function well in online forums due to organizational and collaborative needs of online learning. Examples of these needs might be pulling together ideas from asynchronous postings, ameliorating the lack of audio-visual cues, and reading and responding to large numbers of posts (Hara et al., 1998; Tagg, 1994; Winograd, 2000). Student moderators can also aid in trouble-shooting technology issues (Cifuentes et al., 1997).

Additionally when all students are required to moderate during a course, students may participate fully to support their moderating classmates. This could be to ensure similar cooperation when they take the moderating role (Thormann & Zimmerman, 2012). Student participation can be influenced by discussion requirements. More participation can be seen when students are assessed weekly rather than earning a participation grade at the end of a semester (Fidalgo & Thormann, 2012). Thormann and Zimmerman (2012) indicate that most students responded positively to student moderation and instructors found it a useful tool for instruction and community building.

Critical Thinking

According to research about critical thinking in online learning, online forums offer the potential for critical thinking, problem solving, and active group participation similar to face-to-face classrooms (Al-Fadhli & Khalfan, 2009; Marra, Moore, & Klimczak, 2004). Aspects of online communication may lend themselves to deeper critical analysis in student posts compared to oral discourse, due to having the time to write, edit, and read others' posts and the reduction of social anxiety through relative anonymity compared to face-to-face settings (Maurino, 2006-2007). However, research studies (Gazi, 2011; Maurino, 2006-2007) suggest that the presence and competence of instructors or tutors remains important to ensure that online students engage with the material and each other in an active, substantive, and critical manner. Similarly, Fidalgo and Thormann (2012) found that online course structure, discussion guidelines, and requirements are important to ensure the quality, rate, and depth of student interaction.

Constructivism and Critical Thinking in Online Learning

Despite individual learners demonstrating facets of critical thinking, Newman et al. (1995) posit that critical thinking is generated from student-student or group interaction, whether online or face-to-face. In accordance with this, Fidalgo and Thormann (2012) equate shared reflection of content and discussion to be fundamental to critical discourse in online courses. In studies conducted by Akyol and Garrison (2007) and Gold (2001) they found that student collaboration in both online and blended courses engendered higher-order learning outcomes. The facilitation of critical thinking through the co-construction of knowledge aligns with the constructivist approach to learning. In this approach, student-student combined with student-instructor interaction facilitates critical thinking and problem solving (Gold, 2001; Ladyshewsky, 2006).

Constructivism is learner-centered and typically based on authentic learning, in which the problems and scenarios reflect students' lives (Gold, 2001; Carwile, 2007). Instead of the traditional 'sage on the stage' approach, in which instructors impart knowledge that learners passively take in, online constructivist learning requires that students engage critically with new information through problem solving, analysis, and the interpretation of new information through prior beliefs, experiences, and perspectives (Ladyshewsky, 2006; Murphy & Rodriguez-Manzanares, 2009). The instructor's role in

constructivist learning takes a de-centered position as a facilitator who guides learners to engage critically with the material and collaborate with other students, and rarely imparts knowledge directly (Carwile, 2007). Research by Gold (2001) found that a constructivist approach increases interaction between students in online settings. Since individual perspectives cause interpretation of the same information differently, constructivist learners benefit from student-student interaction and the ability to demonstrate learning through shared posts (Gold, 2001; Ladyshweky, 2006). In doing this the learners may form a more cohesive understanding of information.

Statement of Purpose

The research cited establishes that having students serve as moderators for discussions in online courses can be advantageous for learning. In addition, there is evidence that critical thinking skills can be exercised well in constructivist learner-centered online courses involving peer interaction. But there is not agreement as to how student moderation should be implemented to promote interaction and critical thinking in online courses. The authors have used various strategies including having one, two, and three student moderators (SM).

This study may help provide direction as to how and if the number of SM makes a difference. SNA was used to measure interactions while Newman et al.'s (1995) measures were used for critical thinking. This study will hopefully also start a discussion about other aspects of SM implementation and promotion of critical thinking in online course discourse.

Methods

Setting

The course discussions that are analyzed are from three separate graduate level courses about technology and special education. The analysis focuses on the same assignment in three different course sections. The assignment was in the same ordinal position in each section. Courses were held in the fall of 2007, 2008, and 2010 with 13, 9, and 13 students enrolled in the courses, respectively.

In the assignment, non-moderating students selected a web accessibility tool to evaluate five pages of their school or district's Web site. After posting their report in 2010 each student was required to read at least one classmate's report. They were asked to compare and contrast their report with others, ask at least one question, and then respond to all comments and questions about their own report. In 2007 and 2008

although follow up was not required for this assignment almost all previous assignments in these two years (and 2010) required this follow up. Students participated fully in 2007 and 2008. In all years each group contributed at least the "required" number of responses without being a requisite.

The moderator directions were the same for all three sections. Each student was asked to select a week/topic to moderate. Moderators were not required to write or post a report for the assignment they moderated but were directed to be familiar with the assignment content.

The moderator(s) role was as follows:

    a.   Focus the discussion on course content and encourage new ideas;

    b.   Initiate further discussion through questions or observations;

    c.   Find unifying threads and communicate them;

    d.   Draw attention to opposing perspectives, different directions, or conflicting opinions and encourage debates;

    e.   Summarize and post a report about the discussion by restating the ideas and controversies, as well as clarifying misconceptions. The summary serves to pull ideas together.

Students took the moderator role after the third assignment was completed. This was done so students could observe the instructor moderate. When modeling moderation, the instructor attempted to engage students to use critical thinking skills. In addition, the instructor stayed on topic, responded to each student's assignment, and extended knowledge.

The constructivist teaching approach encouraged student participation and critical thinking by giving students time to engage with each other before the instructor entered the conversation, especially once student moderators were in charge. In the past the instructor found that if she entered the conversation too early it curtailed student contributions.

The analysis of Web sites in the assignment studied was used as a jumping off point for the discussions. In addition, class structure included *Coffee Shop* and *Teacher's Room* forums, where students could discuss topics that did not relate directly to the weekly assignment. This seemed to help students write focused contributions and the requirements asked that contributions to discussions be substantive.

Participants

The instructor, who has taught online courses since 1996, was the same for the three courses. Students were nationwide K-12 educators in the United States, most of whom were earning a master's degree in Technology in Education online. This course ranged from being the fifth course in the online program for some students to the eleventh and final course for others.

Ethical Considerations

The instructor did not contemplate conducting this research until a year after the last class was completed. Thus students were not involved in an experimental design. No student names or identifying information is revealed. In addition, students' contributions in the discussion were not included in this study.

Student Postings Data Analysis Procedure

A statistical comparison among the three forms of student moderation was performed on the participant student (non-moderator) posting frequencies. A single factor ANOVA was used to compare the effect of a variable number of student moderators on the participation rate of the other students enrolled in the course, as measured by the number of postings to course discussion forums.

Social Network Data Analysis Procedures

SNAPP (Bakharia, Heathcote, & Dawson, 2009) produced the matrices for SNA. In addition, SNA using UCINET software (Borgatti, Everett, & Freeman, 1999) was used to do in-depth analysis of network structures and participant interactions. The main indices calculated were cohesion, centrality and centralization, betweenness, and closeness.

SNA is defined by Breiger (2004) as "the disciplined inquiry into the patterning of relations among social actors, as well as the patterning of relationships among actors at different levels of analysis (such as persons and groups)" (p. 507). Reinforcing this idea, Scott (2000) adds that "Social network analysis emerged as a set of methods for the analysis of social structures, methods that specifically allow an investigation of the relational aspects of these structures" (p. 38). SNA describes interactions using numerical data. In an effort to gain a deeper understanding of the SNA measures, text analysis was done.

Critical Thinking Data Analysis Procedures

The text analysis method consisted of reading and coding student interactions and doing a content analysis using Newman et al.'s (1995) 10 critical thinking categories. These coding categories have been used by others (Wickersham & Dooley, 2006), compared with other coding systems (Marra et al., 2004), and found to be acceptable to

examine students' critical thinking in online communications. Other critical thinking measures were considered (Gunawardena, Lowe, & Anderson, 1997; Hara et al., 1998; Seo, 2007), but Newman et al.'s measures appeared to be more widely used and were more amenable to interpretation.

In their content analysis method for critical thinking of online discussion threads, Newman et al. (1995) divide critical thinking into multiple categories, graded positively or negatively depending on the use of the facets of critical thinking. These categories are relevancy, importance, new ideas or outside knowledge, clearing ambiguities, linking ideas, facts and notions, justification, critical assessment of contributions, practical utility of ideas, and widening the discussion. Although the precise definition of critical thinking and categories in online learning settings can vary between fields of study and cultural contexts (Woo & Wang, 2009), Newman et al.'s method achieves generalizability due to its thorough scope and combination of previous, accepted models of analysis for critical thinking, such as Henri's (1991) cognitive reasoning skills and Garrison's (1992) five-stage critical thinking model (Wickersham & Dooley, 2006).

Two of the researchers coded the data. Training was done by first discussing the 10 categories to establish a shared understanding. For practice, we coded student postings in other forums together followed by coding non-research postings independently. Once some inter-rater reliability was reached each student's threaded discussion was copied into a text document and the researchers coded the postings separately. One point was given for each occurrence within a category. There were 31 student postings for the 1 SM group, 56 for the 2 SM, and 52 for the 3 SM. The length of each posting was typically from 1 to 10 sentences. Thus the y axis in Figures 5 and 6 represents the number of each category occurrence. Afterwards, each posting was reviewed to check for rating agreement.

Newman et al.'s categories of I (importance) and R (relevance) were difficult to distinguish. Thus we decided to eliminate I. We also found overlap between C (critical assessment) and J (justification) and L (linking ideas, interpretation), but we came to a consensus of how to interpret each category in our final coding discussions.

The ratio and data analysis procedures that Newman et al. used were not applicable to this study due to a minimal number of negative critical thinking scores. The course guidelines required that students post substantive information, and there were specific outlets for socializing.

Although we changed the way the analysis of interactions was calculated, the categories were still valuable to assess critical thinking between different treatment groups. We compared the differences in the types and quantities of categories between groups. We did not code the instructor's postings since we were not investigating instructor critical thinking. In order to compare directly the results of the group of 9 students with those of the two groups of 13 students, we scaled the numbers from the group of 9 by a factor of 13/9 [1.44].

A chi square test of independence was applied to the resulting data of critical thinking category postings to determine whether the frequency and/or pattern of responses was significantly different. Each of the three student moderator intervention groups was compared with the other two in paired fashion.

Findings

Number of Posts

The 3 SM group had the greatest average number of postings but the lowest average number of moderator postings. The 1 and 2 SM groups had approximately the same average numbers for SM postings and non-moderator postings.

Table 1

Numeric Participation and Average Number of Postings

# of Student Moderators	3	2	1
Year	Fall 2010	Fall 2007	Fall 2008
# of Total postings	106	78	46
# of Instructor postings	24	8	7
# Student Moderator postings	10	14	8
# Student Non-Moderator postings	72	56	31
# of Student Non-Moderator participants	10	11	8
Average # of Student Non-Moderator postings	7.20	5.09	3.88
Average # of Student Moderator postings	3.33	7.00	8.00

Figures 1, 2, and 3 indicate the number of interactions by participants in each group.

1 SM (2008)

	A	SM	Instructor	B	C	D	E	F	G	H
Number of posts per participant	9	8	7	5	4	4	3	2	2	2
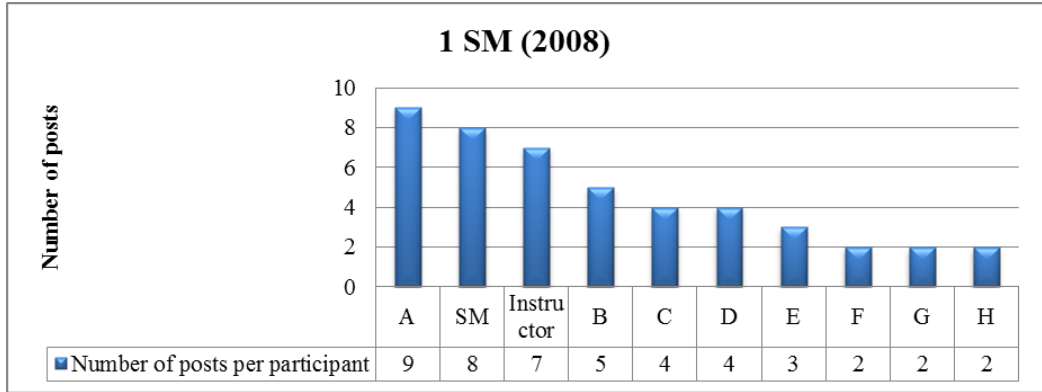
Figure 1. Number of posts per participant of 1 SM forum.

2 SM (2007)

	SM	Instructor	A	B	C	D	E	F	G	H	SM	I	J	K
Number of posts per participant	11	8	8	7	7	7	6	5	5	4	3	3	3	1
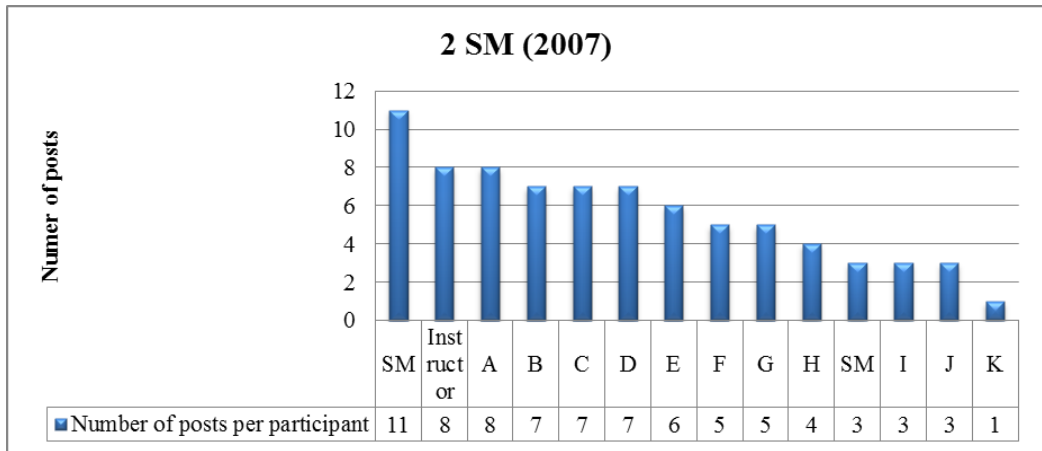
Figure 2. Number of posts per participant of 2 SM forum.

3 SM (2010)

	Instructor	A	B	C	D	E	F	G	H	I	J	SM	SM	SM
Number of posts per participant	24	13	9	8	8	7	7	6	6	4	4	4	3	3

Figure 3. Number of posts per participant of 3 SM forum.

The 3 SM group had the greatest average number of participant student postings; the 1 and 2 SM groups had significantly less as measured by a single factor (course SM size) ANOVA (Table 3). With an *F*-value of 4.574, the differences in the number of student postings between the different SM size groups was significant at the $p = 0.02$ level.

Table 2

Single Factor ANOVA on Number of Student Postings by SM Size

ANOVA

Source of Variation	SS	*df*	MS	*F*	*P*-value
Between Groups	51.857	2	25.929	4.574	0.020
Within Groups	147.384	26	5.669		
Total	199.241	28			

Paired class examination of student non-moderator participation with the t-test indicates that the significance in performance occurs between two and three student moderators. Table 3 shows that there is no significant difference in student non-moderator participation be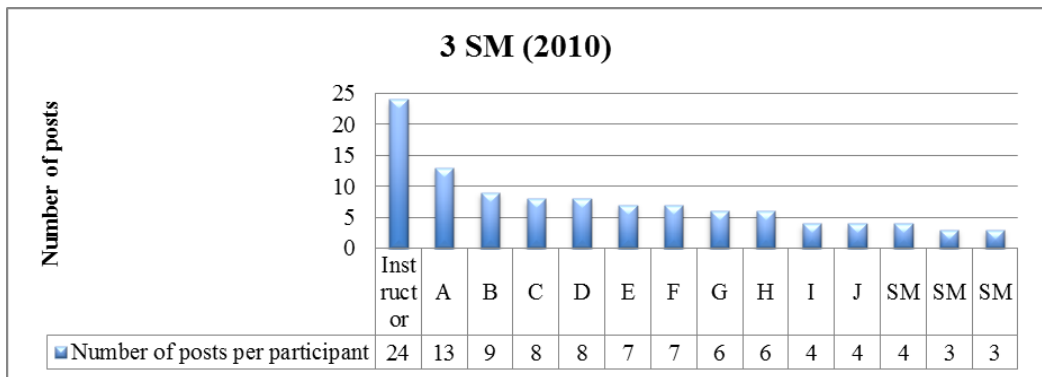tween the one and two student moderated classes ($p = 0.13$). But both one and two student moderated classes experienced significantly lower posting rates than the class with three student moderators (Table 4 $p = 0.01$ and Table 5 $p = 0.03$, respectively).

Table 3

Student Non-Moderator Participation

t-Test: 1 vs 2 Student Moderators

# of Student Moderators	1 SM	2 SM
Mean	3.88	5.09
Variance	5.55	4.69
Number Non-Moderator Students	8	11
df	17	
t Stat	-1.16	
p	0.13	

Table 4

Student Non-Moderator Participation

t-Test: 1 vs 3 Student Moderators

# of Student Moderators	1 SM	3 SM
Mean	3.88	7.20
Variance	5.55	6.84
Number Non-Moderator Students	8	10
df	16	
t Stat	-2.80	
p	0.01	

Table 5

Student Non-Moderator Participation

t-Test: 2 vs 3 Student Moderators

# of Student Moderators	2 SM	3 SM
Mean	5.09	7.20
Variance	4.69	6.84
Number Non-Moderator Students	11	10
df	19	
t Stat	-2.02	
p	0.03	

With respect to the participation of the student moderators (SM), we note that in the 3 SM group, moderator participation was low in comparison to others. In the 2 SM group, one moderator's number of postings was high and one low. In the 1 SM group the moderator had a comparable number of interactions but others in the group did not post with great frequency. The instructor was more than four times as active as the moderators in the 3 SM group. In the 1 and 2 SM groups the instructor's participation was a little less than one of the moderators.

SNA Relational Aspects of Networks

Through the use of UCINET software we did the analysis of the main SNA indices. Most of the main indices did not show any significant difference between the groups moderated by one, two, and three students. We decided to present only the indices in which differences were found between the three groups.

Centralization

"A graph centralization measure is an expression of how tightly the graph is organized around its most central point" (Scott, 2000, p. 66). Centralization is a special condition in which an actor plays a central role by being connected to all other actors, all of whom need to go through him or her to connect to each other (Alejandro & Norman, 2005).

The values of centralization are shown in Figure 4. The most active actors (focal points) from the three networks were not always student moderators. In the 2 SM group two students acted as moderators but only one stood out. In the 3 SM course all student moderators participated equally. The 1 SM course had the highest value of network centralization which means that the student in charge of moderating the forum played a central role connecting the other participants, unlike the other two courses. Despite these students' values, the instructor was also a focal point in the three courses, sharing higher values of centralization with some students.
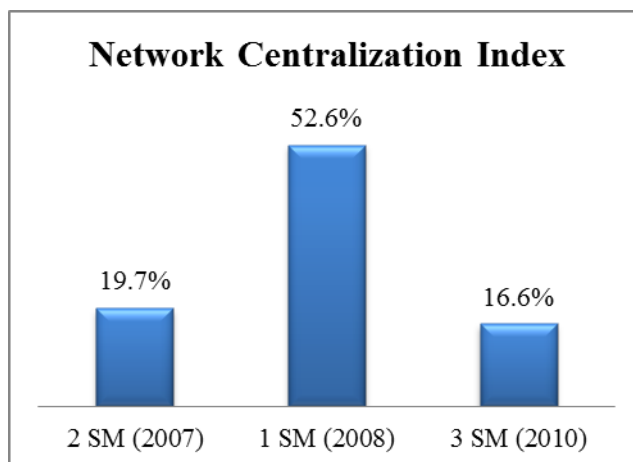

Figure 4. Network centralization index of 1, 2, and 3 SM forums.

Critical Thinking

On measures of critical thinking, paired chi square tests of independence show that the frequency of postings by critical thinking category by the 1 SM group is significantly lower than either of the 2 SM and 3 SM groups. The 2 SM and 3 SM groups did not show a statistically significant difference, even though the number of postings of the 3 SM group was noticeably greater.

Table 6

Chi Square of Critical Thinking Postings by SM Size

Chi Square

Group	2 SM	3 SM
1 SM	0.003	0.002
2 SM	-	0.313

The relevance rating was very high for all groups with the 3 SM group having about 25% more relevant postings than the other groups. Practical utility, outside knowledge/experience, and width of understanding were the most frequent types of critical thinking content and provided the differences that appeared between and among the three levels of student moderation. This was followed by critical assessment and linking ideas. The topic, type of student, and the questions and comments from the student moderators and instructor may have influenced this type of interaction. In almost all categories the 3 SM rate was higher than the others, followed by the 2 SM. The 1 SM group seemed to have posted fewer critical thinking postings than the other groups. In only two categories did any of the groups show negative scores, which were critical assessment and linking ideas. However, the number of postings in these categories was miniscule in comparison to the other positive postings. This was possibly due to course requirements.

Table 7

Critical Thinking Occurrences with One, Two, and Three Student Moderators

Critical Thinking Categories	1 Moderator (2008)	2 Moderator (2007)	3 Moderator (2010)
Justification+	32	33	24
Practical utility+	37	49	59
Outside knowledge/experience +	29	58	72
Critical assessment+	3	16	24
Width of understanding+	29	25	44
New information+	3	3	4
Linking ideas+	1	13	8
Ambiguities+	6	1	2
Relevance+	111	137	201
Justification -			
Practical utility -			
Outside knowledge/experience -			
Critical assessment -	10	12	20
Width of understanding -			
New information -			1
Linking ideas -	1		3
Ambiguities -			
Relevance -			

In summary, in five of the eight positive critical thinking categories the 3 SM group had a higher score followed by the 2 and 1 SM, respectively. Figure 3 shows that the instructor participated more than four times as much as the 3 SMs. This may have influenced the critical thinking in the discussion.
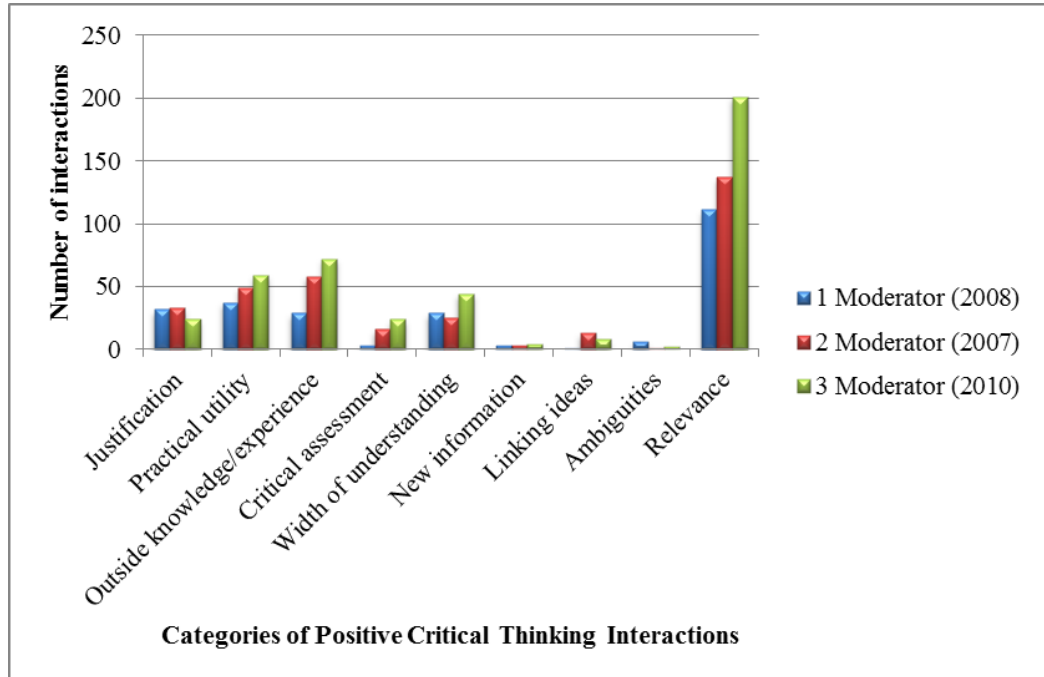
Figure 5. Number (*y* axis) and positive critical thinking interactions (*x* axis) of 1, 2, and 3 SM groups.
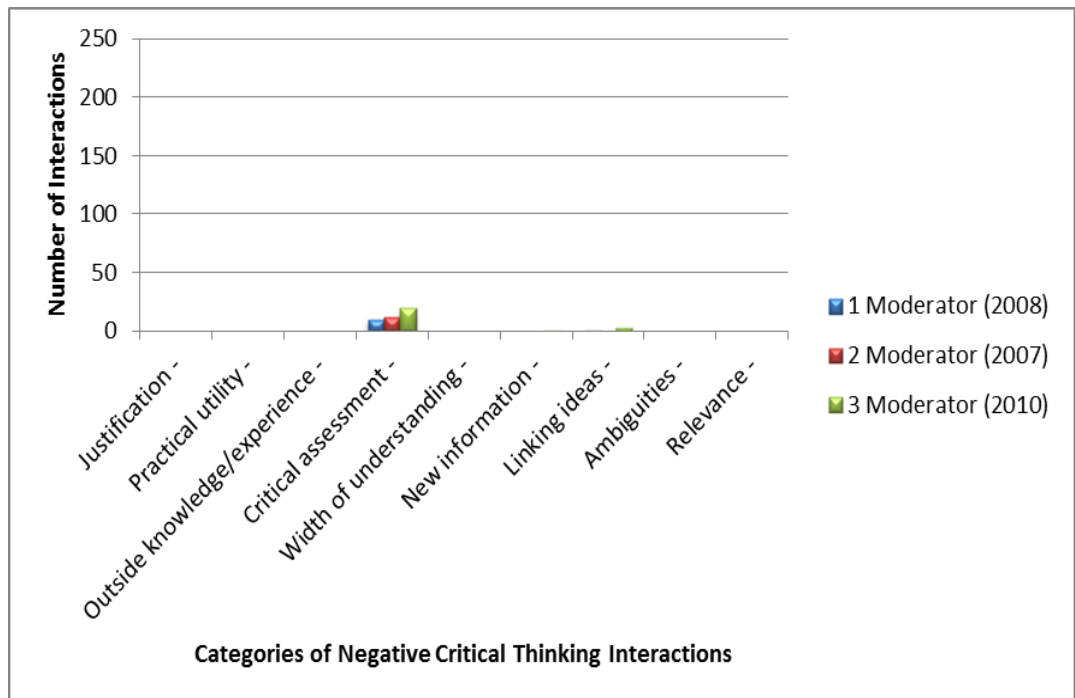

Figure 6. Number (*y* axis) and negative critical thinking interactions (*x* axis) of 1, 2, and 3 SM groups.

Implications for SNA

The presence of 1, 2, or 3 SM did not affect most measures of SNA. With the exception of centralization (how tightly the group is organized around its most central point), the measures of cohesion, centrality, betweenness centrality, and closeness had negligible variance.

The 1 SM network had a higher value of centralization (52.6%) which means that the network members were more tightly organized around focal points (Student A, the SM, and the instructor). This may have been due to the interaction dynamics promoted by having one SM.

The expected focal points were not exclusively the SM. In all three courses the instructor had a prominent role and in the 3 SM course another student competed with SM values. Despite the different centralization values, network cohesion (density) had similar values, which may indicate that although the focal points had higher centralization values (especially in 1 SM forum) the speed of dissemination of information among actors and the extent that those focal points had a high degree of social capital and/or social constraint was not very different.

Although the presence of student moderators did not greatly affect most SNA measures, the number of student moderators was positively aligned with average non-moderator postings. Average non-moderator posts increased with the number of student moderators, such that the 1 SM group had 4.2, the 2 SM had 5.3, and the 3 SM had 8.7. Additionally, the average number of moderator postings was negatively matched with the number of student moderators: 1 SM had 8, 2 SM had 7, and 3 SM had 3.3. This suggests that as the number of moderators increased individual moderators contributed less.

Implication for Critical Thinking

Generally, as the number of moderators increased the positive measures of critical thinking increased. Interestingly, just as the number of student moderators increased positive measures of critical thinking, the same occurred for negative measures. The only two negative categories of critical thinking exhibited by students, critical assessment and linking ideas, increased with the number of student moderators. This suggests that with the increase of non-moderator posts comes an increase in the use of critical thinking overall with 1, 2, and 3 SM.

The influence of the instructor is worth investigating regarding average posting and measures of critical thinking. This study concurs with the research conducted by Tagg (1994), which indicates that shared responsibility between instructor and moderator is useful. The 3 SM group had the most average non-moderator postings, least average moderator postings, and the highest levels of critical thinking, but had the greatest instructor contribution as well. It is possible that the instructor had an influence on

non-moderator postings, measures of critical thinking, and moderator contribution. This analysis should be examined with the understanding that the only statistically significant difference in critical thinking was between the 1 SM group as compared to the 2 or 3 SM group.

Since the instructor and the moderators perform related tasks of encouraging in-depth and critical discussion, there are implications for moderator training that could make the moderator presence more dominant. The constructivist approach encourages critical thinking through a de-centered teacher presence that guides students to problem solve or engage in deep analysis through peer collaboration (Gold, 2001; Ladyshewsky, 2006). The role of the instructor and moderators, then, is to foster instead of lead discourse. In order to foster critical thinking, prompting questions guide students to elaborate critically within discussions. Moderators could be trained to ask prompting questions based on the Newman et al. (1995) facets of critical thinking. For example, student moderators could ask questions that link ideas from other posts, ask students to elaborate on or invent practical solutions to problems, or bring outside knowledge on a topic.

There are also implications of the efficiency of 2 SM over 3 SM for moderator contributions. Average moderator contributions fell with the increase of student moderators. This drop may signify that multiple moderators exerted less effort while fostering more interaction and critical thinking. The 2 and 3 SM groups had significantly more average non-moderator student postings than the 1 SM group. But the increased instructor presence begs one to consider other implications. For example, it is possible that the 3 SM group did not take as much initiative, possibly due to a poor or unclear distribution of responsibilities that ultimately defaulted to the instructor.

The 3 SM group distributed the work evenly in responding to posts. In the 2 SM group one person interacted with classmates and the other wrote the summary of the discussion, which was one of the SM tasks. In effect, the 2 SM interactions were similar to the 1 SM group in that one moderator was wholly responsible for the discussion, but the 1 SM had to write the summary as well.

The instructor participated later in the conversation in all three forums. The number of days that elapsed appears to have been dependent on when the SM started to engage with classmates. In the 1 SM group the SM started to make comments and ask questions the first and second day her classmates posted their assignments. Similarly the primary SM in the 2 SM group interacted the first, second, and third day. The 3 SM group got involved two days after assignments were posted and ceased interacting after their initial posting. The timing and intensity of the 1 and 2 SM groups allowed the instructor to let the SM take charge, thus the instructor did not join the discussion until the eighth and second day, respectively. However, in the 3 SM group the sparse facilitation of the SMs pushed the instructor to jump in to enhance the discussion on the fourth day, which was one day after the 3 SMs posted.

Relationship between SNA and Critical Thinking Measures

SNA measures show how group interaction changed depending on the number of SMs. Based on a number of SNA measures the only measure that showed a difference was centralization, which was highest in the 1 SM group. The critical thinking data show that as the number of SMs increased the critical thinking measures increased. There seems to be a reverse relationship between the centralization index and the critical thinking measures based on the number of SMs.

Limitations

This study was small in scope. The instructor was obliged to respond to individual course dynamics among students and thus there were differences in the way the instructor interacted, as in the case of the instructor's high participation in the 3 SM course.

Recommendations

To be able to establish with more certainty what is the optimal number of student moderators, additional research could be conducted in courses with different content, with larger classes, or in courses in which the instructor uses a different teaching approach.

The three courses were designed and taught without regard to the research that was conducted. Rather, the research emanated from the observation that the number of student moderators varied and an interest in finding out how this variation affected interaction and critical thinking. It could be useful to examine 1, 2, and 3 SM in a pre-planned environment to control instructor participation as well as other variables.

Our findings indicate that student moderating is beneficial in many ways and supports inclusiveness, power sharing, student ownership of discussions, and critical thinking. Another finding was that the instructor also played an active role, which was contingent on moderator participation. Although the number of student non-moderator postings and critical thinking measures increased with the number of student moderators, moderator participation was the lowest in the 3 SM group and resulted in high instructor participation.

Conclusion

Online interaction is crucial for learning (Anderson, 2003) and we are witnessing increasing interactivity between learners, instructors, and content via computer mediated communication (Rogers et al., 2009). The importance of understanding the mechanisms of online interaction is a central requirement for the success of online interaction processes and dynamics (Rogers et al.). Although the use of online forums is

a common way to promote interaction, instructors are not taking full advantage of these forums for distance education. Educators do not yet fully understand the dynamics of this medium. This study presents a small contribution to the available knowledge about online interactions.

There is evidence that use of student moderators supports student interaction, as shown in this and other research (Hara, Bonk, & Angeli, 1998; Seo, 2007; Thormann, 2008; Thormann & Zimmerman, 2012). Non-moderator posts and use of critical thinking increased when there were more moderators. The 3 SM group averaged about half the number of moderator posts compared to the 1 and 2 SM groups. The 3 SM group had significantly more non-moderator student postings than the 1 or 2 SM groups. Using six SNA measures we found only one sizable difference between 1, 2, and 3 SM groups which was in the measure of centralization. The 3 SM group dynamics resulted in increased instructor presence which may have had an impact on students' postings. More research is needed to determine the most effective use of student moderators in online courses.

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Synchronous Online Collaborative Professional Development for Elementary Mathematics Teachers

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Abstract

Math is often taught poorly emphasizing rote, procedural methods rather than creativity and problem solving. Alberta Education developed a new mathematics curriculum to transform mathematics teaching to inquiry driven methods. This revised curriculum provides a new vision for mathematics and creates opportunities and requirements for professional learning by teachers. Conventional offsite, after school, or weekend professional development is typically "sit and listen, maybe try on Monday". Professional development that is embedded, responsive, and personalized is known to be more effective at changing teaching practice. Alberta teachers are geographically dispersed making online professional learning a desirable alternative to on-site workshops. As access to and use of the Internet gains momentum in schools across the country, opportunities for collaborative, online professional development become more viable. The online professional development in this hermeneutic study maps on to the new vision promoted in Alberta's math curriculum, and addresses the challenge of a distributed teacher population. Thirteen geographically dispersed participants, including 10 teachers, a PhD mathematician, and two mathematics education specialists, collaborated in an online professional learning community to build knowledge for teaching mathematics. This paper describes and interprets the shared experiences of learners within an online, synchronous learning community that focused on discipline rich, focused inquiry with mathematics. Findings show that the nature and quality of the mathematics task impacted the quality and nature of the online interaction. Mathematics problems that incorporated easily drawn symbols and minimal text worked best in the online collaborative space. Members of this learning community discovered how to assert their identity in the online environment.

Keywords: K-6 education; teacher professional development; mathematical problem-solving; synchronous online learning environments; professional learning communities

Math is often taught poorly with an emphasis on procedural rote methods rather than designs for creative thinking; often, students hate math and teachers are not well prepared to teach math effectively (Ball, Thames, & Phelps, 2008; Friesen, 2008; Jacobs et al., 2006; Schoendfeld, 2009; Stigler & Hiebert, 2009).   The revised Alberta curriculum was developed to purposefully shift mathematics teaching from procedural mathematical tasks to designs that engage learners in solving complex non-routine problems (Alberta Education, 2007). The new vision for mathematics teaching created a need for professional learning opportunities for teachers. Math teachers are distributed across the province, which can make it difficult to provide high quality professional learning for all math teachers. Online professional learning is a viable alternative to on-site workshops.   With the advent of this new philosophy and research informed approach to teaching mathematics, teachers in schools are called upon to grapple with the following questions as they redesign their instructional designs and teaching practices: What are these mathematical processes? Why are these processes important? And, how are these mathematical processes supported and developed in the classroom?

Background

Professional Development

It is well known that to successfully implement new curricula, teachers need professional learning opportunities and ongoing support to make the needed changes to their pedagogical practices (Darling-Hammond & Bransford, 2007; Fernandez & Yoshida, 2004; Jacobsen, 2006; Stigler & Hiebert, 1999).

Professional development is often offsite, after school, and on weekends. Geographic and temporal limitations often prevent suburban and rural teachers from being able to attend meaningful and transformative, face-to-face professional development opportunities. In their seminal work on educational reform, Darling-Hammond and McLaughlin (1995) outlined the difficulty that many teachers face accessing quality professional development while attempting to transform their teaching. The quality of professional development is measured by the teachers' success in developing pedagogical competencies and perspectives, which are reflected in new visions and approaches to practice, while unlearning the beliefs about students and methods of instruction that have dominated their professional lives to date.

Unfortunately, few occasions and little support for meaningful, transformative professional development exist in many teachers' environments (Darling-Hammond & McLaughlin, 2011). Conventional professional development does not transform teaching. Teachers often have little or no choice in the type and timing of their professional development. Most professional development is pre-determined, "sit and listen, maybe try it on Monday" with a one size fits all approach. To be more effective, the professional development needs to be embedded in the classroom, responsive to the teachers' needs and experience, tailored, and personalized. Online (delivered via the Internet) professional development is viewed as having potential for providing diverse and meaningful learning opportunities for teachers (Darling-Hammond & McLaughlin, 2011).

Online Professional Development

Definitions.

Bringing teachers together online for professional learning has been described using a number of terms including online teacher professional development (oTPD) (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2009; Marrero, Woodruff, Schuster, & Riccio, 2010), professional learning communities (PLCs) (DuFour, DuFour, Eaker, & Many, 2010; Stoll & Louis, 2007), professional learning networks (PLNs) (Lieberman & Grolnick, 2005; Trust, 2012), in higher education, asynchronous learning networks (ALNs) (Hiltz, 1998; Rovai, 2002), and simply as online learning communities (Mackey & Evans, 2011).

Wenger, Trayner, and de Laat (2011) distinguish between a PLN and a CoP. They define a PLN as

> the set of relationships, personal interactions, and connections among participants who have personal reasons to connect. It is viewed as a set of nodes and links with affordances for learning, such as information flows, helpful linkages, joint problem solving, and knowledge creation. (p. 9)

In contrast, a CoP requires "the development of a shared identity around a topic or set of challenges. It represents collective intention – however tacit and distributed – to steward a domain of knowledge and to sustain learning about it" (p. 9). The terms that best describe the nature of learning sponsored by the design of this study are online teacher professional development (oTPD) (Dede, et al., 2009).

Meaningful professional development.

Not all online professional development can be considered meaningful and effective. Dede, et al. (2009) noted a proliferation of large-scale online teacher professional development (oTPD) studies. In a meta-analysis, the research team categorized 40

oTPD research studies into four themes: program design, program effectiveness, program technical design, and learner interactions. Most of the oTPD program and research initiatives centered on "program design and effectiveness within a community-of-practice theoretical framework" (p. 13). Their analysis suggests that market driven evaluative research is preferred over research that "informs design and extends our understanding of models that affect teacher learning and behavioural change" (p.13). Despite millions of dollars being spent, and extensive research (Dede, et al., 2009), the professional development that most teachers experience is fragmented, superficial, and ineffective (Borko, 2004).

Many of the online professional learning opportunities for teachers are large scale. For example, large PLNs include Classroom 2.0 with more than 61,000 members, Edmundo with 6.5 million users, and The Educator's PLN with 11,000 members (Trust, 2012). The Math Forum (http://mathforum.org/) offers teacher resources, online workshops, and online forums and lists 800,000 visits per month (Renninger & Shumar, 2002).

Dede's (2004a, 2004b) research described six requirements for professional development to improve education: (1) a shift from rote methods for high stakes testing to 21st century knowledge and skills, (2) a focus on transformational strategies, (3) a shift from "make and take" professional development to ongoing teacher driven professional development, (4) a shift from passive professional development to active teacher engagement through collaborative learning communities of researchers and practitioners; (5) synchronous distributed learning opportunities that maximize available media tools, and (6) distributed learning opportunities, which are powerful mechanisms for knowledge diffusion when they exemplify practice and impart the innovations reinforcing systematic change. Collaborative online professional development was found to be desired by teachers (Marrero et al., 2010) and to expand teachers' knowledge, skills, and ideas (Glazer, Hannafin, Polly, & Rich, 2009)

Almost all Canadian schools are now connected to the Internet. In a pan-Canadian survey, Plante and Beattie (2004) found that schools averaged one computer per five students, and that close to 100% of schools were connected. Statistics Canada (2010) data indicates that in 2009, 80% of Canadians aged 16 and older, or 21.7 million people, used the Internet for personal reasons, which indicates an increase of 7% from 2007 when the survey was last conducted. In Alberta, SuperNet is a government initiative that provides affordable high-speed network connectivity and internet access to all schools, post-secondary institutions, libraries, hospitals, provincial government buildings, and regional health authorities in the province, which amounts to connecting over 4,700 sites (Alberta Education, 2012).

As access to and use of the Internet proliferates in schools across the country, more opportunities for online, collaborative professional development of teachers are being designed. What this means is that every Alberta teacher has access to the Internet at school, and can take advantage of online professional development opportunities and professional networks. Examples of online professional development include Alberta

Professional Development (http://www.albertapd.ca/), which offers webinar courses and recordings of previous webinars; the Southern Alberta Professional Development Consortium's Online Math Symposium (http://www.sapdc.ca/) with one day of online presentations; and the Alberta Regional Consortia (http://www.arpdc.ab.ca/), which provides access to online demonstration classes. While these programs provide access to learning opportunities to geographically dispersed teachers, they are not tailored, responsive, and personalized. In this study, our purpose is to describe the intent and formation of a professional learning community that is small, responsive, personally connected, embedded, situated, and meaningful to the participants to continually improve their teaching practices.

Mathematics Professional Learning

The pedagogic format for this study was borrowed from a face-to-face professional learning program developed at the Galileo Educational Network (GENA) called Lesson Study. The program was designed, in part, based on a Japanese form of professional learning where teachers collaboratively plan, implement, and revise teaching lessons (Fernandez & Yoshida, 2004; Moore, 1993). The positive impact of collaborative approaches to support teachers' design of learning is well documented (Fernandez & Yoshida, 2004; Jacobsen, 2006; Preciado-Babb & Liljedahl, 2012; Stigler & Hiebert, 2009). The Lesson Study process provides ongoing professional development for teachers to create ideas and design artefacts to implement in class. The process of collaborative learning design has contributed to the transformation of rote procedural teaching practices to problem solving approaches in Japanese schools (Stigler & Hiebert, 2009). Additionally, students in Japan consistently demonstrate higher achievement results in international tests (Martin, Mullis, & Foy, 2008; Mullis, Martin, Gonzales, & Chrostowski, 2004).

At GENA's monthly two-hour sessions of Lesson Study, teachers would gather from across Calgary to work on rich mathematical problems with mathematicians and mathematics educators. The goals for Lesson Study were for teachers to experience learning mathematics as learners themselves, and to design learning experiences for their students that cultivated imagination and creativity with mathematics. The key elements of GENA's Lesson Study considered important to transforming teaching and learning included a) collaboration and professional dialogue amongst teachers, mathematicians, and mathematic experts to investigate and solve good mathematical tasks together; and b) the collaborative development of ideas and artefacts for implementing inquiry learning tasks in the classroom.

In this study, we describe what we learned as we transformed GENA's Lesson Study into an online, professional learning format. In four synchronous sessions we sought insight into the following research questions:

1. How do we bring teachers and mathematicians together online to learn about teaching mathematics?

2. How do we collaboratively solve mathematical problems in the online environment?

The Study

An interpretive hermeneutic approach was chosen to re-establish a research connection to original human experience. Hermeneutics is about finding practical knowledge in the everyday experience (Smith, 1999). Few studies focus on what teachers and students are *doing* with new technologies and how they are *adapting* to complex circumstances in educational practices (Friesen, 2009); this study attempted to address the gap. Hermeneutics was chosen to inform the study for several reasons: (1) hermeneutics is consistent with an emergent approach to designing online learning environments (Friesen, 2009); (2) rich, descriptive, context-dependent knowledge is valuable for understanding human learning processes (Flyvbjerg, 2001); (3) the fecundity of the individual case is a powerful interpretive tool for understanding pedagogy (Jardine, 2006); (4) exploration and discovery is necessary for learning and understanding in a study (Van Manen, 1997); (5) hermeneutics permits a focus on mathematics and interactions with mathematics in accordance; and (6) hermeneutics situates the study in the lifeworld to facilitate understanding of lived experiences with mathematics online.

Study participants.

Thirteen participants joined the study. Lily, a PhD mathematician from British Columbia, assisted in developing each inquiry session. Lily[1] had a rare combination of characteristics that were believed to be necessary for the study. Lily was interested in K-12 education, valued mathematical problem solving, and was comfortable with technology. Sharon, a PhD mathematics educator, and Ella, a mentor for teachers, provided expertise on teaching mathematics. Sharon and Ella both worked at GENA. An invitation to participate in the online mathematics professional learning community was sent to teachers who had participated in Galileo Network's professional development in previous initiatives. Ten teachers from around Southern Alberta were selected from this convenience sample of volunteers. The participants were chosen because they had indicated their desire to continue with GENA's professional development, and had an interest in exploring how to better teach mathematics. The teachers who were included in this study had experience teaching grades five to nine. One principal at one rural school, a former GENA professional development participant, invited six teachers to participate together. The other five teachers all held previous experience with GENA's professional development and were from unique schools located in different geographic locations in Alberta.

Interpretation.

Hermeneutics is an approach that enables the researcher to be responsive to the situation at hand. Several sources of data were collected for analysis and interpretation

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[1] Lily and Sharon chose to use their first names. All other participant names are pseudonyms.

in this study. While the experiences of participants in the four Elluminate™ sessions were the primary source of data, the conversational interviews conducted at the beginning and the end of the study, asynchronous text discussions, emails, informal telephone and face-to-face conversations, and field notes also supplemented the analysis. Each of the four sessions was digitally recorded, preserving audio and visual images. In an iterative process of listening, observing, writing, and reading, the hermeneutic text was formed (Friesen, 2009; van Manen, 1997).

Findings

This section describes the online learning experiences as they unfolded chronologically and the nature of participants' learning experiences in the four Elluminate™ sessions. Due to a desire for succinctness, the following chronology summarizes rather than narrates the collective experience. Each event has two components: (1) A pre-session online meeting where Lily and Krista tested the mathematical problems, and (2) the online learning experiences with participants.

Pre-Session 1

Prior to meeting with participants, Lily emailed mathematical problems for the first session in a black and white PDF image. Krista added colour images and formatted the problems into slides that could be uploaded for the session. Lily had never used Elluminate™ or any other computer-mediated learning environment before, so Krista and Lily conducted a trial in Elluminate™. Lily learned how to depress the microphone button to talk and experimented with the online toolset. Lily provided a photocopy of a coding problem which required deciphering shape coded integers in algebraic equations. I reproduced the problem in colour to make it more appealing. Within half-an-hour, Lily felt comfortable enough with the technology to help moderate the session. An email was sent to all participants with information about the upcoming session and directions for testing their systems.

Session 1: A Comedy of Errors

> Thus we shall never experience our relationship to the essence of technology so long as we merely conceive and push forward the technological, put up with it, or evade it. (Heidegger, 1977, p.4)

Unfortunately, the first online professional learning experience was a frustrating breakdown of communication. We encountered firewalls, non-functioning microphones, and issues with usernames and passwords. A group of teachers in rural Alberta and one teacher in Calgary found that they could not access Elluminate™. With much deliberation through phone calls and emails, we concluded that firewalls were preventing the connection. Many school divisions put up firewalls to block social

networking sites (Clifford, Friesen, & Lock, 2004; Jones & Cuthrell, 2011): an institutional IT decision that excluded half of the invited participants from the session. Another participant had difficulty logging in; his user ID and password would not work. We were unable to alleviate this participant's technical issues; he was unable to join the session.

Of the six of us that did connect, three microphones did not work, including the primary researcher's microphone. The on-campus, faculty IT support person arrived late to the sessions and plummeted into a hotbed of technical issues. Jonassen (2004) describes a cognitive process that is required to solve trouble-shooting problems that begins with "identify the fault state and related symptoms" (p. 13) and continues through a linear series of diagnoses that ends with "repeating the process of generating and testing hypotheses until the fault is identified" (p. 14). The faculty IT support person was expected to help identify the audio problems and get participants connected.

Unfortunately, we found ourselves stuck in a troubleshooting feedback loop (see Figure 1). The faculty IT support person hypothesized that the microphones were faulty and asked me (and several others) to test the problem. Given the functionality of the mic in the pre-session, I was certain that it was not the problem. Each time that I did not test the hypothesis (i.e., try a different mic), the support person could not be sure that the hypothesis was incorrect and thus could not reject the hypothesis. Without being able to reject the hypothesis, a new hypothesis was not formulated.
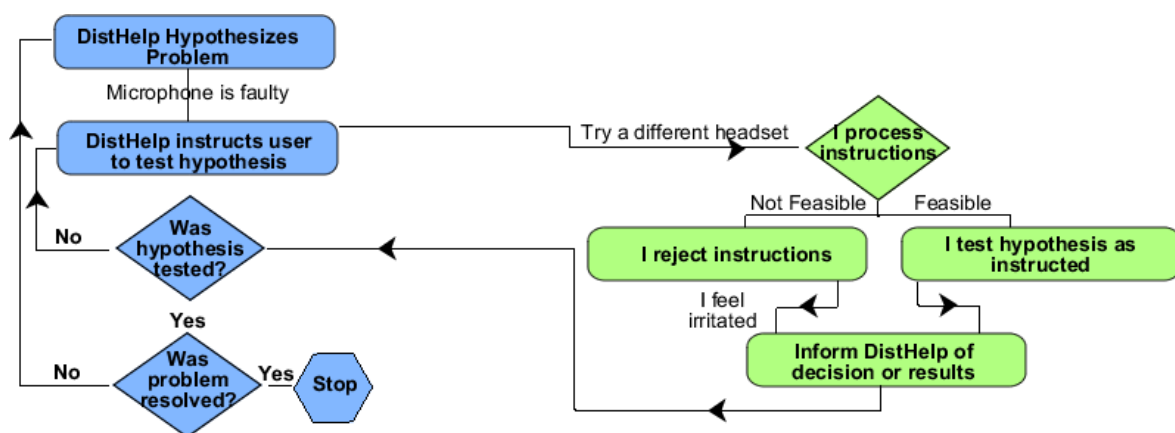
Figure 1. Troubleshooting feedback loop.

Held in a continual infinite loop, the issues were not resolved in this first session. After the session, we discovered how to configure the OSX system to the USB headsets.

While initial online experience with teachers enabled us to explore a math problem together, it felt like a technological nightmare. We questioned the impact of such technological issues on new instructors. Will new instructors who experience challenges with technology dismiss or discount the value of online spaces? What is the likelihood

they will want to continue? Will they believe in the possibilities for meaningful and engaged learning in online courses? Will they "put up with it, or evade it" (Heidegger, 1977, p. 4)?

The problems we experienced offered insightful reminders that online educators cannot expect technology to work perfectly the first time. When embarking on any new synchronous collaboration, anticipate that the first session will offer a technology learning session for participants to get used to the tools. Anticipate firewall issues that require advanced technical support. Know who to contact beyond initial microphone testing and connection help.

Preparations for Session 2

Shortly after Session 1, one participant withdrew from the study. Considering our previous challenges from Session 1, we were grateful no one else withdrew. Again, Lily emailed math problems to the researcher for the session. Lily chose word problems with an *Alice in Wonderland* theme. Krista added static images to the word problems to make the problems more visually appealing on the whiteboard. In the pre-session, we worked the problems and were satisfied with their functionality.

Session 2: Something is Not Quite Right

> I didn't like doing school work....School was boring. And
> the school work I was learning was boring. Boring,
> boring, boring. (Clifford & Friesen, 2003, p. 92)

Prior to Session 2, firewalls were removed by the upper level IT in the school boards and we had all learned how to configure our audio microphone settings. During Session 2, the conversation among the participants seemed stifled. One participant chose to ignore the problem and was "away" for the entire session. Lily repeatedly called upon people to invite them to participate. As Lily tried to entice participants, she eventually demonstrated the solution to the problem.

Lily:	2 times 1000 plus 0 times 100 plus 0 times 10 plus seven times one. Then that 2 times 1000 equals 2 times 999 plus 2 times 1. With modular arithmetic or remainder arithmetic, you do not need to worry about anything times 999. You can then use the trick to get rid of the two times 999. We only have 7 plus 2 equals 9 to deal with. 9 is divisible by 9 therefore 2007 is divisible by 9. If 2007 is divided by 9, the number of papers would have been 2007+1, and Alice is right. Does that make sense or am I talking to myself?
Sandy:	I am really sorry Lily, but my Grade 6 brain is not processing what you just explained to us. I can't see on the whiteboard the

times 100 work that you were doing, so I am really lost.

Lily wrote on the board 2*1000=2*999 + 2*1

Lily: Can you see now?

Sandy: Yes now it has come up.

Samantha: Now that it is on the board I see that, but why specifically is it significant to this problem to be able to do that.

Lily: The main idea is to use the distributive law to break this number's powers of 10, into multiples of 9 plus 1. Like 999 plus 1 and 99 plus 1 and 9 plus 1. Once you tag on the place value of 2007 you have 2 times 1000, 0 times 100, 0 times 10 and 7*1. All that allows you to throw away the 999. Anything multiplied by 999 is still divisible by 9. We just have to look at the ones – the 2 times one plus the 7 times 1

Micky: I am seeing that now. Thanks Lily.

In Figure 2 is a screen capture of the problem and Lily's solution as it appeared in Elluminate™.

Figure 2. The mathematics problem in Elluminate™.

Something was not quite right in Session 2. We observed that the nature of the mathematical problem seemed to adversely influence interaction in the online environment. The interaction could be characterized as instructor-student with very little student-student interaction (Moore, 1989, 2007). Upon reflection, we realized the problem text occupied the bulk of available whiteboard space, which reduced the space available for participant interaction (see Figure 2). With the available tools, we had difficulty typing and drawing numbers on the whiteboard screen. Forming letters and numbers with a mouse was difficult. Consequently, the problem was unsuitable for the chosen media. To borrow from Clifford and Friesen's (2003) quote above, the session turned out to be boring.

On the one hand, Session 2 taught us how quickly technological problems can fade. The learning community experienced few problems with login and interaction. We also learned that filling the whiteboard space with the problem text limits the potential for student-student interaction. The experience in Session 2 taught us that a routine procedural problem stifles mathematical conversation and exploration.

Preparation for Session 3

For future sessions, we sought less routine calculation problems with fewer words to occupy less whiteboard space. Discrete mathematics is a loosely defined term that includes combinatorics, vertex-edge graphs, iteration, and recursions (DeBellis & Rosenstein, 2004). Goldin (2010) argues that discrete mathematics provides opportunities for interesting, non-routine problem solving and mathematical discovery. In an Elluminate™ planning session, Krista challenged Lily with a discrete mathematics problem called Jumping Chips (Lewis, 2002) that used the interactive features of the medium. This problem required participants to slide and jump chips to solve the problem. Instead of writing/typing numbers and equations, participants could move objects on the whiteboard. In response to this interactive experience, Lily excitedly exclaimed she had some ideas for problems.

Session 3: Talking About Mathematics

> This is mathematics we are talking about, the language
> in which, Galileo said, the Book of the World is written...
> For mathematics itself is the study of connections: how
> things ideally must and, in fact, do sort together –
> beyond, around, and within us. (Kaplan & Kaplan, 2007,
> p. 5)

The math problem for Session 3 employed minimal text and required participants to use drawing sticks on the whiteboard to explore solutions (see Figure 3).

When participants logged in for Session 3, they were encouraged to practice drawing sticks on the title page. Within a few minutes, the page was messily marked up with black sticks. As the board began to get messy, Lily piped in, "Could you please pick a

colour and let me know who is drawing with that colour?"   Soon we had a colour-coded key ascribing a name and colour identity to the sticks.

Lily's toothpick problems drew upon the Roman numeral system and algebraic reasoning.   As Lily began to explain the problem, Brice jumped onto the board with an incorrect solution.   Brice moved the vertical line of the plus sign to form IIII as the answer: IX-V=IIII.   Lily used Brice's error as a chance for dialogue.   Lily clarified, "Roman numeral systems do not use four sticks to write a four."

A flurry of activity erupted as participants used the space to explore solutions.   Micky rewrote the problem in red.   Brice's orange answer disappeared in a blink of an eye. Anonymous green lines appeared.   Maggy texted that she tried, but was on the wrong track.   An orange answer suddenly appeared.   Once again, Brice solved the problem. Lily encouraged Brice to justify his solution strategy.

Figure 3. Brice finds the answer.

Lily: Brice got that. Wow! That was really fast. How did you do that?

Brice: Once I figured out that we could just move the equation from addition to subtraction, I just looked at different combinations of numbers and operators.

Lily: OK, thank you Brice.

The polite stifled atmosphere dissipated into enthusiastic and unrestrained conversation about playing with and teaching mathematics. We talked about some of the emotional baggage teachers have surrounding mathematics: panic and being slow. While their subjective emotions about mathematics initially interfered with the participants' willingness to play, it also exposed shared vulnerabilities that appeared to relax the group, a collective form of letting go. Lily and Sharon described the connections of mathematical creativity and competency. Everyone in the group contributed to the conversation and tried to solve the problem.

Session 3 was a turning point in the development of this online learning community. We had "move(d) from learning to use ICT to using ICT to learn" (Haughey, 2006, p. 2). For Session 3, Lily chose a non-routine problem which was entirely different from the procedural problems of Session 2. With minimal text, the problem suited the whiteboard. By requiring participants to draw sticks for creating solutions, the problem encouraged interaction with the tools. By choosing unique colours, we created online identities. The problem was non-routine and connected several mathematical concepts, including equivalence, number, and the history of the number system. The participants reported feeling comfortable risking mistakes in problem solving, trying creative solutions, and revealing their attitudes about mathematics. Collective conversations about our own learning needs and experiences with mathematics led us into deeper conversations about students' learning and how to teach mathematics and design challenging tasks. The depth of mathematical conversation sponsored in the online environment demonstrated knowledge building and collaborative design in community.

In Session 3 we achieved the right combination of conditions to optimize online professional learning with mathematics. The technology faded and the mathematics conversations were amplified. The essential conditions included: 1) a complex non-routine mathematical problem for which easily drawn manipulatives facilitated the development of solution methods, 2) established identity of participants and trusting relations, 3) sufficient experience with the technological environment, and 4) adequate time to develop and cultivate our professional learning conversations and knowledge building interactions.

Preparations for Session 4

Lily brought *Nim* for our next session, a two-person game that requires the removal of chips to find a solution. In the test session, Krista mistakenly thought participants could easily draw circles on the whiteboard. The task turned out to be too cumbersome

and the formulated circles were too uneven. Recalling the ease of drawing lines in Session 3, Lily suggested creating static images of the disks in rows. With a prepared template, uniformity and organization could be ensured. Also, a line drawn through the disc provided an easy removal of chips.

Session 4: Playing with Symmetry

> The chief forms of beauty are order and symmetry and definiteness, which the mathematical sciences demonstrate in a special degree. Aristotle

In every session, participants and the instructors were learning and adapting within the emergent online community. In Session 4, Lily engaged participants in the two-player game called Nim. Similar to the math problems in Session 3, this game demanded that participants play using the whiteboard tools. Lily encouraged participants to articulate their thoughts and strategies while playing with Nim. There was no lurking allowed in this session; everyone was called upon to play and contribute to the conversation.

We observed that as soon as the first problem slide appeared in Session 4, the group immediately started writing their names in their chosen color.

Figure 4. Drawing coloured names to establish identity.

Brice and Sandy jumped in and immediately played the game. After Brice won, Lily suggested that Abby and Gerald play together. Abby made the first move, crossing off the left most chip. Gerald crossed off the middle chip. Abby crossed off the second chip. Gerald crossed off the last two chips, won the game, and exclaimed, "It looks like I won." Lily replied, "Gerald, could you take off your last two crosses and Abby, could you remove your second stick. I would like to consider what was happening after the first two moves."

The board was erased and Abby drew a line through the first circle again. Gerald drew his second line through the middle disc (see Figure 5 below).
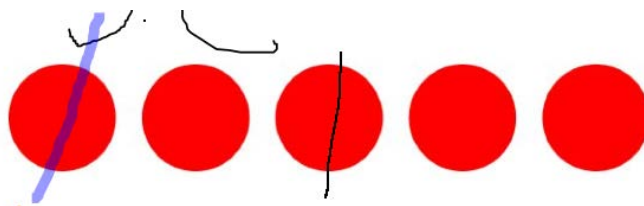
Figure 5. Session 4: Problem 1 - The first two moves again.

Lily interjected, "At this point can you see who can win? It is Abby's turn. Suppose we give Abby more time to think. Would it be possible for Abby to win from here?" Abby crossed off the last circle in the row. Gerald was no longer able to win. Whichever circle he took, there would be one circle remaining. Lily probed, "a change of Abby's second move meant she won. Why?" Gerald articulated that if the first person took the middle chip and then copied the moves of the second player, the first person would always win. Lily restated Gerald's copying strategy as the mathematical principle of symmetry.

For the remainder of the session, participants explored whether the strategy of symmetry worked with other scenarios. Learners played with six chips, seven chips, and then two-dimensional versions. Lily shuffled everyone up, ensuring that everyone played and that everyone was able to utilize symmetry as a strategy.

The next problem had six discs in row. When Gerald and Brice were playing together, lines were drawn and erased several times. Finally, the game was over when Gerald drew the two lines on the far right.
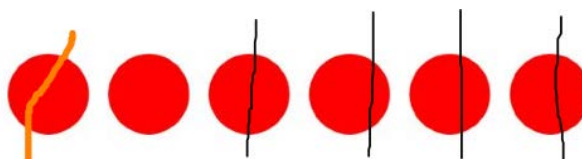
Figure 6. Session 4: Problem 2 - Gerald loses?

Lily: Hey how did that happen? Gerald how could you let Brice win?

Gerald: Good question. I think we have a little rat over here. I think Brice is manipulating the colours and the lines here.

Lily laughed appearing to enjoy Brice's manipulation of identity. Brice had used deception of identity (different colored lines) which created a sense of playfulness.

We observed that the participants were collaborating to solve problems together. The Nim problems that Lily chose required two players. As the group observed two participants playing, we learned from the strategies they used. When we played in teams, we tested what we had learned from the observation. The other participants watched the new game and cheered on the "winner". Jokes were made; laughter was heard; fun was had; and mathematics was learned.

The task of Nim turned out to be ideal for online mathematical learning and community conversation purposes. Drawing sticks was quite easy on the whiteboard. The game required participants to interact with each other using the whiteboard in order to play the game. As two participants played, the others could watch and learn, which demonstrates knowledge building in community and the emergence of community knowledge. Lily moderated by ensuring that everyone actively participated on the whiteboard – lurking was not allowed. She also encouraged participants to communicate their strategies, to think aloud, which made their strategies both visible and available as a narrative. Lily connected our informal vocabulary into mathematical terminology by reading back, or restating, the participants' contributions using mathematical principles and language, which also contributed to the development of group knowledge.

Discussion

This hermeneutic study sought to provide illustrations and insights into the interactive nature of collaboratively problem-solving with mathematics in an online professional learning community. An interpretive analysis of online learning experiences with mathematics across the four sessions yields key insights about (1) pedagogical design, 2) appropriate mathematical problems / tasks, and 3) sponsoring knowledge building and online collaboration with mathematics using technology.

The key finding from our research questions was the tremendous importance of the mathematical task. The nature of the mathematical task impacted (1) the use of the online technology, (2) the professional learning, and (3) the collaboration and mathematical problem solving. Our findings are directly relevant to the revised curriculum that requires teachers to design inquiry learning experiences in math for students. The type of learning that teachers experienced in the study was exemplary of

the type of learning experiences that they are expected to design and support for their students.

Additionally, the hermeneutic study of teachers' experiences was consistent with inquiry approaches to learning. Hermeneutics begins with understanding the lived experience and situating the historical, cultural, and literary context of the experience. Understanding deepens with more experiences along a hermeneutic circle or spiral (Gadamer, 1989; Heidegger, 1962). Each session traversed us further on the hermeneutic spiral deepening our understanding of how to create meaningful online mathematics teacher professional development. With inquiry, meaningful experiences deepen understanding of an issue, question, or problem. Hermeneutics was the appropriate approach to gain insight into an innovative approach to professional development. For an innovation, studying the lived experiences of the participants revealed deep insights into how to create meaningful online professional development for mathematics teachers.

The key contributions of this study are, first, the connection between the nature of the mathematical problem and promoting meaningful interactions using synchronous online technology, and, second, new insights about cultivating mathematical problem-solving conversations among educators to inform ongoing teaching and design of learning tasks.

From a technological perspective, mathematical problems that required minimal writing and more drawing appeared to work best in this online learning environment. Using the tools in Elluminate, participants could easily draw lines. In contrast, typing could easily run off the whiteboard, and writing text with the mouse was cumbersome. Also, problems with too much text minimized the amount of whiteboard space for collaborative interaction and participant voice. From a mathematical problem-solving perspective, routine, procedural, calculation problems lead to stifled, polite, and disengaged involvement and interaction amongst the participants. Conversely, multifaceted, non-routine, discrete problems fostered the most engaged and playful mathematical spaces for active learning, discovery, collaboration, and broad connecting conversations amongst educators in the online learning community.

Each session contributed to the graduated journey of learning for the participants in this online learning community. In each session, we asked participants to consider, "what was technology asking of us?" and "what was mathematics asking of us?" Session 1 was plagued with unresolved technical difficulties: firewall blockades, login trouble, and audio problems. The issues were entirely frustrating for all of the participants and impeded the community's ability to communicate. Connecting synchronously was complicated and the entire group needed to learn how to overcome many unforeseen obstacles. However, the technological challenges in this first online learning experience were not repeated in subsequent sessions, and did yield some important group problem solving strategies and more familiarity with the technology.

In Session 2, Lily provided the participants with a routine calculation problem that was hidden within a lengthy text: a word problem. In terms of mathematics and mathematical conversations, we observed the conversation tended to be stifled and focused on the solution procedures for the problem in question, rather than the engaged, active interaction that was hoped for and expected. One participant chose to ignore the problem and was "away" for the entire session. The participants appeared to need Lily's coercion and constant prompting to engage in mathematical conversations. Lily pointedly asked individual participants questions to draw them into conversations; however, we observed that no one volunteered or spontaneously jumped into the conversation – much like a conventional math class in school! A procedural mathematical task did not elicit a sense of collaborative problem solving. In terms of technology, typing text and numbers for the solution was difficult for participants given the available whiteboard tools. In retrospect, we realized that a graphics tablet and pen may have made the participant's ability to write on the whiteboard easier. However, the expense of graphics tablets prevented our ability to use them for this study. A wordy procedural problem requiring text for the solution turned out to be an unsuitable problem for encouraging online collaborative problem solving in this session.

With the complex, non-routine problems that were presented in Sessions 3 and 4, the online community participants were able to make connections into the broader ideas of mathematics. Using easily drawn lines to form Roman numerals, Session 3 connected the learning community to the concept of equivalence, the concept of number, and the history of the number system. Collectively, the professional learning community members were able to solve the problem and, through knowledge building conversations, were able to strengthen their own mathematical understandings. Non-routine, complex problems helped the learning community to create and use mathematical spaces for discovery, collaboration, and broader knowledge building conversations. Technologically, we learned to capitalize on a technological affordance, which gave us the ability to draw lines with ease. Participants in the learning community also learned how to establish an identity by choosing unique colours for the drawing tools. Problems that required colored lines to demonstrate a mathematical solution resulted in an explosion of participant engagement and interactive drawing on the whiteboard. Participants engaged with each other and with the mathematical problems using the whiteboard tools, interactive chat, and audio tools. Non-routine, complex problems that connected mathematical ideas and also required minimal drawing on the whiteboard were excellent problems for encouraging online, collaborative, and engaging problem solving.

Through this hermeneutics study, it was determined that with the right conditions, collaborative mathematical problem solving is not only possible in the synchronous online environment, it can lead to collective knowledge building for learning and teaching with mathematics. Finding non-routine, discrete mathematics problems facilitated the participants' engagement and mathematical discovery as learners, and fostered conversations about fostering this kind of learning for the teachers' own learners in the classroom. Adapting the mathematical problems to minimize writing

and emphasizing drawing was observed to facilitate increased whiteboard interaction and participant contributions to mathematical conversations. Giving the community time to adapt and learn how to use the Elluminate™ interface is also essential. Based on our experiences, the online synchronous environment provided opportunities for geographically dispersed individuals to collectively learn about collaborative mathematical problem solving in an online professional learning community.

Relevance of Study

This paper contributes to the literature in open and distance learning by linking research and practice to gain insights into the experiences of participants in the online learning environment. With the proliferation of oTPD in a number of content areas, little is known about the actual social and cognitive processes in which its participants engage during those experiences, nor has enough been said about the limitations imposed by online spaces and tools. This article investigates these processes and should be of interest to researchers, administrators, teachers, and instructional designers.

Recommendations

The following recommendations for the design and support of online teacher professional development for mathematics inquiry emerged from this study. Plan for the first session to serve as an introduction to each other, to collaborative mathematical problem solving, and to the technology. Have a good mathematics problem selected, but expect mathematics to be in the background at first as participants become familiar and fluent with the interactive online environment. Give participants opportunities to play with the whiteboard tools to familiarize themselves with the affordances and constraints of the online environment. Establish protocols for identifying each other and having a distinct presence on the whiteboard. For instance, have each participant choose a unique colour and develop an identity colour code. Bring mathematical and teaching experts together to help facilitate conversations and keep content relevant to the discipline of mathematics. Choose complex non-routine mathematical problems where solution methods can be found with easily drawn symbols and lines. Be responsive to the group finding and contributing mathematical problems that are relevant and interesting. Allow sufficient time to establish a community to facilitate meaningful conversations and learning.

Before embarking on an online professional development program, online professional developers need to anticipate technological challenges and rely on the first session to trouble shoot, to diagnose connection and interaction affordances and constraints, and to introduce and orient the participants to the learning topics as well as the online learning environment for interaction and collaboration with mathematics and with each other. Learning leaders need to have a good mathematical problem or two ready for the first session; however, hold off on the enthusiasm for mathematical problem solving until technical issues are taken care of and the participants gain fluency in navigating the online learning space. Plan time for the participants to play with the technology.

Hold pre-sessions to test the problems in the environment before every session. Trouble shooting and problem solving in pre-sessions informed and enhanced each session. The disciplinary expertise of the mathematician and the mathematics educator were invaluable to the emergent learning design process. The shared understandings and deeply held expertise shaped the participants' learning, the online mathematician's learning, and the researchers' learning. Problems that required line drawings for solutions worked the best in this design. Lastly, find complex problems that draw upon multiple mathematical concepts. Adapt these problems to suit the online environment and encourage interaction on the whiteboard.

Future Research

Future research should follow up with the participants to investigate whether the professional learning transferred to the classroom. If so, what transferred and how? Continued research is needed to understand what knowledge is needed for teaching mathematics, how that knowledge can be incorporated in the classroom, and how online teacher professional learning can inform new understandings and change mathematics teaching. Such research should be contextual with research and practice informing mathematics teaching in a cyclical process that builds understanding and capacity.

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Rethinking OER and their Use : Open Education as Bildung

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Abstract

Despite the recent increases of interest in open education, notably in massive open online courses (MOOCs) (Fini, 2009), it has been continuously asserted that this form of social knowledge production lacks a philosophical or theoretical foundation (Vandenberg, 1975). Similar accusations have been made with respect to distance education, such as being slow to engage with critical debates in theory and research (Evans & Nation, 1992). In a similar vein, Danaher, Wyer, and Bartlett (1998) claim that researchers in open and distance learning tend to draw on too narrow a range of theoretical resources in their research. Given the considerable rise of open education over recent years, these critical appraisals urge us to expand theoretical approaches and refine our understanding of evolving pedagogical and technological relations (cf. Bell, 2011). In this paper, we contribute to debates surrounding open education and open educational resources by introducing the concept of *Bildung* (self-cultivation, self-realization) as a powerful reflective tool and framework for approaching open education. We will elaborate on the potentials of Bildung by reviewing the history of the concept and exploring the extent to which Bildung can provide open education with a theoretical framework. Our focus is not exclusively on open educational resources (OER): We follow other commentators (Mackey & Jacobson, 2011, p. 62; cf. Weller, 2011) who argue that 'openness' in education necessarily shifts the focus from content (OER) to practices (OEP) that are necessary for the use of that content.

We also argue that the beliefs and values associated with Bildung – including autonomy, critical reflection, inclusivity, and embracing the potential for self-development – are suitable for providing a theoretical framework for open education as well as providing a

critical lens through which to assess contemporary models of education (e.g., Liessmann, 2006).

Keywords : Open educational resources; open education; educational theory

The Impact and Challenges of Open Education

The Open Education Movement

The open education movement (OEM) is often thought to have grown out of the open source movement in software development. Open-source software is published with a licence that makes the code available to those who would modify, port, adapt, and share it, and was largely developed in response to the software monopolies that developed through the 1980s. Wiley (1998) coined the phrase *open content* to describe analogous intellectual properties which are not licensed under conventional copyright restrictions. With the explosion of internet technology over the last twenty years, it has become increasingly easy to share knowledge and information. This had led to new pedagogical possibilities, particularly in the field of distance education. There are now an incredible range of courses, tools, and other materials available on an open basis, including OpenLearn, Connexions, OERGlue, P2PU, MIT OCW, Wikieducator, MITx, OpenStudy, and the Mechanical MOOC. Contemporary open education thus represents a fusion of powerful communication technologies, internet literacy, and pedagogical innovation which is developing into a new creative paradigm for education. This includes a wide range of actors and stakeholders, including a number of advocates who publicly endorse pedagogical and/or institutional 'openness'. These diverse actors are thus united by their broad endorsement of openness in education. Their key commitments might be described as follows:

- A belief that education is undergoing fundamental changes as a result of innovation in digital technologies

- A normative commitment to the idea that knowledge should be free, both to access and develop. In practice this has involved both reducing the cost of education at the point of delivery (such as through open textbooks) as well as courses which are entirely free to participate in, such as the MITx courses

- Encouraging collaboration across disciplinary boundaries and between academics, educators, technologists, and support staff within and beyond educational institutions

- Arguing that we need new pedagogies and systems for intellectual property which are adequate for contemporary education

- Improving access to education and widening participation by closing the digital divide. (Smith & Casserly, 2006)

Open Educational Resources

Open educational resources (OER) are often thought to have developed out of the discourse around learning objects in the 1990s. The term *learning-object* was first coined in 1994 by Wayne Hodgins, who proposed the development of discrete units of learning which could be delivered electronically. Chiappe (2007) defined the learning object as "a digital self-contained and reusable entity, with a clear educational purpose, with at least three internal and editable components: content, learning activities and elements of context", arguing that "learning objects must have an external structure of information to facilitate their identification, storage and retrieval: the metadata".

> OER are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use or re-purposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge. (Atkins et al, 2007, p. 4)

While this definition is often cited, it should be noted that there remains no universally established definition of OER (Geser, 2007). OER include many different kinds of digital and non-digital assets. Learning content might comprise course curricula, learning objects, modules, blogs, and repositories with formats including text, images, audio, video, interactive simulations, and games. By releasing these materials under the appropriate Creative Commons licence, authors can legitimate the use, re-use, re-appropriation, and re-mixing of open content. Thus, OER remove restrictions for learners and educators. Creative Commons (2012) offers a range of licences for educational content which are more flexible than the standard "all rights reserved" expression of copyright. In most cases, OER are free of direct cost and generally accessible online, although there are undoubtedly degrees of openness where legal, ethical, business, and pedagogical contexts meet and interact.

Open Education Practices

The boundaries of the debate around open education are increasingly expanding in order to focus on the institutional, cultural, and pedagogical implications of adopting the open model rather than supporting focus on the (copyright status of the) resources themselves. The implications of a shift to the mainstream use of OER profoundly challenge existing models of research, scholarship, dissemination, and teaching. OER throw the validity of existing educational systems into question. One central assumption in this regard is the acknowledgement that

> traditional ways of providing learning opportunities are no longer adequate to equip teachers, students and workers with the competences required to participate successfully in the emerging knowledge-based society. It is becoming ever more evident that the societal frameworks and conditions are changing at a pace that is not being met by what most educational institutions today offer as learning opportunities. (Geser, 2007, p. 37)

It is often argued that OER can catalyse transformations in education as they offer a more learner-centred approach and problem-solving strategies. Key competences in this regard are closely linked to the utilisation of ICT to search and access information on the Internet. However, there is also a need for new pedagogic practices based on an open paradigm, for instance engaging in open online collaborative projects using wikis or blogs. Currently, we still witness the dominant power of the teacher-centred model in most educational settings. New competences are difficult to enact and are heavily dependent on the engagement of the individual learner. Yet it remains vague how these competencies should be defined as empirical evidence is either lacking or far from conclusive.

Open Education as Bildung

In this section we introduce the concept of Bildung (self-cultivation, self-realization) as a reflective tool and as a point of orientation and regulation. Our contention will be that there are a number of ways to understand how the modern practice of 'open' education elicits opportunities for learning which may be seen as overlapping or being coterminous with the tradition of Bildung. We proceed by reviewing the genesis and history of the term in the early modern tradition.

The Concept and History of Bildung

At the end of the eighteenth century, a conceptual transformation took place in Germany leading to the birth of a new value idea: Bildung. This means that during this time a significant extension occurred so that Bildung from now on signals a new value of its own:

> Whereas *Bildung* was previously a synonym for *Erziehung* (from *erziehen*, to 'educate', 'bring up') and was related to Enlightenment [*Aufklärung*] the idea now encompasses all this and is elevated into the region of culture [*Kultur*] and 'humanity' [*Humanität*] more generally. (Dumont, 1994, S. 82)

A classical definition states that Bildung is to be understood as a free, dialogical, and dialectical interplay between the individual and the world which allows and supports the individual's self-realization. Wilhelm von Humboldt (1767 to 1835) coined the expression of a "connection between our 'I' with the world in the most general, most lively and freest interaction" (Wellmon, 2010, S. 255). It is thus a "process in the course of which specific human beings acquire the general characteristic human features" (Menck, 2000, S. 93). This process is a never-ending attempt to be able to live a "good life" which was regarded as a fundamental right for every human being.

According to Eldridge (undated) the first references occur in theological debates of the 16th century where devout Christians were encouraged to 'cultivate' (Bildung) themselves in the image of God. Later, philosophers of biology used the word to refer to the inherent potentialities that might explain the development of an organism as it interacts with its environment. Mendelssohn (1997, p. 314) went on to use the term to describe the unfolding of one's potential in a general, cultural sense.

By the 18th century ideas about developing potential were infused with the political and philosophical ideals of the Enlightenment. Eldridge's assertions do seem to be supported by a simple test of concordance. As the following graph shows, there was an explosion in use of the term around 1750. This had subsided by the middle of the next century, with peaks of interest in the term continuing to manifest until a dropping off in the latter half of the 20th century.
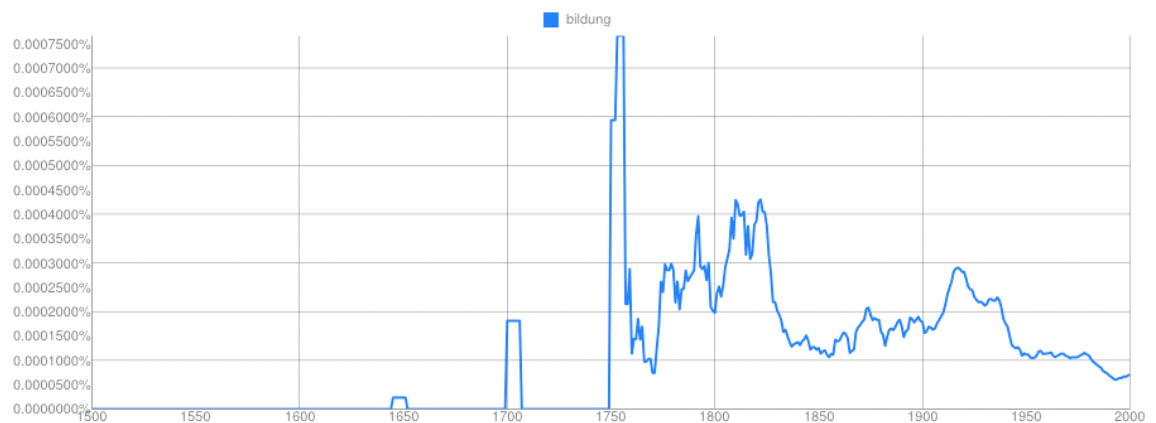
Figure 1. Diagram showing incidence of the term Bildung in German literature, 1500-2000 (Google, 2012).

In the late 18th century Herder construed Bildung as a kind of natural unfolding which was to be understood culturally and aesthetically. Herder's place as the forerunner of *geisteswissenschaftliche Pädagogik* (hermeneutically-inspired education studies) is based on his insistence that man's creative and intellectual capacities need to be developed if we are to live virtuous lives. Eldridge suggests that Herder's conception of Bildung is one which replaces academic philosophy with philosophical anthropology. Bildung thus conceived treats criticism and reflection as much a part of human reason as natural science, but without the same manipulative attitude toward the world that one might associate with utilitarian or positivist accounts of human reason (cf. Habermas, 1968).

Following Herder, Humboldt emphasized the unrestrained interplay between the individual and the world, an exchange through which the individual relates to the world in the most comprehensive, vital, and freest way possible. Self-development is not an adaptation to an external order but rather a cultivation of the inner life: a reflective, creative form of self-realization or self-cultivation which, crucially, is achieved in and through relations with others (Sorkin, 1983). Humboldt also advocated informal education that was free from state interference. In the modern Hegelian tradition, Adorno (1973) draws attention to the commercialisation of education, criticizing the factory model of production as a feature of the instrumental reason that characterises modernity [*instrumentellen Vernunft*]. The poverty of modern educational theories, he contends, is that Bildung has been co-opted by capitalistic production with a drive to increase sales and profits and treating learners as consumers rather than active, reflective agents. Rather than nurturing difference, modern educational paradigms emphasize homogeneity among learners, closed systems, and job training rather than cultivation and education. Authentic Bildung does not conform to market systems and can never be fully subsumed into the status quo (Liessmann, 2006).

This sense of going beyond existing structures has remained a constant theme in the humanistic tradition. It should be noted that the pedagogical, biological, cultural, and aesthetic elements of Bildung have been controversial ever since Herder's proposal. Since the focus is on the potential for human development, it has functioned as something of a blank canvas for a range of thinkers interested in education (Horlacher 2004, p. 424). Discourse around Bildung is thus always and necessarily mediated, necessarily unresolved, dialectical, and *open*.

Bildung and Contemporary Education

In order to clarify the conception of Bildung put forward in this paper, theories of transformative learning which are more familiar to most of the readers may be helpful in explaining some of the core features. As defined by Mezirow (1997, S. 5) "transformative learning [...] is the process of effecting change in a frame of reference". Of critical importance in this definition is the term "frame of reference" which is stated to be "[...] the structures of assumptions through which we understand our experiences" to selectively shape cognitive, conative, and emotional processes. Furthermore, it is assumed that a frame of reference is a relatively stable construct working like a critical lens and sets a "line of action". Modern theories of Bildung (Marotzki, 2003) build on the frame of reference and claim that there are many grand transformations in the society (e.g., digitalisation, globalism) which require a new transformation of the frame of reference. As we have seen, it is now a common practice to "hack" education, that is, to retrieve materials from open repositories all over the world or to collaborate with others in MOOCs. Traditional practices that have been obtained throughout formal educational settings have insofar offered little to help learners with orientation in open complex environments. Bildung may thus be understood as a way of reconsidering learning practices in a way which is appropriate to the challenges of modern education.

Recent theoretical approaches claim that Bildung is more closely linked to media than ever before. More specifically, it is assumed that media are an essential vehicle for Bildung because they represent the world for us (Jörissen & Marotzki, 2008). With the advancement of innovative ICT (social software) Bildung is exposed to new opportunities but also to new challenges. In recent attempts to describe Bildung in changed realities such as virtual worlds or digital spaces, the influence of innovative ICT has gained significant influence (Meister & Meise, 2010). Of central importance are the extended possibilities for articulation in new social media spaces. Expressing one's opinion in a blog or posting a statement in a discussion forum not only reflects individual Bildung but can also contribute to modifications of individual Bildung. Moreover, Bildung exceeds the dominant perspective of the individual to embrace the social realm. In this way, Bildung enables participation in public affairs and eventually leads to a "participatory culture" (Jenkins, 2009) which is assumed to emerge from the so-called Web 2.0 era.

How can Open Education Benefit from the Introduction of the Theory of Bildung?

It has been consistently suggested that open education lacks a solid theoretical framework. This was the case in earlier writings on the *Philosophy of Open Education* (Nyberg, 1975) and has continued up to this day (Peters, 2008a). In this regard, it seems astonishing that the massive critics on open education in Germany that have been mostly adopted in schools such as open curriculum were not linked to Bildung despite its influence in theoretical debates. Instead there was a rather vexed discussion which often attempted to demonstrate that openness should be regarded as a buzzword with virtually no exploratory power (Lenzen, 1976). Its foremost function is to subsume critics on the perceived closed systems of education (Nehles, 1981).

On the other hand, openness does point to a critical aspect in theorising Bildung which goes back to the classical writings of Humboldt. He and his contemporaries outlined the notion of Bildung being related to the world to enable the individual to have all the experiences that contribute to becoming a fully developed human being. This was based on a subject-object-dualism that claims that the state of an inward harmony can never be fulfilled without a connection to the external world by engaging and interacting with it and by leaving one's mark. This is a distancing and reflective process. Openness is thus important as an unrestricted access to the world constitutes the precondition for Bildung to take place. This typically takes a form where the person is confronted with a diverse array of (often challenging) experiences which then can be transformed into an integrated self:

> The person can... never gather himself enough in the whole human race. The more diversity he transforms into the whole, the richer, and the more powerful and successful he will be. The impact of the multifaceted relations provides him the diversity. The more he opens up (toward the world), the more new sides (and multiple abilities) he can possess, and the more active his inner activities can be so as to develop individually and to combine all together to a whole. (Humboldt, 1797/2002, p. 346, our translation)

Obviously, Humboldt's work is rooted in Idealism and unconcerned by technical issues like access to educational materials and learning on a massive scale. Given the aspiration of theories of Bildung – to capture the contemporary condition – it seems warranted to focus instead on the notion of openness as an enabler of Bildung. Moreover, it can be argued that Bildung and openness are kindred spirits because both share certain moral values around humanity and enlightenment (Deimann, 2013). From this expanded perspective, Bildung can be described as a complex process of interaction between the individual and the world based on a well-grounded understanding of the importance of openness: (1) the person is provided an unrestricted, open access to

digital artefacts representing the diversity of the world and (2) the world is given traces and manifestations expressing the human spirit that are added to the world's open database. We see today the emergence of many technologies which strive to support these processes. For instance, the OER Evidence Hub developed by the Knowledge Media Institute and the Institute of Educational Technology at The Open University under the auspices of the Open Learning Network aims to provide an environment to systematically interrogate the open education movement on what are the people, projects, organizations, challenges, solutions, and claims to scaffold the movement. In a similar vein, the OER Knowledge Cloud has been established to identify, collect, preserve, and disseminate available documents of enduring value to researchers, industry, government, scholars, writers, historians, journalists, and informal learners.

Open education and Bildung can both be linked to the broader context of web literacies, that is, the abilities to utilize the Web in a way to get the most out of it for personal development. Mozilla Foundation recently issued a paper which defines the four basic web literacies (2013):

1. **Exploring** - I navigate the Web while learning, questioning and evaluating what it has to offer.

2. **Creating** - I create things with the Web and solve problems while respecting the work of others.

3. **Connecting** - I communicate and participate appropriately in one or more Web communities.

4. **Protecting** - I protect the Web as a public resource for free expression.

This framework resonates with previous attempts outlining the potentialities of digital learning environments for Bildung (Marotzki, Nohl, & Ortlepp, 2003), which states that first and foremost information has to be transformed into knowledge – an understanding that is reflected in the open education movement by the shift in focus from OER to OEP. Secondly, knowledge should be reflected upon considering a number of factors, including (a) its emergence and constitution, (b) its scope, (c) its justified utilisation, (d) and with reference to the articulation of one's own position (with regard to the reflected knowledge) in public space.

We can see some similarities here with the connectivist approach for understanding MOOCs (Downes, Siemens, & Cormier, 2013) and other forms of open education, which may be simplified as entailing four steps: aggregation, remixing, repurposing, and feeding forward. However, being focused on the distributed nature of knowledge and cognition this approach neglects to describe the specific procedure that takes place during the process of personal self-transformation. Despite the ways in which transparency and openness to criticism are encouraged in open learning (Smith & Casserly, 2006) much of the content of these personal transformations remains opaque

or not well understood. While in a typical MOOC the learner is committed to open up materials from a technological and idealistic standpoint, Bildung elaborates on the importance of openness from a philosophical point of view, providing a way for learners to understand and influence their own intellectual development.

Thus far, building theories around the philosophical and pedagogical particularities of OER has been restricted by relying on concepts from an earlier phase in thinking about educational techniques that may not share the vision and explanatory force of Bildung. During the past two decades learning has become much more multi-faceted and complex, largely due to the proliferation of modern ICT. This has caused an "increasing encroachment on everyday life" and also "boundaries between settings in which people learn and in which they use technology for other activities have blurred" (Kop, 2011, S. 20). Consequently, learning now involves not only cognitive but also social, emotional, and other elements often undertheorised in traditional learning models. Attempts to describe learning and education in these complex contexts can be found, for instance, in the activity theory established through the extensive work of Engeström (2001) who argues that

> In important transformations of our personal lives and
> organizational practices, we must learn new forms of
> activity which are not yet there. They are literally learned
> as they are being created. There is no competent teacher.
> Standard learning theories have little to offer if one
> wants to understand these processes. (p. 138)

In a similar and parallel vein, open education has emerged as a new paradigm of social production in the global knowledge economy (Peters, 2008b) to challenge existing forms of teaching and learning. In the networked, digital world – and especially in the future – the sheer volume and diversity of content can be overwhelming, what Weller (2011) has referred to as abundance of knowledge in need of pedagogy. Evidently, one of the biggest hurdles for the learner in this kind of online environment is the ability to orientate oneself. There has already been a debate on the increasing information overload that has begun in the so-called knowledge society (Marotzki & Jörissen, 2010). There is a distinct difference between knowledge of *how* things can be better produced, more efficiently (*Verfügungswissen*) and knowledge of *why* or for what reason things are done or produced (*Orientierungswissen*). Both forms are inversely proportional: Whereas Verfügungswissen is easily accessible due to open formats and open archiving, it does not, however, contribute to an increase of Orientierungswissen. Furthermore, it exacerbates its acquisition. In this context, Bildung is seen as a critical factor for establishing competences that help people to navigate through open, complex worlds by relying on their own creativity and reflection to arrive at deeper understandings of their own educational experiences.

Bildung as Theoretical Framework: MOOCs, Communities, and Literacy

Excitement over massively open online courses (MOOCs) continues to mount while satisfaction with traditional forms of college education falls amid ever-rising costs to students and their families and a resulting restriction of access to higher education (particularly in the USA and the UK). High profile education providers from around the world have been working to make open courses available to all. Perhaps the first ground-breaking act was the Massachusetts Institute of Technology launch of the OpenCourseWare (OCW) initiative to make all its courses online and freely accessible. Several other institutions did the same so that rich repositories like MERLOT (Multimedia Educational Resource for Learning and Online Teaching) could be established. More recently, platforms like P2P University or Open Study Group started to offer not only open access to materials but also enabled open practices, including peer support or tutoring.

As they scale, MOOCs "[build] on the active engagement of several hundred to several thousand 'students' who self-organize their participation according to learning goals, prior knowledge and skills, and common interests" (McAuley, Stewart, Siemens, & Cormier, 2010, p. 4).   There are many other providers in this market (including Khan Academy, Coursera, Udacity) and thus MOOCs have already bifurcated into two distinct models: the "classical" (connectivist) MOOCs and the new xMOOCs (Daniel, 2012). However, proponents of MOOCs still emphasise the efficiency, flexibility, and accessibility of massive online instruction and assessment.

MOOCs disrupt a number of long held convictions about organised education. They are open to anybody with an internet connection, a willingness to learn, and a willingness to agree to the honour codes that serve to ward off plagiarism. Traditional higher education directs students towards achieving a degree, and degree programmes often include some materials that are more or less interesting to the student. By selecting their own courses, MOOC learners must direct their own learning at a fundamental level. MOOCs may be radical pedagogical activities in that they often do not specify learning goals or examine the learning process in anything like the typical ways. Assessment of learning is typically peer-based rather than carried out by an instructor. It is thus a totally learner-centred (and learner-driven) approach which is at odds with almost all institutional pedagogy. While the curricula and delivery of learning materials are planned by the course teams, participation in a MOOC is often "emergent, fragmented, diffuse, and diverse. It can be frustrating. It's not unlike life" (McAuley et al., 2010, p.4).

How can learners (and teachers) orient themselves in a MOOC environment when many of their preconceptions about the learning process are based on "closed" institutional models? We propose to frame the question in terms of a new kind of literacy that is informed by theories of Bildung. MOOC learners must take responsibility for their own learning and development to a degree that is arguably greater than that of typical higher

education students. They must therefore be relatively more autonomous in some ways than typical college students.

Often serving many hundreds of thousands of students, MOOCs are often assumed to improve access to education. Though there are undoubtedly large numbers of students enrolled on such courses, it is too early to say whether we should really think of this as widening access to education. The MOOC model may be understood as a very large scale process of information assimilation with standardised assessment. In some ways, these could be seen as the worst aspects of mechanical learning brought to a massive scale.

To avoid this kind of charge, most MOOCs rely on peer assessment of graded work and lively forum discussion to create communities and support structures that can replace classroom interaction and a personal relationship with an instructor.

There is a general tendency to think that the sheer scale of MOOCs will produce immersive learning communities. But perhaps this is overly optimistic. One blogger (Borden, 2012) reflecting on his experience of a statistics MOOC noted:

> [A]fter asynchronous discussions with about 10 peers, I soon realized that I was likely the most knowledgeable person in our group when it came to statistics... nobody had anything of value to bring to the table. Social learning is indeed a powerful thing, but without what Vygotsky would call the "More Knowledgeable Other" in the group, it starts to break down quickly. MOOCs could rely solely on high stakes, standardized, auto-graded tests, but again, that would simply perpetuate a bad practice from face to face teaching in the online realm.

One of the most evident attractions of MOOCs is the ability to scale educational activities, but we need to be attentive to the kind of activities we scale. Organisers of MOOCs are under an obligation to demonstrate the validity of their instruction, but need to ensure that an over-reliance on learning analytics and machine learning does not restrict our idea of education to only those things which may easily be measured and quantified. Without basic cultural skills like reading there are few possibilities for Bildung (Ließmann, 2009) and if those taking part lack a certain basic standard of academic ability it is difficult to see what value they offer to others in peer-based assessment.

As McAuley, Stewart, Siemens, and Cormier (2010) found, student dropout in MOOCs is much higher than in traditional courses. Whether the majority of students feel that they get value from participating in a MOOC remains an open question. As we have seen from our overview of Bildung-theoretic perspectives, Bildung offers a way of making sense of (and informing) this kind of activity by providing an account of what

meaningful interaction within a MOOC might look like: an activity which emphasizes curiosity, imagination, passion, and creativity in order to encourage authentic and personal forms of learning through open communities. There is a striking similarity between these digital learning activities and events that took place during educational journeys described in a literature of its own: *bildungsroman* (often translated as the coming-of-age novel).

Such narratives are etymologically and culturally rooted in the same idea as Bildung. In 1821, Johan Wolfgang von Goethe published the novel *Wilhelm Meister's Journeyman Years* which is considered to be the prototypical bildungsroman based on a trichotomy of (1) youth, (2) years of apprenticeship and wandering, and (3) master craftsmanship to describe the personal and biographical development of a fictional character. Beginning in the boyhood years, the author explains how Wilhelm Meister breaks out of his confining childhood home to find liberation in the world of theatre. Once he is out in the wild world, he is exposed to violence (robbery), a failed love affair, and other difficulties that he has to cope with throughout the journey of his life.

Learning in a MOOC has significant parallels to the wandering years of Wilhelm Meister. For instance, the experiences of the confining structures of the family may represent the closed learning management systems that have become predominant in higher education for a decade. As these systems get unbundled by implementing OER and OEP, learning is less predictable and more fragile (McAndrew, Farrow, Law, & Cirigottis-Elliot, 2012) but also more conducive for Bildung because the vast amount of freedom requires the person to reflect more deeply, not only about learning per se but also about fundamental questions about life, that is, the notion that describes Bildung as a process of transformation, recognition of one's autonomy and potential, or going beyond the present state (Marotzki, 2003). Bildung is thus an existential process of becoming, not a fixed state or achievement.

In this regard, social media provides outstanding potential to elicit this process given their emphasis on networking, collecting and sharing, collaboration, articulation, and participation. More specifically, tools like Mendeley offer opportunities for identity management, creative handling of cultural objects, and reflexivity in public participation. The potential can be enhanced by a gradual opening to reach a larger community than traditional environments (classroom, online discussion forums). Using these tools can engage the learner in processes that are articulated in the tradition of the bildungsroman.

Conclusion

The present paper has attempted to provide a theoretical base for an educational field that has gained enormous attention over the past years. Developments have been closely related to and thus mediated by innovative ICT. Consequently it has become challenging to keep track of the accomplishments of the open educational movement. Besides the consequences for practitioners (e.g., difficulties to find appropriate OER materials) there is also a significant downside with concern to scholarly work. As long as there is no solid theoretical foundation, the movement is in danger of becoming weakened, which was the case during the earlier open classroom movement in Germany that exploited openness as a buzzword during the struggle for more educational innovations and thus failed to be recognised as an influential field.

To bridge this gap, we have introduced the theory of Bildung which roots in philosophical and theological thinking (self-cultivation). We have briefly reviewed subsequent history to demonstrate how education has benefited from Bildung. With the recent advent of innovative ICT, media has become a core subject for Bildung. There is significant potential to elicit or encourage Bildung through the use of OER, such as through providing open access to a rich base of materials from various cultural contexts. In this process of engaging with multiple and complex resources it can be assumed that a transformation of the way in which the individual is approaching learning is likely to happen. We explored this through the context of MOOCs and argued that Bildung can provide a useful contribution to understanding and maximising the value of open education.

The beliefs and values associated with Bildung – including autonomy, critical reflection, inclusivity, and the rejection of commercial imperatives – are suitable for providing a theoretical framework for OER as well as providing a critical lens through which to assess contemporary educational models in practice (e.g., Lessman, 2006). The commercialization of higher education threatens to conflate education and learning, and learning experiences are often treated as isolated consumer choices. We need a framework like Bildung to analyse changes in education, helping us make decisions about the kind of educational culture to which we aspire. Overall, Bildung is more reflexive, more critical, and more open than didactic models of education or traditional theories of distance learning. There are good reasons to think that it can provide the open education movement with an improved philosophical and pedagogical foundation.

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Web sites

MIT OCW http://mitx.mit.edu/

OLnet http://ci.olnet.org

OERGlu http://www.oerglue.com

OER Knowledge Cloud https://oerknowledgecloud.org/

OpenLearn http://www.open.edu/openlearn

OpenStudy http://openstudy.com

P2PU http://p2pu.org/en/

Wikieducator http://wikieducator.org/Main_Page

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An Explanation for Internet Use Obstacles Concerning E-Learning in Iran

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Abstract

E-learning is advancing in Iran right now. The Iranian higher education system is applying electronic learning in order to conquer the limitations of the existing education system. These limitations include the growing number of applicants for entering universities, lack of classrooms for education, and universities' tensions in replying to these needs. Also, ease of access to e-learning and a lack of financial resources are reasons for applying e-learning in Iran. In addition, the Iranian higher education system wants to progress with global changes in the information era and they see it as necessary to acquire information and knowledge. Meanwhile, web technology enjoys a special and significant role. This paper investigated barriers to using internet technology for e-learning in the Iranian context. The methodology employed both qualitative and quantitative techniques. In the qualitative stage, exploratory observations of eight virtual institutes for higher education and interviews with 20 experts in these institutes were used. The analysis of the data showed that socio-cultural, structural, educational, economic, and legal factors were the most prominent obstacles to web technology use; each factor comprised a number of components. So as to check the primacy of the factors and the extracted components at large, the researchers developed a Likert-type questionnaire; the questionnaire, which comprised the five types of obstacles and their related components, enjoyed a high degree of validity and reliability. Twenty students in each of the eight institutes were asked to fill out the questionnaire. The analysis of the data showed that socio-cultural factors are the most influential barriers to use of the Internet in e-learning.

Keywords: Internet; e-learning; distance learning; Iran

Introduction

The development of information technology (IT), in the last century, has brought about significant changes in many areas including learning and teaching (Jerry, 2000). Higher education has not been an exception (Cahill, 2008). In this arena, IT has brought about significant changes to the delivery methodologies in the open university (OU). An OU, which is a distance learning and research university, employs a variety of communications technologies with the aim of giving students the opportunity to study off-campus (Cahill, 2008). In other words, it provides university education to those wishing to pursue higher education on a part-time and/or distance learning basis. In recent years, computers and the Internet have made distance learning distribution easier and faster and have given rise to the virtual university, the entire educational offerings of which are conducted online (Phipps & Merisotis, 1999). The idea of distance education, which was first promoted in the United Kingdom, has spread over many countries around the world (Carswell & Venkatesh, 2002).

Fariborzi and AbuBakar say,

> In Iran, the number of students is growing faster than the number of public and private universities or any other institutions of higher learning. The Web-based learning is the solution to this problem. However, the current Iranian higher education system faces so many challenges that it is very difficult to achieve the effectiveness of Web-based learning. (2011, p. 59)

Along with the significant advancements in distance education or e-learning in many parts of the world, considerable improvements can be observed in Iran's higher education system (Kamalian & Fazel, 2009; Rahmanpoor, Liaghatdar, & Afshar, 2008; Safavi & Mohammadi, 2007). The large youth population and growing demand for acquiring higher education in Iran (Araste, Sobhaninejad, & Homaie, 2009; Emadzade, 2009; Ghavidel, Farjadi, Razeghi, & Badiei,2012; Iran's National Education Report, 2006; Roushan, 2009) create a condition wherein replying to the need for e-learning is not only replying to an educational need but also to a social need. A lack of classrooms, the flexibility of time and place for education, access to multi-media resourses, the ease of updating information, and the growing number of applicants for higher education are reasons to increase online access to education in Iran. Studies show that acceptance of e-learning from Iranian students in comparison to traditional learning is advancing with high speed especially in higher education.

Though such movements are worth appreciating, one cannot ignore the main obstacles to providing web-based distance education in developing countries, in general, and in Iran, in particular, due to economical, social, political, and cultural factors. The present study was conducted to identify the main obstacles to providing online distance education and to provide a number of suggestions to help remove the obstacles. In

comparison to other research in Iran, our study is more complete in some ways and takes a careful look at the subject. The five components discussed in this study are not found in others. Further, in comparison to studies conducted in other developing countries, we can say that different countries have different cultures. In the authors' view, although this study has some common points with studies in other developing countries, there are differences. The authors could not find resources relating to the subject of this article other than the ones described below, because of limitations in Iran as far as access to research and the Internet.

Review of the Literature

According to Farajollahi et al. (2010) Morss and Murray mention that the most important mission of higher education from the beginning has been to give information, knowledge, and skills to students (2005, p. 5). But higher education is at the beginning of a revolution regarding information and communication power. In another article Miguel and Pherson (cited in Farajollahi et al., 2010) say that today universities should educate those who have the ability in grouping, analyzing, and combining information, problem solving skills, communication skills, discussion, and verbal, technological and management skills, instead of preserving and saving data, to be able to adjust themselves to rapid social and industrial changes (2004, p. 78).

Umrani-Khan and Iyer (2009, p. 1) believe that

> use of technology to facilitate learning is accepted as a value across educational institutions. However, the focus is still largely on getting the infrastructure and creating the e-learning content. It is necessary to consider the individual factors that play an important role in the adoption of e-learning. For example, attitude of students and teachers towards e-learning may affect their acceptance of the technology in the teaching learning process. The four determinants of e-learning acceptance are performance expectancy, effort expectancy, social influence and facilitating conditions.

E-learning was first coined by Cross and refers to any kind of learning which is mediated through the use of the Internet and an intranet (Atashak, 2007). Examples of e-learning are web-based teaching, web-based learning, internet-based teaching and advanced learning (Khan, 2005; Yaghoobi, Malekmohammadi, Irvani, & Ataran, 2008). Cooper (2004) defines e-learning as the set of training activities employing audio, visual, computer, and networking electronic devices. In his definition of e-learning, Mayer (2005) views e-learning as an active kind of learning which changes teaching and learning processes dramatically and plays a significant role in developing information

and communications technology. In a more comprehensive definition, Murthy and Mathur (2008) define e-learning as incorporating all educational activities that are carried out by individuals or groups working online or offline and synchronously or asynchronously via networked or standalone computers and other electronic devices. More recently, Hamdi (2007) defines e-learning as using web technology for planning and delivering lessons and providing a learning environment for monitoring teaching and learning activities.

Many advantages for e-learning have been put forward by a number of scholars. Pawlowski (2006), for instance, believes e-learning can help overcome geographical and individual limitations which are typical of traditional educational systems. In other words, by providing off-site educational opportunities, e-learning offers the possibility of flexibility to accommodate the many time-constraints imposed by personal responsibilities and commitments. Accordingly, learners can study wherever they have access to a computer and the Internet. They can join discussions in the bulletin board threaded discussion areas at any hour, or visit with classmates and instructors remotely in chat rooms.

Such flexible access to information and resources has also been acknowledged by Naidu (2006); he appreciates distance learning for giving learners, who are generally adults in full or part-time employment, the opportunity to study at a time and place that is convenient. This way, distance education frees learners from the constraints of conventional residential educational settings since they are not required to attend lectures in locations away from where they may be living and working.

Besides removing constraints of time and place, distance learning provides learners with self-paced learning modules which allow them to work at their own pace. In fact, learners have the option to select learning materials that meet their level of knowledge and interest. Here, different learning styles are addressed and facilitation of learning occurs through varied activities (Solution for international schools, n.d). Other merits like providing equal and free opportunities to access and search through courses, improving the quality of teaching training methods, and reducing the demand on educational resources and institutional infrastructure such as buildings have also been acknowledged by Geogieva, Todorov, and Smrikarov (2003) and Pawlowski (2006).

Despite interest in e-learning, it is not free from flaws. Among the constraints to using e-learning, one can refer to the lack of access to the technology infrastructure or not having knowledge of how to use it. Another limitation can be the costs of hardware and software, costs of infrastructure support and its maintenance, and related costs that are factored into the deployment of an e-learning venture (Naidu, 2006). Besides these disadvantages, e-learning has other limitations in developing countries like Iran: Low motivation of the students and instructors in virtual learning and teaching, lack of staff knowledge of the technology, and lack of proper management and expert human resources are among the basic problems when implementing virtual education in Iran (Maneie, 2003).

It does not mean, however, that no attempts have been made in Iran to promote e-learning opportunities. Distance education based on e-learning has attracted much attention in recent years due to the emphasis of the country's Fourth Development Program (based on Wisdom) on improving e-learning (Rahmanpoor et al., 2008). Accordingly, increasing numbers of universities are becoming interested in providing virtual educational opportunities to the students in different academic fields. Shiraz University was the first institution which provided virtual education, but in only one study area, in 2004 (Safavi, Bavaghar, & Ghafari, 2007). This trend was later continued by Science and Industry University, Amir-kabir and Khaje-nasir Industrial Universities. Other institutions like Shahid Beheshti, Qom and Esfahan Industrial universities are making the final preparations for providing virtual distance education to their students (Jafarpoor, Fayyazi, & Bahrahzadeh, 2008). Despite such attempts, one should not ignore serious obstacles to using e-learning that might hinder further efforts in the field.

Methodology

This field study is conducted on two levels: quantitative and qualitative. In the first step in order to find out the obstacles facing the research, we conducted an interview with 20 professors and specialists who were executives of e-learning in Tehran. It should be said that the participants were selected in a non-random and targeted way. Throughout the interview at first we explained the general goal of the research and then the questions. Then we brought up the relevant questions. Considering the limitation of the target population, we investigated different aspects of the subject through deep interviews and the content analysis method, text analysis, and we elicited five obstacles, economical, cultural and social, legal and legitimate, educational, and structural. In the second step, we designed a 26-question questionnaire with the help of acquired components (with 0.86% Cronbach's alpha coefficient and confirmed reliability by a specialist) with five Likert-type variables. In each institution, we asked 20 M.A. students of different majors, such as Information Technology and E-commerce, Administration and MBA, Commercials and Media, totalling 160 people, to answer the questionnaire. After conducting the questionnaire, we extracted the raw data of the research and formulated it in a general information table. Then the information was analyzed in SPSS and with the help of the Freidman test. In an interview phase, at first we explained the general goal of the research then asked the relevant questions. In the questionnaire phase, also, we explained the necessary points written on the questionnaire form to the respondents, and when the respondents were answering the survey, we were present to answer their questions.

Results

According to 20 theses guided by the first author of the study and several studies conducted by the first two authors, as well as previous research, reference studies, and the results of an interview with well-known university professors in this field, there are five obstacles.

Results of the study are presented in different sections: First, the primacy of the five obstacles is reported and next the importance of each component within the extracted obstacles is presented.

Primacy of obstacles.

Table 1 summarizes the level of importance of each one of the five obstacles for questionnaire respondents in percentages.

Table 1

Primacy of the Five Obstacles

	Obstacles	Unimportant	Of little importance	Moderately important	Important	Very important	Total
1	Socio-cultural	5	8	16.7	25	43.3	100
2	Structural	5	10	26.7	23.3	35	100
3	Educational	3.33	13.33	28.3	30	25	100
4	Economic	5	15	33.3	30	16.7	100
5	Legal	8.3	13.3	36.7	25	16.7	100

Freidman statistics proved that there was a statistically significant difference in the significance respondents attached to different obstacles: $x2$ = 15.99, p = .003, df = 4. Also, it was found that the socio-cultural obstacle is viewed to be the main barrier to implementing e-learning; legal barriers, on the other hand, were found to be the least significant among the five.

Socio-cultural obstacles.

Freidman statistics also showed that there was a statistically significant difference between the seven components of the socio-cultural obstacle: $x2 = 33.8$, $p = .000$, $df = 7$. Table 2 indicates the ranking of the components based on responses to the questionnaire. As the table shows pessimism of the government toward the Internet was selected with highest frequency by the respondents.

In Iran and other developing countries, the government and other responsible institutions in this field have an authoritative and pessimistic view toward cyberspace. This condition becomes worse in relation to universities and other higher educational institutions. Previous studies revealed that the government has a very high tendency to interfere with university affairs (Rabiee & Nazarian, 2012a; Winter; 2012b).

Table 2

Ranking of the Seven Components within the Socio-Cultural Obstacle

		Components	Mean rank
Socio-cultural obstacles	1	Pessimism of the custodians toward the Internet global network	5.43
	2	Lack of national preparation and determination to launch online training	5.08
	3	Perceived lack of efficiency of online training compared with traditional methods of instruction	4.94
	4	Custodian's willingness to impose limitations on using the Internet	4.42
	5	Students' willingness to participate in classes	4.03
	6	Students' concern over perceived lack of socialization associated with virtual universities	3.99
	7	Lack of public familiarity with virtual education	3.52

Structural obstacles.

Freidman statistics also showed that there was a statistically significant difference between the four components of the structural obstacle: $x2 = 70.8$, $p = .000$, $df = 3$. Table 3 indicates the ranking of the components based on responses to the questionnaire. As the table shows inappropriate telecommunication infrastructure in the country was selected with highest frequency by the respondents.

Table 3

Ranking of the Four Components within the Structural Obstacle

		Components	Mean rank
Structural obstacle	1	Inappropriate telecommunication infrastructure in the country	3.21
	2	Poor coordination for using the Internet at the international level	2.94
	3	Learners' need for having access to the Internet	2.15
	4	Lack of preparation of institutions	1.69

Educational obstacles.

Freidman statistics also indicated that there was a statistically significant difference between the six components of the educational obstacle: $x2 = 21.99$, $p = .001$, $df = 5$. Table 4 indicates the ranking of the components based on responses to the questionnaire. As the table shows resistance of a number of faculty members to online training was selected with highest frequency by the respondents.

Table 4

Ranking of the Six Components within the Educational Obstacle

		Components	Mean rank
Educational obstacle	1	Resistance of a number of faculty members to online training	4.45
	2	Difficulty of studying online materials compared with printed ones	3.48

	3	Lack of sufficient familiarity of the students with search tools	3.46
	4	Lack of necessary training of the teachers and lecturers from educational institutions	3.35
	5	Problems with practical and laboratory courses	3.22
	6	Low record of virtual education in the country	3.04

Economic obstacles.

Freidman statistics also showed that there was a statistically significant difference between the four components of the economic obstacle: $x2 = 35.2$, $p = .000$, $df = 3$. Table 5 indicates the ranking of the components based on responses to the questionnaire. As the table shows the high expense of studying in virtual universities for the students was selected with highest frequency by the respondents.

Table 5

Ranking of the Four Components within the Economic Obstacle

		Components	Mean rank
Economic obstacle	1	High expense of studying in virtual universities for the students	3.28
	2	Lack of interest of private sectors in investing in virtual education	3.04
	3	High costs of administering online training for the institutions	2.98
	4	Lack of adequate financial support of the government	2.88

Legal obstacles.

Freidman statistics also indicated that there was a statistically significant difference between the three components of the legal obstacle: $x2 = 16.9$, $p = .000$, $df = 2$. Table 6 shows the ranking of the components based on responses to the questionnaire. As the table shows lack of compliance with international norms and standards of using the Web was selected with highest frequency by the respondents.

Table 6

Ranking of the Components within the Legal Obstacle

		Components	Mean rank
Legal obstacle	1	Lack of compliance with international norms and standards of using the Web	2.25
	2	Infringement of copyright	2.25
	3	Lack of adequate security and protection in electronic systems.	1.66

Conclusion

The present study was conducted in order to find the obstacles facing the use of the Internet in the process of e-learning in a developing country like Iran. The results show that decision makers are not unified in respect to the cultural and political consequences of Internet use and this results in a lack of trust in using the Internet for educational purposes, so using the Internet for different aspects in Iran is actually facing a delay. To cite an example, we observe a judgement of unreliability regarding e-journals and e-learning courses. Also, studies show that people who volunteer to participate in electronic education are those who don't succeed in entering the state universities; thus, choosing such an option for them isn't considered a need for e-learning but only an option to continue their higher education. On the other hand, some believe that Iranians' face-to-face and oral culture is an obstacle to e-learning in the country. Furthermore, in developing countries, techniques, communication, and tele-communication foundations are few and this can also be considered an obstacle for e-learning. Also, developing countries like Iran are facing different international boycotts; consequently, they do not have enough capacity to develop e- learning.

According to Feyzi and Rahmani (2003) and Kamalian and Fazel (2009) and Mosavi et al. (2011), another obstacle for e-learning in Iran is that learners do not have easy access to computers with the appropriate hardware, software, or connectivity to the Internet. On the other hand, cultural, structural, and economical barriers actually turned into educational barriers. As far as professors and persons in charge of educational affairs, no mental readiness for the higher educational system and a lack of basic education relating to e-learning lead to difficulties in the use of communication technologies, so are considered to be obstacles to e-learning. According to the results found through deep and qualitative interviews with specialists, e-learning is not

widespread in elementary and high schools, students and professors are not familiar with e-learning, and learners do not have enough information about e-learning, all of which lead to serious difficulties related to making the culture and structures for e-learning. The results of the research confirm that students and learners do not have enough knowledge of and enough skill in e-learning. The results accord with the study by Seyed Naghavi (2007). On the other hand, the results of the present study show that one of the most important factors in e-learning is previous experience with using and searching the Internet. This accords with the study results of Mahdizadeh et al. (2008). Furthermore, e-learning in the higher educational system in Iranian universities isn't free of charge and this is another obstacle for e-learning in the country. Also, different policies in the higher educational system are obstacles for the private sector to participate in e-learning education and this decreases competition.

According to the results of this study and considering the conditions of the country, the following suggestions are recommended. We need to say that these suggestions are substructure solutions that are ordered in accordance with the results of this research and other findings.

- First, it is recommended that online training courses be offered to students with no fees in public universities.

- It is offered that online training courses be available to students from the very early stages, possibly from primary school; this results in students' familiarity with online training and might lead to public acceptance of virtual learning. To achieve this aim, we need to train students on how to use computers and search engines. Not only students but also instructors and staff need to be familiar with online training courses.

- It is suggested that development of virtual universities be stipulated in the country's national policy. Also, it is recommended that strict training policy be implemented in virtual universities; this way the credibility of virtual university degrees will increase.

- We need to offer e-learning in elementary schools. In order to do this, it is necessary to introduce the concepts of the computer and information technology as a foundation for e-learning in the future.

- The government should consider enhancing the communication skills of students, like writing and sending emails, doing searches, writing for blogs, and so on in order to become an essential part of the country's programs.

- Another solution is to place e-learning educational units in the Ministry of Education and the Ministry of Health and Treatment and to improve universities that have the capacity to change into e-learning universities; this capacity is now present at Payam Noor University. Also, the

government should educate instructors and students to become ready to accept e-learning. Another suggestion is to promote the validity of academic documents of e-learning.

- Decreasing the cost of e-learning courses and getting financial help to improve e-learning courses, as well as educating instructors and students about e-learning, are other suggestions for developing e-learning in the country.

- Appropriate organization of educational resourses and materials, ease of access to the materials, and appropriate educational content play an important role in conducting these courses. Thus, it is better to consider proper material and content before conducting e-learning courses.

- E-learning courses should complement traditional teaching and should be held mutually with well-known local and foreign universities.

- Removing unnecessary legal limitations on using the Internet will make it easier to accept e-learning courses.

- The validity of the academic documents of e-learning courses is under question from official organizations in Iran. So necessary action should be taken in order to give the same value to e-learning courses as other traditional courses.

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Enhancing Motivation in Online Courses with Mobile Communication Tool Support: A Comparative Study

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Abstract

Mobile technologies have helped establish new channels of communication among learners and instructors, potentially providing greater access to course information, and promoting easier access to course activities and learner motivation in online learning environments. The paper compares motivation between groups of learners being taught through an online course based on an e-learning system with and without the support of mobile communication tools, respectively. These tools, which are implemented on a mobile phone, extend the use of the existing Moodle learning management system (LMS) under the guidance of a mobile communication tools framework. This framework is considered to be effective in promoting learner motivation and encouraging interaction between learners and instructors as well as among learner peers in online learning environments. A quasi-experimental research design was used to empirically investigate the influence of these tools on learner motivation using subjective assessment (for attention, relevance, confidence, satisfaction, and social ability) and objective assessment (for disengagement, engagement, and academic performance). The results indicate that the use of the tools was effective in improving learner motivation, especially in terms of the attention and engagement variables. Overall, there were statistically significant differences in subjective motivation, with a higher level achieved by experimental-group learners (supported by the tools) than control-group learners (unsupported by the tools).

Keywords: e-learning; mobile communication tools; motivation; online courses; online learning

Introduction

Online learning increases learners' ability to learn at their own convenience; however, the physical separation from their peers and instructors that online learning involves may result in a lack of communication and interaction and a weaker sense of belonging to a classroom community. These affect learners' motivation and can lead to poor performance, dissatisfaction, and dropout (Balaban-Sali, 2008; Hirumi, 2002; Rau, Gao, & Wu, 2008). Effective interaction can positively impact learners' motivation, engagement, and interest in learning. To address learners' problems and needs in relation to motivation during online courses, new communication technology—particularly mobile technology—seems to be effective by virtue of its ability to encourage interaction between learners and instructors (Rauet et al., 2008; Shih & Mills, 2007).

Relevant Research

Mobile learning gives students the ability to interact with their instructors and fellow learners immediately—at any time and place—and adapt content to their individual needs, which in turn facilitates sustained connections between learners and instructors. This may include content or processes where appropriate knowledge needs to be quickly and easily accessible and where a large volume of introduction or context is not needed; topics where the viewpoints and opinions of recognizable instructors with whom the students have had the opportunity to have fulfilling interactions; topics where advice, tips, and best practices can be simply presented and packaged, for example in areas such as recruitment and coaching; topics where capability to locate them at a certain place or time adds value, for example, location-specific access; and topics where the student will almost certainly benefit from access to learning on the move—this may include learners such as field engineers and salespeople (Ufi & Kineo, 2007).

Mobile learning research on motivation in online contexts.

Recent innovations incorporating m-learning activities in various online courses are reportedly effective in encouraging the motivation to learn (e.g., Mockus et al., 2011; Olasina, 2012). However, m-learning studies that explore motivation to learn in online environments remain limited in number. Table 1 summarises research on motivation in m-learning settings in recent years.

Table 1

Research on Motivation in Mobile Learning

Author (year)	M-learning tools or activities	Experimental research	Outcome measured	Results/ conclusion
Mockus et al. (2011)	Mobile course website (syllabus, course schedule, course announcements, blog aggregator), mobile flashcards study tool, and audio podcasts	No	Attitude, motivation	Positive
Olasina (2012)	E-learning tools such as Yahoo groups, wikis and online communities, Web-enabled handsets, e-library, Facebook, Web 2.0 tools, and hypermedia	No	Attitude, motivation	Positive
Andrews, Smyth, & Caladine (2010)	Vodcasts (video podcasts) and videoconferencing	No	Attitude, engagement	Positive
Chou & Fan (2012)	Web 2.0 and location-based service	No	Not defined	Not defined
Garrido, Miraz, Ruiz, & Gómez-Nieto (2011)	Using NFC (Near Field Communication) technology to develop pervasive games	No	Attitude, achievement	Positive

A review of the current literature indicates that there are various m-learning tools or activities presently used to motivate online learners. Web 2.0 tools and audio and video podcasts seem more popular than other tools. However, these research studies have had a tendency to develop mobile based learning applications that do not identify any design strategy for the stimulation and support of learner motivation. Apparently, none of these studies conducted an experiment to investigate whether there are motivation changes/improvements due to the proposed m-learning tools.

Motivation in online learning.

Previous approaches to motivational design in online learning environments have mostly been based on Keller's (1987) ARCS model (e.g., Bae, Lim, & Lee, 2005; Jones, Issroff, Scanlon, Clough, & McAndrew, 2006; Shih & Mills, 2007). The ARCS model identifies four essential strategic components for instructors to enhance learning motivation. These components are *attention*, where the instructor gains and sustains the learners' attention and interest throughout the session; *relevance*, which is

conceptualized as a matter of how learning activities are depicted to the learners as reflecting their needs, interests, and motives, rather than actually referring to content; *confidence*, which focuses on learner performance, and helps learners develop a positive expectation that they will be able to achieve a successful learning experience; and *satisfaction*, which provides learners with positive reinforcement for their efforts (Keller, 1987).

In addition, *collaborative learning*—learning through social interaction—has been extensively acknowledged for its ability to encourage a spirit of learning and to foster knowledge about the learning process (Sharan & Shaulov, 1990). Since cooperative learning groups provide each member with essential praise and recognition for their positive effort, cooperative learning activity can raise learners' motivation. Miyake (2007) and Slavin (1995) have shown as well that learners are more motivated to learn in a collaborative situation and that this has a positive effect on academic, social, and attitudinal outcomes.

Although a significant number of studies have examined the motivational requirements of online learners and on their basis created models for motivational design in online instruction, very little research-based evidence has been conducted on learners' motivation in relation to the use of mobile devices as a complement to existing e-learning systems. Therefore, this study attempts to prove that online learners' motivation can be enhanced when the proposed mobile communication tools are used as part of an existing e-learning system in accordance with a motivational design model. This study is designed to examine whether the proposed mobile communication tools have the effect of stimulating and maintaining learners' motivation to use the e-learning system, and also whether any motivational differences exist across different conditions of online courses (i.e., those using mobile tools vs. not using them).

Method

The quasi-experimental study presented in this paper was designed to compare learning motivation between learners in a course being taught using Moodle LMS supported by mobile communication tools (the experimental group) and those being taught using regular Moodle LMS only (control group). An experimental comparison of the two groups' learning motivation was carried out in the first semester of 2011 in the Faculty of Information Technology at a university in Thailand. The initial sample consisted of 193 undergraduate students (68% female, 93% aged 18–21) enrolled that term in a course called IT for Learning. These initial participants were assigned to control ($n = 92$) and experimental ($n = 101$) groups on the basis of their demographic profile in order to ensure homogeneity across the groups, thus reducing bias.

Learners in both the experimental and control groups learned the same content and used the same online course materials. The courses consisted of weekly modules,

wherein the instructor required the learners to regularly take part in a variety of online class activities, for example, to read a given text online, post a short essay, engage in debate on the discussion forums, create their own blogs on course topics, and vote on class social activities. During the courses, learners were assessed regularly by means of formative assessments, including discussion forum posts and individual assignments, and summative assessments, including assignment grades and midterm and final exams.

The quasi-experimental design employed by this study can be separated into three periods: the *pre-treatment* period (first and second weeks), the *treatment* period (third to twelfth weeks), and the *post-treatment* period (thirteenth and fourteenth weeks). Figure 1 describes the procedure used by the experiment. Learners from both groups began in the pre-treatment period (the first two weeks, in which no treatment had yet been applied). They took part in regular online courses using Moodle, and objective assessment data (on disengagement, engagement, and academic performance) were collected on the basis of their actions. Data from this pre-treatment period were collected and analysed in relation to those from the treatment and post-treatment periods. During the treatment period, the learners in the experimental group were provided access to mobile communication tools integrated with Moodle, whereas the learners in the control group were able to access regular Moodle only. Scores on the midterm test were added to treatment assessments to assess learners' academic progress and performance. During the post-treatment period, learners in both groups learned through the regular Moodle LMS, unsupported by the mobile tools. Instead, the objective assessment measures on engagement and academic performance, respectively, were the number of help requests made by the learners and their scores on the final test. They were also asked to complete the *Online Course Motivation Survey*.
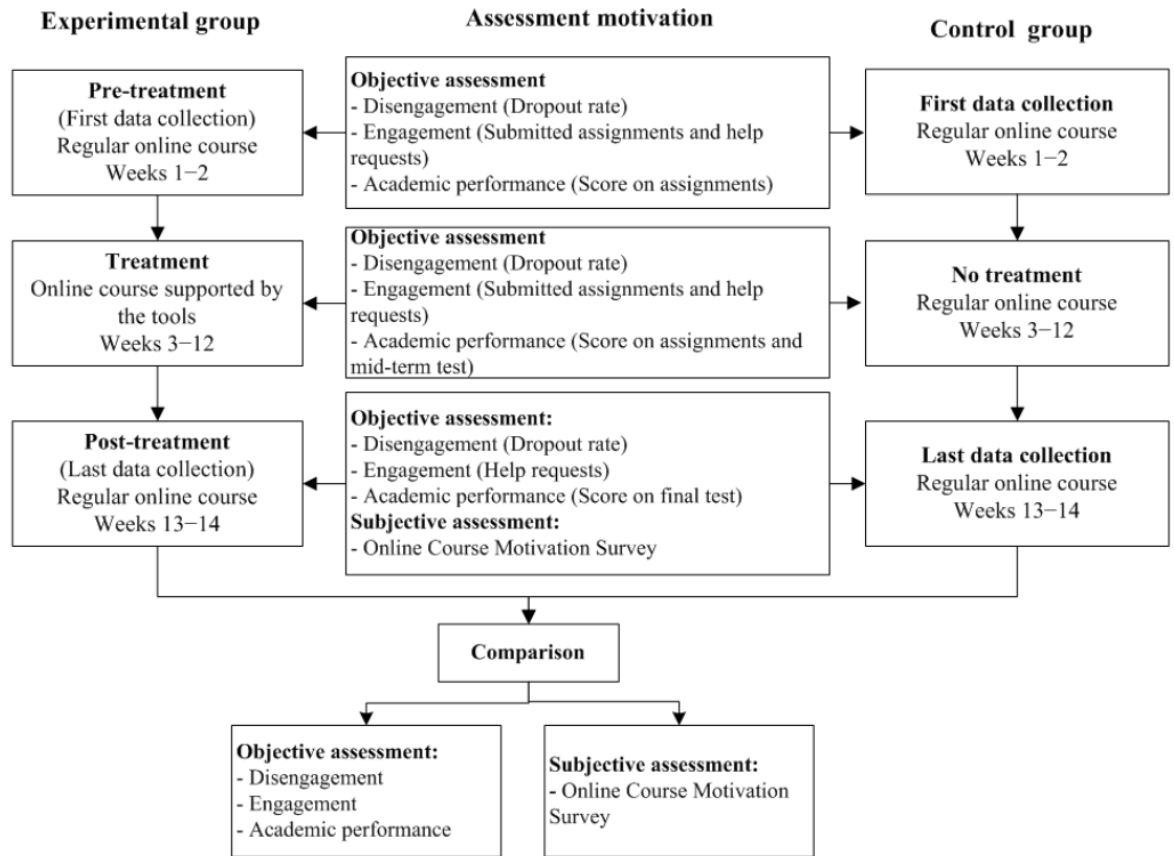
Figure 1. Experimental procedure.

This study used the procedure shown in Figure 1 to develop appropriate mobile communication tools integrated with Moodle LMS for online learners in the experimental group.

Overview of Mobile Tools

The mobile communication tools used for the experiment are an extension of the Moodle LMS, taking advantage of the help of interactive mobile applications. Figure 2 presents an overview of the whole system, including the e-learning client, server, and m-learning client. The e-learning client used consisted of learning products delivered via a web browser over a network. This study also employed some user interfaces customised to suit the proposed tools in the presentation layer of Moodle. Another component consisted of the server, which delivered course information in a database to the (desktop or laptop) browser, and the web services required (translating LMS requests for the mobile devices). The last component, the m-learning client, was composed of the text messaging system and mobile communication tools. The former was used only by the instructors, to send text messages retrieved from Moodle to individual learners, while the latter were used by learners on their mobile phones to access Moodle.
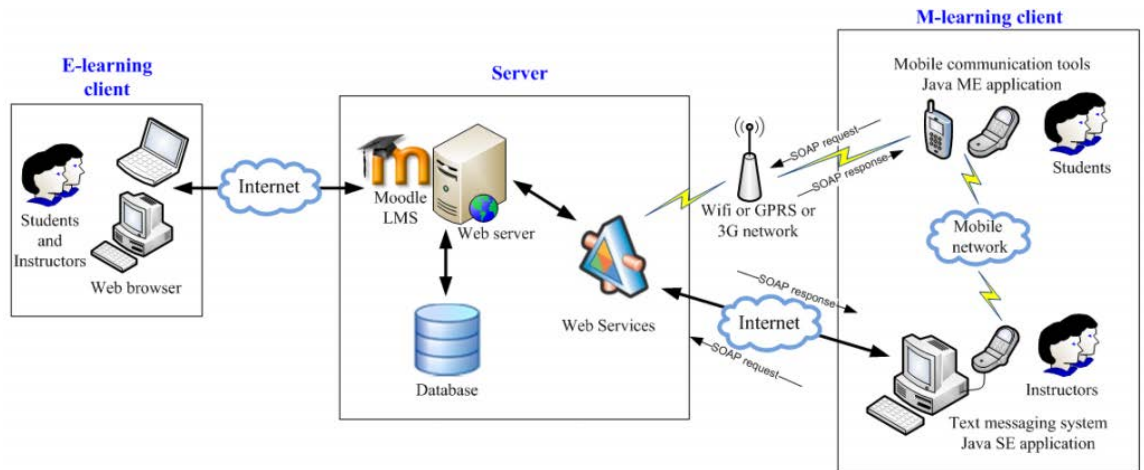
Figure 2. Architectural diagram of the integration of the Moodle LMS with the mobile communication tools.

Mobile communication tools used in this study.

This study's development of mobile communication tools to enhance motivation in e-learning is guided by a combination of Keller's ARCS motivation model and the collaboration research of Chaiprasurt, Esichaikul, and Wishart (2011), which presented a framework for tool design and showed that the tools developed were effective in improving learner motivation.

Table 2

A Mobile Communication Tools Framework

Motivational factors	Mobile communication tools
Attention: arousing and sustaining learners' curiosity and interest in instruction or learning activities	SMS (asking questions, receiving course notifications and announcements) Mobile RSS feeds (information related to the topic being taught, forums, news)
Relevance: adapting instructions to learners' needs, interests, and motives	SMS (targeted online feedback and course information)
Confidence: learners' expectations of a successful learning experience	Assignment feedback tool Gradebook tool

Motivational factors	Mobile communication tools
	Attendance reporting tool
	SMS (reinforcing feedback)
Satisfaction: learners' sense of achievement regarding learning activities or experiences	SMS (grading results)
Collaboration: working together with other learners or groups to accomplish shared goals	Mobile instant messaging (MIM)
	Mobile blogging
	Mobile polls and votes

Table 2 illustrates how the ARCS model and the collaboration factors were utilised as a framework for developing mobile communication tools into existing e-learning systems. The approach to designing the tools based on the framework is discussed in more detail in the following sections, focusing on collaboration factor by factor and tool by tool.

Attention.

Strategies to gain and sustain learners' attention and interest include capturing interest, stimulating curiosity, and maintaining attention (Keller, 1987).

- *SMS (course notifications and announcements).* Receiving SMS announcements or course reminders such as deadlines for assignment submissions can stimulate learners' curiosity and interest in these learning activities and tasks.

- *SMS (asking questions).* When learners or instructors use SMS to ask questions, it helps them collect information, evaluate existing ideas, and create new ideas. Frequent and thoughtful questions based on lessons learnt are expected to stimulate learners' attitude to inquiry and provide problem-solving opportunities that naturally challenge their thinking.

- *Mobile RSS feeds.* Mobile RSS feeds offer challenging and unexpected frequent communication. They accommodate a variety of learners' unique needs and learning preferences. They also support the attention factor leading to improved learner motivation in the LMS.

Relevance.

Relevance in this context refers to a quality of furthering personal understanding and competence, linking instruction to learners' interests, and tying it to learners' experiences (Keller, 1987).

- *SMS (targeted online feedback and information).* To use this tool, instructors first identify learners who have been receiving poor scores or have not submitted some or all of their assignments. They can help these learners understand the material better by texting them a link to detailed feedback or explanations of how to solve a problem or otherwise improve performance. Thus, this tool links content to learners' needs and wishes, a technique that appears to be effective in increasing learners' motivation.

Confidence.

To help learners gain self-confidence, instructors need to consider their anxieties and provide instruction that fosters positive expectations for success and belief in competence based upon the learners' efforts and abilities (Keller, 1987).

- *Assignment feedback tool.* The mobile feedback tool aims to provide personal information on a particular assignment via the LMS, a quicker, more convenient way to access feedback. Learners can refer to the feedback repeatedly, anytime and anywhere, using their mobile devices. Obtaining assignment feedback is a great way to improve learners' confidence by inspiring them to maintain or improve aspects of their competence.

- *Attendance reporting tool.* By attending online learning sessions regularly, learners are more likely to keep up with daily course activities. It is important to let them know that their personal efforts and abilities are the major factor in their success, and that this begins with attendance. Regular attendance can help learners feel that they have control over the outcome of their studies.

- *Gradebook tool.* This tool allows learners to view their grades through their mobile device. Learners are more comfortable accessing their grades directly through mobile applications than through mobile web browsers. Clearly, easily accessible grades, like feedback, will help learners track their progress, making it more likely that they will exert the required effort to be successful.

- *SMS (reinforcing feedback).* Reinforcing feedback differs from general feedback in that it includes words of affirmation, encouragement, praise, or recognition, acting as a powerful motivator that boosts morale and improves results. SMS reinforcing feedback allows instructors to deliver mass SMS messages to tell learners that what they are doing with the LMS is working well. Providing timely encouragement can help learners believe in their success and connect it to their ability and effort.

Satisfaction.

These factors help learners feel satisfied with their accomplishments, and include encouraging and supporting learners' intrinsic enjoyment of the learning experience, providing rewards as incentives, and building learners' perception that they are treated fairly (Keller, 1987).

- *SMS (grading results).* Learners eagerly await their grades, especially at the end of the semester. During the term, timely release of grades is important for learners who need improvement and require more assistance. Sending learners their grades using SMS is a great way to immediately communicate necessary information to each individual. This tool can also encourage and support learners' intrinsic enjoyment of the learning experience, since it will reassure them regarding their progress and performance.

Collaboration.

Collaborative learning is learning through social interaction.

- *Mobile blogging.* A mobile blogging application enables instant access to and submission of LMS blog entries from mobile devices. These actions are automatically registered on the LMS blog. Learners can take photos with the tool, caption them, and easily upload them directly to their LMS blog. They can add more text when they have access to a computer with a keyboard. Their peers can use the tool to view their blog entries. This represents an attempt to afford learners the opportunity to share their authentic context of use and to make their reality better understood by their peers and instructors.

- *Mobile instant messaging (MIM).* Instant messaging is a natural medium for the online community, building peer discussion and helping to foster a greater sense of online collaboration. The MIM functionality integrated into the Moodle Messaging System gives learners the ability to share information, communicate in real time, and improve teamwork, not only in synchronous collaboration but also asynchronously in online peer discussions. Learners can keep in touch with their peers on their mobile devices when away from the computer. This is a very convenient way to stay connected and get hold of each other easily.

- *Mobile polls and votes.* Mobile polls provide an easy way for learners to express their opinions and determine where they stand among their peers. They also provide instructors with valuable information on learners' preferences and perspectives. Polling enhances the ability to share ideas, opinions, and knowledge, which in turn adds collaborative power to learning.

On this basis, we proceed to evaluate improvement in learners' motivation when they use the proposed tools and compare motivation outcomes using objective

measurements between groups of learners being taught in an online course based on an e-learning system with and without the support of the proposed tools, respectively.

Assessment of Motivation

To assess motivation, this study measured learner motivation towards an e-learning system using subjective (self-assessment) and objective (learners' actions) measures. For the subjective assessment, a questionnaire was constructed to identify learner motivation and carefully designed and tested for validity and reliability. This instrument is based mainly on three questionnaires: Keller and Subhiyah's Course Interest Survey (CIS) (1993), Keller's Instructional Material Motivational Survey (IMMS, 1999), and Laffey, Lin, and Lin's Social Presence Questionnaire (2006). The CIS and IMMS are designed in accordance with the ARCS model and are widely used to measure learner motivation with regard to a specific course. The former assesses learner motivation in relation to teacher-led instruction, and the latter, motivation in relation to instructional materials. The Social Presence Questionnaire, in contrast, covers social ability (the ability of the learner to situate his or her experience and perception of social interaction, use online social tools, and undertake activities) in online learning contexts.

The Online Course Motivation Survey developed for this study on the basis of these previous instruments consists of 45 items grouped onto five motivation scales, namely attention, relevance, confidence, satisfaction, and social ability. These scales each contain three constructs, and each construct consists of three items. The following is a list of three constructs related to each scale:

- attention: (ability to) capture interest, stimulate inquiry, and maintain attention;

- relevance: (ability to) relate to goals, match interests, and tie materials to experiences;

- confidence: (ability to raise) success expectations, success opportunities, and personal responsibility;

- satisfaction: intrinsic satisfaction, rewarding outcomes, and fair treatment;

- social ability: (perception of) peers' social presence, instructor's social presence, and social navigation ability.

Five experts who have worked extensively with the online learning environment, the ARCS model, and/or psychological measurement completed the content validation survey. Items with an item objective congruence (IOC) of < .75 were examined and revised to achieve acceptable IOC scores. The draft questionnaire was trialled in a pilot study in the first semester of 2010, and the questionnaire was subsequently refined. The refined questionnaire consists of 45 items.

Reliability is often estimated by Cronbach's alpha. The alpha internal consistency values separately applied to the five scales were 0.81, 0.82, 0.77, 0.91, and 0.90 for attention, relevance, confidence, satisfaction, and social ability, respectively. These values were consistently > .75, showing good reliability.

Table 3 lists examples of the constructs and of items used to assess learners' motivation levels in response to the attention scale. A five-point Likert-type scale was used with a choice range of (1) *strongly disagree* (2) *disagree* (3) *neutral*, (4) *agree*, and (5) *strongly agree*.

Table 3

Examples of Constructs and Items used to Assess Learners' Attention

Constructs	Definitions	Items
Capture interest	The degree to which the course captures learner interest.	1. The instructor does interesting things in this online course (e.g., engages in innovative course activities or unique types of online interactions). 2. This online course has **very little** in it that immediately captures my attention. (reverse item) 3. The way the course content is presented online is interesting.
Stimulate inquiry	The degree to which the course stimulates learner information-seeking behaviour.	4. The questions asked or the problems given for the subject matter in this course often stimulate my curiosity. 5. The online environment of this course encourages me to question ideas and/or perspectives. 6. I feel that I am encouraged to ask questions.
Maintain attention	The degree to which the course sustains learner interest in instruction and learning.	7. The information presentation style in this course keeps me attentive. 8. This course provides a variety of elements (e.g., multimedia, interesting examples) to help me stay on task. 9. The variety of activities and interactions in this online course holds my attention.

For objective assessment, learner motivation was captured by analysis of learner's actions when interacting with the LMS based on information logged, without interrupting their activities. According to Russell, Ainley, and Frydenburg (2005), motivation is frequently inferred from learners' engagement in learning activities. Under this assumption, engagement relates directly to behaviour and indicates a strong connection between person and activity, whereas disengagement indicates the lack of a connection. If the learner is motivated to perform the activity, he/she is likely to be objectively engaged. The term engagement in the present study is thus used to refer to learners' focus on the learning activity. Fredricks, Blumenfeld, and Paris (2004) conclude that behavioural disengagement is often a precursor to dropping out. This is confirmed by Martinez (2003), who contends that "low-motivational" behaviour is usually associated with dropout. Thus, a higher level of high-disengaged (low-motivated) learners would lead to higher rates of dropout.

Moreover, the impact of motivation on the learner's academic performance is also an important aspect of effective learning. Therefore, the objective measurement of motivation in this study used engagement, disengagement, and academic performance as the indicators of motivation. Table 4 summarises the assessment methods, motivational variables, and items or instruments used to assess learners' motivation.

Table 4

Instruments for Assessing Learner Motivation

Method of assessment	Motivational variables	Items/Instruments	Relevant literature
Objective assessment (learner's action)	Disengagement	- The number of learners dropping out of the course	Russell et al.(2005), Jun (2005), Fredricks et al. (2004), Martinez (2003)
	Engagement	- The number of submitted assignments	Cocea & Weibelzahl (2007)
		- The number of help requests made by learners	Qu, Wang,& Johnson (2005)
	Academic performance	- Average scores on assignments and tests	Cocea (2006), Hershkovitz & Nachmias (2009), Moneta & Siu (2001), ChanLin(2007)
Subjective assessment (self-assessment)	Perceived values of five measurements 1. Attention measure 2. Relevance measure 3. Confidence measure 4. Satisfaction measure 5. Social ability measure	- Online Course Motivation Survey results	Adapted from - Course Interest Survey (CIS) - Instructional Material Motivational Survey (IMMS) - Social Presence Questionnaire (citations above under 'Assessment of Motivation')

Results

To evaluate the impact of the proposed tools, learners' motivation was compared between regular and mobile-added modes of online learning using objective and subjective measurements in three periods along the course timeframe: before, during, and after implementing the tools. Chi-square contingency analysis revealed no difference in the demographic makeup of the treatment and control groups by gender,

year of study, computer skill, the number of prior e-learning courses, and place of accessing the course.

Objective Assessment

Disengagement.

The number of learners dropping out of the courses (with dropout rates in parentheses) was analysed for group comparison using the Pearson chi-squared test. The dropout rate during the treatment period in the control group (15.22%) was higher than that in the experimental group (4.95%). However, the difference was not significant in all periods. Results from the analysis in each period are presented in Table 5. (There was no learner dropout during the post-treatment period.)

Table 5

Dropout Rate and Chi-Squared Results

Phase	The number of learners dropping out (%)		The number of learners left		χ^2	p
	Con.	Exp.	Con.	Exp.		
The initial number of learners	-	-	92	101	-	-
Pre-treatment (Weeks1–2)	12 (13.04%)	13 (12.87%)	80	88	.001	.972
Treatment(Weeks 3–12)	14 (15.22%)	5 (4.95%)	66	83	4.597	.331
Post-treatment (Weeks 13–14)	0	0	66	83	-	-

Note. Con. = Control group, Exp. = Experimental group.

Engagement.

The numbers of submitted assignments and help requests made by learners, according to system records, were counted and compared. It can be observed from Table 6 that for the number of submitted assignments, the means of the experimental group were higher than those of the control group; furthermore, *t*-test results show a significant difference between the means of the two groups during the treatment period. Similarly, for the number of help requests made by learners, as shown in Table 7, the means of the experimental group were significantly greater than those of the control group during the treatment period. This shows that there were statistically significant differences in learners' engagement between the control and experimental groups during the treatment portion of the online course.

Table 6

Descriptive Statistics and T-Test Results for the Number of Submitted Assignments

Phase	Number of Assignments	Control group (*n* = 66)		Experimental group(*n* = 83)		*t*	*p*
		Mean	SD	Mean	SD		
Pre-treatment (Weeks 1–2)	4	1.87	1.42	2.33	1.55	1.809	.072
Treatment (Weeks 3–12)	12	8.09	4.21	10.11	2.25	3.519	.001*

*p<0.05

Table 7

Descriptive Statistics and T-Test Results of the Number of Help Requests Made by Learners

Phase	Control group (*n* = 66)		Experiment group(*n*=83)		*t*	*p*
	Mean	SD	Mean	SD		
Pre-treatment (Weeks 1–2)	.20	.47	.24	.53	.527	.599
Treatment (Weeks 3–12)	.07	.27	.76	1.03	5.798	.000*
Post-treatment (Weeks 13–14)	.00	.00	.02	.15	1.423	.159

* p < 0.05

Academic performance.

To gauge academic performance, learners' scores on tests and assignments were evaluated. During pre-treatment and treatment periods, learners were asked to submit assignments weekly, and their average scores on these assignments were evaluated, whereas the average scores on midterm and final tests were evaluated during treatment and post-treatment, respectively. The learners in the experimental group achieved better learning scores with the proposed tools (see Table 8); however, they have a significantly higher mean score on assignments than learners in the control group only

during the treatment period ($t = 3.486$, $p < 0.05$). In contrast, the average scores on the midterm and final tests, assessed in post-treatment, were not significantly different between the two groups.

Table 8

Descriptive Statistics and T-Test Results for Average Scores on Assignments, Midterms, and Final Exams

Phase	Full scores	Control group (n=66)		Experiment group(n=83)		t	p
		Mean	SD	Mean	SD		
Pre-treatment (Weeks 1–2)	5	3.24	2.07	3.67	1.89	1.299	.196
Treatment (Weeks 3–12)	35	18.25	11.93	24.56	10.18	3.486	.001*
Treatment: Midterm test (Week 6)	30	17.91	2.83	18.34	3.32	.846	.339
Post-treatment: Final test (Week 14)	30	16.67	3.99	17.97	4.07	1.961	.052

* $p < 0.05$

Subjective Assessment

ARCS-Social ability.

A one-way MANOVA was performed to determine whether there are any differences in motivation between students in the online course with and without the proposed tools on the five dependent measures (attention, relevance, confidence, satisfaction, and social ability). Significant main effects were found for the use of the proposed tools, Wilks' λ = .89, $F(5,120)$ = 2.90, p = .016, $\eta 2$ = 0.108. A mean comparison test between the two groups was conducted on each variable and overall due to these significant MANOVA effects. Table 9 presents the mean values and the results of the pairwise comparison (t-test) performed on the two groups obtained from the Online Course Motivation Survey.

The results show a significant mean difference between learners in the control and experimental groups: attention (p = .000), relevance (p = .011), confidence (p = .016), satisfaction (p = .011), social ability (p = .048), and the overall measure of motivation (p = .002). The means for all motivation measures of learners in the experimental group, with the support of mobile tools, were higher than those in the control group. A pairwise

comparison test also revealed that the experimental groups' gain scores in all motivational variables were significantly higher than those of the control group. The attention variable shows the biggest difference in means between the two groups.

Table 9

Comparison of Means of Subjective Measures by T-Test

Variables	Mean Control group (n=55)	Experimental group (n=71)	Mean difference (Exp.–Con.)	Std. error	t	p
Attention	3.87	4.13	.24	.06	3.80	.000*
Relevance	3.83	4.02	.18	.07	2.58	.011*
Confidence	3.66	3.82	.14	.06	2.44	.016*
Satisfaction	4.08	4.27	.18	.07	2.58	.011*
Social ability	4.02	4.21	.15	.08	2.00	.048*
Overall	3.90	4.08	.18	.06	3.23	.002*

*$p < 0.05$

Discussion

The findings confirm that the proposed mobile communication tools are consistent with ARCS and collaboration factors and can be used in existing e-learning systems to enhance the learner's motivation in the online learning environment. These findings are based on both objective data on learners' actions as recorded during the experiment and subjective (questionnaire) data assessing learner preferences and opinion. The subjective measurement technique provided significant insights not available by means of the objective method; however, attitudinal measures may be distorted by biasing factors such as the halo effect and acquiescence (Rubinstein & Hersh, 1984 in Cushman & Rosenberg, 1991). Consequently, this study emphasises the need for both objective and subjective assessments so that they can complement and reinforce each other.

In the objective assessment, the results for the disengagement variable showed that learners' dropout rate in the experimental group was less than that in the control group; however, this difference was statistically insignificant. There was a high dropout rate during the pre-treatment period, in which students were allowed to withdraw from the

course without penalty by the university. For the engagement variable, there was a significant difference between the two groups in all measures, but this was found only during the treatment period. These results confirmed that using the proposed tools can help learners to increase engagement and enhance learning.

Academic performance on assignments of learners in the experimental group was significantly higher than that in the control group during the treatment period but not the post-treatment period (that is, in the class assignments but not the midterm and final exam). There are several feasible explanations of why the post-treatment results showed no significant differences. As Amabile, Hill, Hennessey, and Tighe (1994) discovered, *trait-intrinsic motivation* (motivation to do something because it is enjoyable) correlates positively with course performance, while *trait-extrinsic* motivation (to do something due to the external reward) has no effect. Further, Moneta and Siu (2001) found that the effects of both intrinsic and extrinsic motivation on course performance can be changed by the educational or institutional environment. They also claimed that there are four main reasons why learners' academic performance may not correlate with their motivation: *course interestingness-complexity* (course not sufficiently challenging), *heuristic value of assignments* (assignments require execution of step-by-step procedures and do not allow sufficient exploration or creative approaches), *completeness-validity of assessments* (assessments are not validly recognised), and *shortcuts-to-grades* (shortcuts to good grades allowing surface learning only instead of a deeper understanding).

Pooling these findings together with the results of this study suggests that using academic performance to measure motivation should involve formative assessment, intertwined with teaching, as well as summative assessment and that this should happen at the end of appropriate course subunits throughout the semester. Furthermore, it will be necessary to measure learners' prior knowledge and skills in order to find out what they know coming in so that the advantages in academic performance they have gained during the online course can be more reliably identified.

In terms of subjective assessment, the Online Course Motivation Survey was carried out to assess learners' perceived levels of motivation with regard to online courses. The results revealed that the means of all motivation measures (attention, relevance, confidence, satisfaction, and social ability) in learners who used the proposed tools as part of the online course were higher than in those who did not. Indeed, there was also a significant statistical difference in means between two groups across all motivation measures. The attention measure showed the highest difference. The tools used for intervention in the attention factor consisted of SMS (asking questions, course notifications, and announcements) and RSS (forums and news updates); the results indicate that these tools seem to be more effective than the tools proposed for the other factors.

The technologies used in this study, namely Java ME and SMS, are rather traditional by some new generation developers who prefer Android or iOS platform, and a social

network service-based mobile application, respectively. However, these technologies serve the purpose of this study. In the case of Java ME, it was the most popular technology that could be supported by participants' mobile phones during the experiment period, and SMS was the only one of the proposed tools that could reach 100% of participants. From this research study, it can be concluded that the practical implications of these findings are extremely helpful for instructors concerned with how to encourage more communication between their students and between the students and the instructor so as to enhance their motivation. Learners can use the proposed tools on their own mobile phones to interact both synchronously and asynchronously. Instructors can send SMSs on a system integrated with existing e-learning systems. Instructors using the tools proposed here should know what particular outcomes, feedback, course information, notifications, and announcements are essential to their specific group of online learners, as different people have different needs. It is also important that everyone be seen to be treated equitably and fairly. Moreover, individual learners must have control over their learning process and be able to control the amount of effort they expend and the way in which they learn; otherwise, motivation will be difficult to maintain.

Conclusion and Future Research Considerations

This study examines the potential of several mobile communication tools (SMS, mobile RSS feeds, assignment feedback tool, gradebook tool, attendance reporting tool, MIM, mobile blogging, and mobile polls and votes) to stimulate and enhance the learner's motivation in existing e-learning settings. The quasi-experimental study was designed to compare learners' motivation in online courses with and without the support of mobile communication tools. Both subjective and objective assessments were carried out in order to evaluate the role of the proposed tools in enhancing learner motivation. Disengagement, engagement, and academic performance were subjected to objective assessment. The Online Course Motivation Survey developed for this study, to assess learners' subjective motivation levels, consists of five measures, attention, relevance, confidence, satisfaction, and social ability, respectively. This survey is particularly robust especially in terms of content validity and reliability, providing clear and substantiated insight into the causal relationship between the online course approach and the learner's motivation.

The study revealed significant differences in motivation between the control and experimental groups on the basis of objective assessment items, *engagement* (the number of submitted assignments and help requests made by learners) and *average scores on assignments*, and subjective assessment item, *ARCS-Social ability* (perceived value of all motivation measurements). However, there were no significant differences for *disengagement* (the number of learners dropping out) and average scores on midterm and final tests. Nevertheless, learners who had the support of the tools in their online courses were less likely to dropout, and they gained more on their test scores

(midterm and final) than the control group. The tools can have a favourable impact on learners' engagement, level of interaction, and completion rate, and improve learning efficiency in the online environment. As the results of the study show a significant effect of m-learning on online learners' motivation, the proposed mobile communication tools are proved to be a valuable extension of online learning for the improvement of motivation.

In future research, other forms of objective assessment may be useful to assess online learners' motivation, such as the number of page views and posts for each task, the number of votes made and blog posts produced, or average session duration and time between sessions. In addition, future work should further investigate the impact of online learning incorporating the proposed mobile tools on learning outcomes, using a range of methods, participants, and courses. Another area for future research concerns the ways in which learners use Web 2.0 technologies such as podcasts, audio discussion boards, and social networks (e.g., Facebook and Twitter) as communication tools in tandem with online learning and how these tools can be used to increase interaction among learners and instructors in order to improve motivation and learning outcomes.

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Athabasca University

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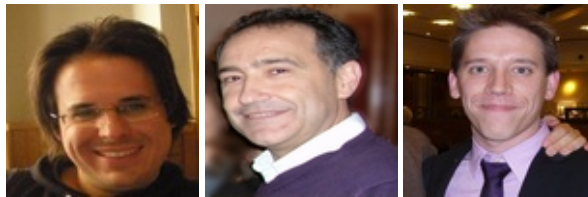
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Abstract

This article analyzes a system of virtual attendance, called "AVIP" (AudioVisual over Internet Protocol), at the Spanish Open University (UNED) in Spain. UNED, the largest open university in Europe, is the pioneer in distance education in Spain. It currently has more than 300,000 students, 1,300 teachers, and 6,000 tutors all over the world, besides Spain. This university is redefining, on the lines of other universities, many of its academic processes to meet the new requirements of the European Higher Education Area (EHEA). Since its inception, more than 30 years ago, the methodology chosen by UNED has been blended learning. Today, this university combines face-to-face tutorial sessions with new methodological proposals, mediated by ICT. Through a quantitative methodology, the perception of students and tutors of the new model of virtual tutoring, called AVIP Classrooms, was analyzed. The results show that the new model greatly improves the orientation and teaching methodology of tutors. However, it requires training and new approaches to provide a more collaborative and participatory environment for students.

Keywords: Virtual attendance; distance education; ICT; video tutoring; blended learning

Introduction

The Spanish Open University (UNED) is the largest European open university and one of the largest in the world with more than 300,000 students, 1,300 teachers, and 6,000 tutors. Its distance learning system combines ICT with personalized attention for students through a central site in Madrid and a network of over 60 associated centers distributed throughout Spain and different continents (South and North America, Europe, and Africa). Open universities' students need continuous support during their knowledge construction process, and for this purpose, UNED delivers optional face-to-face workshops every seven days by tutors who facilitate and guide the students in a self-learning process of incorporating new knowledge in their daily personal, academic, and professional lives. This tuition, adapted to the needs of the European Higher Education Area (EHEA), was organized using blended learning methodology, an online learning platform called "aLF" and a variety of digital resources favoring networking through Regional Campus. In this context, technologically eminent UNED recently developed a program called ATECA (Educational Technology Architecture for the Associated Centers) with the help of European funds "FEDER". The objective of this plan has been to strengthen "virtual attendance", which involves creating classrooms with videoconferencing over synchronous IP ("AVIP-Classrooms") enabling the associated centers to deliver tutoring and mentoring services to geographic areas that were previously beyond reach. The tool combines high-end video-conferencing with low-end web-conferencing and smart board-based learning. It also enables resource manipulation, besides developing digital content repositories in a way that allows the use of virtual attendance within the European Higher Education Area in a blended learning environment. The new AVIP classroom system permits almost the same types of interaction in distance learning that are possible in traditional face-to-face learning scenarios (Dennen, Darabi, & Smith, 2007; Chou & Min, 2009; Rehm, 2009; Hurtado & Guerrero, 2011; Chickerur & Kumar, 2011).

For supporting tutoring and creating a common ICT mediated learning environment, these services require efficient interactivity through video, audio, and educational content of the highest possible quality; in this sense, it is important to use the visual language effectively (Fombona, 2008). This interactivity is achieved through proprietary communication software developed at UNED, called "AVIP Classrooms Level 1 + Audiovisual IP". Aided by this videoconference system and with tutor support, UNED generates shared workspaces to minimize the training requirements and to extend the tutoring services nationwide at reasonable cost. AVIP Classrooms are organized at two levels:

- Level 1: AVIP classrooms, equipped with videoconferencing systems and interactive whiteboard using Multipoint Control Units (MCU) that enable simultaneous connectivity with several centers and classrooms.

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- Level 2 (Capture sessions [seminars, tutorials ...]): Contents are transmitted from classrooms and online conference rooms for storage and delayed live broadcast.

The AVIP (AudioVisual over IP) tool provides "virtual attendance"; that is, students and tutors can access classroom activities of any center from any center or classroom. This facility can be developed "live" (online) for broadcasting seminars or classes at scheduled times, and for "on replay" (off line), through access to information on demand (VOD), along with related documentation that may have been stored on the same server.

This technology facilitates robust interpretation of blended learning which promotes social presence with the benefits of online teaching and learning (Kumar & Benbasat, 2002; Shin, 2002). It further enables exploration of learning designs which utilize social processes in promoting understanding of the social motivation of users, in improving social affordances of telecommunications systems, and in enhancing research of social cognition, interpersonal communication, and theories of mind (Biocca et al., 2003; Lee, & McLoughlin, 2010; Vázquez, 2011, Vázquez & Sevillano, 2012; Vázquez & López, 2012).

This paper analyzes, through a quantitative methodology, the perception of students and tutors about the functionality, difficulties, and challenges of AVIP classrooms and undertakes a preliminary assessment of their efficacy in planning improvement of virtual processes in distance university studies.

Virtual Attendance: More than Blended Learning

Blended learning is favored in teaching and learning environments where there is an effective integration of different modes of delivery, models of teaching, and styles of learning as a result of adopting a strategic and systematic approach to using technology in combination with the best features of face-to-face interaction (Tu & McIsaac, 2002; Krause, 2007). According to Garrison and Kanuka (2004), the simplest model of blended learning "is the thoughtful integration of classroom face-to-face learning experiences with online learning experiences", which aims at taking advantage of a synchronous face-to-face situation and the asynchronous, text-based Internet. Typically, this means traditional face-to-face teaching or lecturing with additional online materials and learning assignments, using different learning management systems, such as Moodle or other digital platforms. Thus, from the blended learning point of view, social software provides interesting opportunities to support collaborative learning (Ferdig, 2007; Brindley, Walti, & Blaschke, 2009; Conole, 2010). However, researchers have approached this concept from different points of view. The three most commonly mentioned definitions documented are as follows:

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1. combining instructional modalities (or delivery media) (Singh & Reed, 2001; Orey, 2002);

2. combining instructional methods (Driscoll, 2002; Rossett, 2002);

3. combining online and face-to-face instruction (Reay, 2001; Young, 2002; Sands, 2002; Rooney, 2003; Ward & LaBranche, 2003).

Other authors, like Köse (2010), consider blended learning as advantageous for using different tools of social software in producing material, in demonstrating knowledge, and in communicating. In fact, distance learning in Spanish Open University tries to reach higher standards of interactivity than those of blended learning. This development is called "virtual attendance" (Read, Verdejo, & Barros, 2003). It is defined as the audience feeling as if they are in a computer generated environment that is like reality (Gaspar et al., 2008; Arzuaga & Kaeli, 2010). Witmer and Singer (1998) define this kind of presence as the subjective experience of being in a place or environment, even when one is physically situated elsewhere. It is relevant to compare social presence with virtual presence and investigate hybrid collaborative environments where several modes of interaction are provided, because both of them—social and virtual presence— can improve performance (Harms, et al., 2006; LaPointe & Reisetter, 2008; Caspi & Blau, 2008).

The new system of audiovisual attendance, in comparison to the usual blended learning systems, improves both task performance and perceived affordances. Virtual attendance generates social presence in one aspect: "involves the degree to which media are capable of making users perceive other users´ sociability, warmth, sensitivity, personality, or closeness in a mediated communication situation". Others interpret the concept in different ways: "the feeling that others are involved in the communication process" (Whiteman, 2002, p. 6); "the degree to which a person feels 'socially present'" (Heeter, 2003, p. 340); "the degree of person-to-person awareness" (Leh, 2001, p. 10; Tu, 2002, p. 1662); "the sense of being present in a social encounter with another person" (McLellan, 1999, p. 40); and "the degree to which participants are able to project themselves affectively within the medium" (Garrison, 1997, p. 6).

However, Gunawardena and Zittle (1997, p. 9) put it most simply when they say that social presence in virtual environments is "the degree to which a person is perceived as a real person in mediated communication". A high degree of virtual presence means that participants will have a "sense of being in and belonging in a course and the ability to interact with other students and an instructor, although physical contact is not available" (Shin, 2002). The learners feel cognitively present to tasks and experience mentally the state of "being there" in the distance learning system (Young, Birtolo, & McElman, 2009). "Physical presence implies being present in (or present to) the virtual or real environment: being there" (Heeter, 2003, p. 341). A sense of presence can be

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achieved if the system is interactive and highly responsive in a many-to-many context communication (Schroeder, Minocha, & Schneider, 2010; Lee & McLoughlin, 2010).

As Whiteman (2002, p. 8) states, "people feel more comfortable around us when they believe we share a kinship and common values". When the environment lacks social presence, the participants see it as impersonal and, as a result, the amount of information shared with others decreases (Leh, 2001; Tallent-Runnels et al., 2006). The overall goal of creating social presence—online or face-to-face—in any learning environment is to create a level of comfort in which people feel at ease around the tutor and other participants. Failing this, the learning environment cannot be fulfilling or successful for instructors and learners.

VideoTutoring Model over IP: AVIP Classrooms 1 and 1+

The AVIP classroom structure is organized in one of the two modes: Classrooms AVIP (Level 1 and Level 1 +) or online tutoring (Level 2 +). These classrooms allow synchronous teaching and tutoring at different locations.
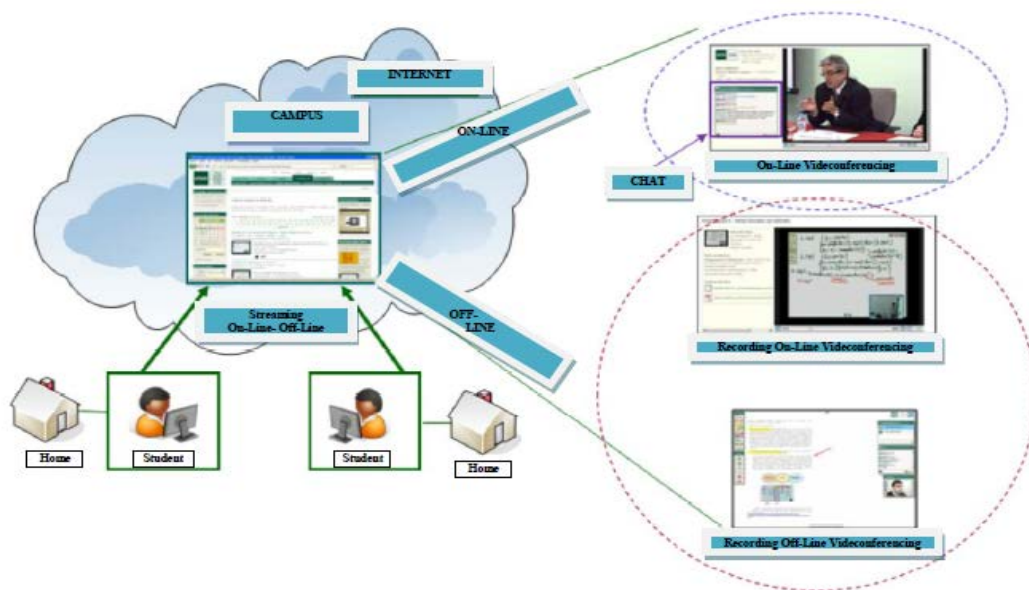
Figure 1. UNED-AVIP.

AVIP Classrooms (Level 1+)

Level 1 is provided with high-end video conferencing over an interactive whiteboard (PDI) in classrooms of associated centers. The goal is to conduct tutoring classes simultaneously in several physically separate classrooms. The contents offered can be

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"live", which necessarily requires the student and tutor to be in an AVIP classroom or in streaming "off-line". Some items of the videoconferencing equipment used are *Polycom* or *Tandberg*. Videoconferencing technology is built up with ISDN or Internet (with sufficient bandwidth guaranteed). Interactive whiteboards also require an internet connection to Network-UNED for interconnection with others. The most used tool in interactive whiteboard is the "online whiteboard" which allows connectivity among whiteboards of different manufacturers. This type of synchronous tool 2.0 is characterized by the following features:

- It is possible to create whiteboard rooms.

- Each room supports a maximum of eight participants.

- Access to each room requires a password to prevent entry of strangers into the system.

- All students can interact with the board, and if someone creates a new page, everyone else can view and save the page as PDF with annotations for future reference.

- "Document viewer" is available where one can upload documents for presentation.

- Tutors´ presentations can be downloaded to different AVIP classrooms.

The main objective of this new technology architecture is to offer the user a teaching-learning environment that ensures "virtual attendance". Besides, it is both portable and versatile without sacrificing audio and video quality. This virtual attendance is achieved through empowerment of the following aspects:

- Audio: For communication among multiple users, it is imperative to transmit and receive audio without any defects, micro-cuts, return-audio, echo, noise, and so on.

- Video: The high-definition video quality offered by AVIP classrooms Level 1 is hardly achievable by any other equipment. However, high-definition video may not always be necessary for mere interactivity.

- Content: Besides video and audio, one fundamental requirement of the AVIP tool is interactive content sharing. That content can be images, office documents, notes on a blank page or on a document, desktop sharing, and so on.

For equipping classrooms AVIP 1 +, multi-platform and technology policy are adopted at the UNED. Thus, the choice of equipment is restricted to looking for the best software to complement the tools 2.0, prioritizing quality, interoperability, ease of use, and

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affordability. The basic equipment that makes up the design of these new classes is as follows:

- computer,

- projector,

- webcam,

- peripheral room audio with echo cancellation,

- interactive whiteboard.

The following figure illustrates the interoperability of classroom resources in a real situation, using the tool Audio-Visual IP (AVIP) in telematic tutoring.

Figure 2. AVIP 1+.

Connectivity between videoconferencing equipment can be established in two ways, depending on the number of participants.

Point to point: between two distant locations.
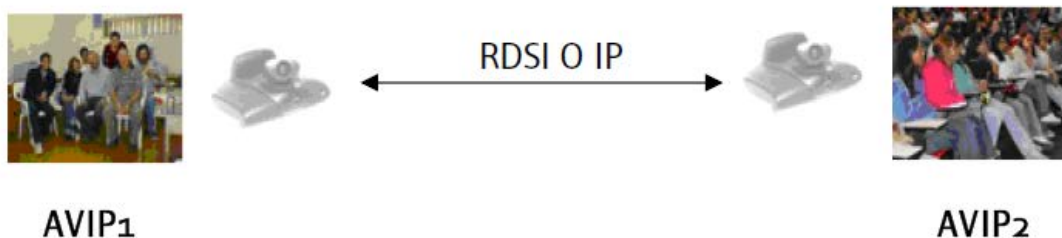
Figure 3. AVIP- Videoconferencing point to point.

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Multipoint: People involved in the videoconferencing are at three or more locations. To conduct a multipoint videoconference, at least one MCU (Multipoint Control Unit) is required, which can be an integrated one or an external one.
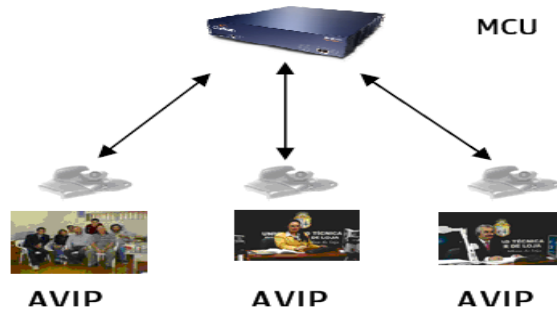
Figure 4. AVIP- Videconferencia multipunto.

The sessions in AVIP Classroom can be recorded in high quality (HD), including signal capture, videoconferencing equipment (H.323), and graphics that come from the PC (presentations, web board), generating a video in FLV format (Flash Video), which can then be played via streaming. Thus, the teaching and learning processes in this university are carried out by a combination of four parameters: face-to-face tutoring, virtual tutoring, blended learning, and distance learning, following the principles of virtual presence. The following figure illustrates the relationship between them.
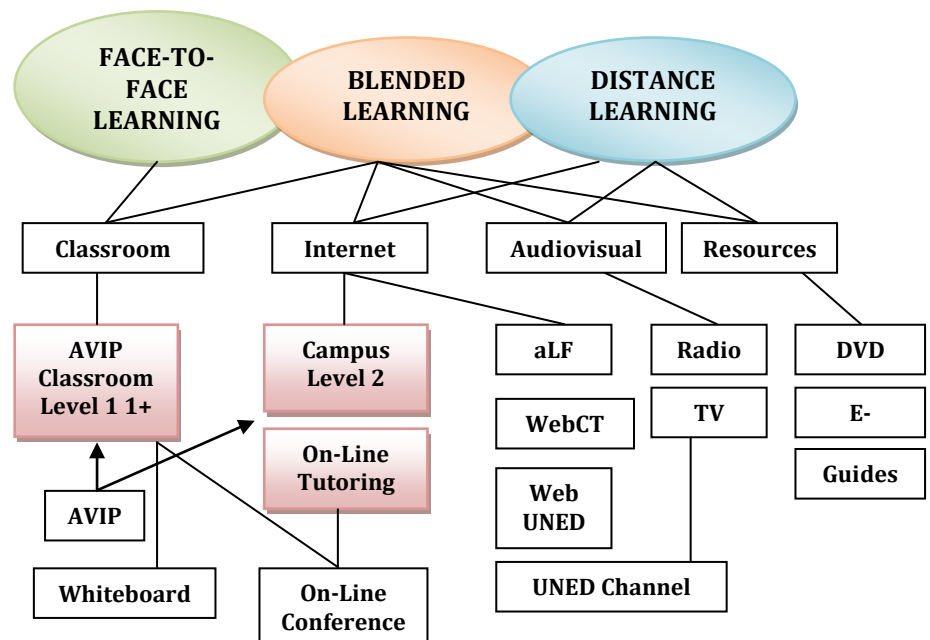
Figure 5. UNED model of distance learning

UNED has chosen this model in order to meet the demands of teaching within the EHEA and adapt its VLE called aLF with web conferencing functions to fulfill the demands of virtual attendance. All activities, tests, and exams done in AVIP are transferred automatically to aLF in order to assess and orientate the learning progress of the students, and all students' profiles and activities can be seen by each professor at the central site of UNED in Madrid. The AVIP system compares to other systems in the following ways: Adobe Connect, Saba, or Blackboard allows students to create and share content with other students and teachers at the same time the classroom is being developed and automatically recorded on aLF. Students can choose, depending on their location, to attend blended-learning classes at a centralized learning centre near their work or home where they have their tutors (they do not evaluate), internet access, library, tutorials, and additional printed material to prepare their subjects, or being at home, if they have internet access, following the video class and participating on-line. These centers allow all kinds of economies and, especially, low-income students to succeed in their studies. These capabilities convert AVIP in a flexible tool which combines aLF and web conferencing; it enables students to maintain rich and fluid communication with their tutors, lecturers, and peers and permits them to work collaboratively in the preparation of the assignments they have to undertake on these courses. Actually, UNED is connecting the AVIP system to existing social networks (Twitter, Facebook, etc.) and creating Apps to see video lessons in smartphones (available in Google play store). From this application you can play recordings and video, interact with the notes made by the speakers, check the chat, or download the documents used in the session.

Research Questions

The goal of this study was to gain better insight into the characteristics of audiovisual methods for developing "virtual attendance" in distance learning university studies. The focus, therefore, has been on answering the following three research questions regarding the advantages of the new model of videotutoring over IP:

1. What are the perceptions of tutors and students about the functionality of the new model of videotutoring over IP?

2. What practices and strategies do tutors and students use to develop their lessons through this new model?

3. What challenges and difficulties do tutors and students encounter in this new model?

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Method

The purpose of this case study was to examine the functionalities, perceptions, and challenges of tutors and students who teach and study with the help of the videotutoring model over IP in the Spanish Open University. The purpose of phenomenological research is not to obtain generalizations, but to describe in detail the breadth and depth of individual experience with the phenomenon and the meaning structures of such experience (Creswell, 2003). The commonality of this particular study was three educational associated centers in different regions of Spain (Madrid, Andalucía, and Castilla-La Mancha). The range and types of institutions, rather than representing a difficulty, symbolize a methodological enrichment that generates greater validity to the findings, providing a general explanation in multiple contexts. Thus, contrasting these different educational centers and testing our hypotheses and conclusions in multiple educational settings, we provide a method to generate substantive theories, with different levels of depth concerning the amount of information collected and the sample of people involved: tutors, administrators, and students. Thus, this study is implemented based on action research methodology. Since it has the characteristics concerning the development of application, the approach employed in the scope of the study requires the implementation of "practice oriented-action research" (Holter & Schwartz-Barcott, 1993). In this process, survey and questionnaire techniques are used. In the execution of the research, a survey and structured interview form was utilized for data collection.

Data Collection and Analysis

The case study was carried out during 2010-2011 and we can see the key informants in Table 1.

Table 1

Sample

	University tutors	Students
Madrid	171	256
Castilla-La Mancha	43	101
Andalucía	87	220

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Procedure

One questionnaire, which included three sections, was developed.

1. General questions: This section relates to the tutors and students' gender, number of years of experience and university studies, and self-rating of skills in using ICT (Tables 2 & 3).

2. Perception of use and main characteristics: This section includes 11 items relating to tutors and students' views on the use of the videotutoring model through IP. These items are rated on a Likert scale, ranging from "Very Dissatisfied" to "Very Satisfied" (Tables 4-6).

3. Training, challenges, and difficulties in developing videotutoring for distance education: This section includes 17 items that address the difficulties involved in performing teaching and tutoring, and in studying these activities in the digital context; the items also address the challenges perceived by tutors and students. The items are rated on a four-point scale, ranging from "Not Important" to "Essential" (Tables 7-9).

Analysis

Analysis involved iterative cycles of examination of the data, identification of key themes, and the drawing of tentative conclusions confirmed (or refined) using a combination of techniques: triangulation, checking for representativeness, respondent validation, investigation of rival explanations, checking/replication of findings, and the examination of outlier cases (Keeves & Sowden, 1997). This approach was consistent with Sowden and Keeves' general framework (1988) for the analysis of qualitative data as a three-step process: 1) data reduction, 2) display and examination, and 3) conclusion drawing and verifying. This process was applied at three points in the study: first, to the ongoing analysis in the dialogical process for each case; second, at the conclusion of information collection for each case; and third, at the end of all information collection for the study. For the Likert items, α-scale construction was carried out by applying principal component analyses and by calculating Cronbach's α-scores. Items that reduced the α-score were excluded from the scales. Subsequently, mean scores per scale were calculated. In order to assess the influence of background variables on the tutoring and studying activities, Pearson correlation coefficients were calculated and multiple regression analyses were carried out.

The questionnaire was completed by 301 tutors and 577 students. Males formed the majority (60.13%) among tutors and females (61.70%) among students. The experience of tutors was in the range of 1 to 10 years (86%). Three out of four tutors (85.7%) rated their computer skills as fair or good and 67.23% of the students as poor to average. As regards the hours of using computing tools, it was in the range of 1 to 6 hours a week for both tutors and students (72.08%). In this analysis, 95% confidence interval, taken, and

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discriminant validity of the survey consists of 28 items by subtracting non-distinctive 4 items was calculated as Cronbach's alpha value of 0.94. The questionnaire could therefore be considered representative in explaining the students´ and tutors´ learning satisfaction with the videotutoring model. The recovered questionnaires were analyzed using SPSS version 18.0 software.

Tables 2 and 3 show the results of Levene's test. As can be seen, all results in macro variables were statistically significant. The results of the independent sample t-test showed that both "Teaching experience" (p = .462 ≤ .05) and "Academic year" (p = .442 ≤ .05) reached a level of statistical significance, indicating that there was a significant difference that conditions the development of videotutoring satisfaction between students and tutors. Regarding the two dimensions of skills and hours of using tools 2.0 (p = .753 > .05 and p = .680 > .05) for social context and online communication, respectively, no significant differences in perceived social context and online communication were indicated for the students and tutors.

Table 2

Dimension 1: Macrovariables (Tutors)

Macrovariables	Items	F	%	Levene´s test for equality of variances		t-value
				F	Sig	
Gender	Male	181	60.13	.206	.653	.046
	Female	120	39.87			
Teaching experience (years)	1-5	143	47.50	.033	.858	0.71
	6-10	102	33.89			
	11-15	29	9.63			
	16-20	24	7.97			
	+20	3	0.99			
Tutor´s skills in the use of ICT	Poor	56	18.60	.026	.871	-.311
	Regular	87	28.90			
	Fair	176	58.47			
	Good	82	27.24			
Hours of training related to using tools 2.0 (per week)	None	78	25.91	.391	.553	-.414
	1-3	100	33.22			
	4-6	87	28.90			
	7-10	23	7.64			
	11 and more	13	4.31			

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Table 3

Dimension 1: Macrovariables (Students)

Macrovariables	Items	*F*	%	Levene´s test for equality of variances		*t-value*
				F	*Sig*	
Gender	Male	221	38.30	.211	.641	.041
	Female	356	61.70			
Academic year	1	287	49.74	.031	.851	0.73
	2	151	26.16			
	3	102	17.67			
	4	37	6.41			
Level of computer knowledge	Poor	99	17.15	.021	.862	-302
	Regular	289	50.08			
	Fair	111	19.23			
	Good	78	13.51			
Hours of study using tools 2.0 (per week)	None	57	9.87	.387	.541	-.403
	1-3	203	35.18			
	4-6	156	27.03			
	7-10	54	9.35			
	11 and more	107	18.54			

Results and Discussion

Dimension 2: Main Characteristics and Tools of Videotutoring Model over IP

Table 4 lists the items relating to "Perception of main characteristics of videotutoring over IP". They refer to the main AVIP´s characteristics employed in face-to-face, multipoint, and single-point classes, and in virtual contexts. Most tutors and students (*n* = 220, 73% and *n* = 410, 71%) consider that both multi- and single-point digital resources are quite useful in developing their classes off-line.

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Table 4

Perception of Main Characteristics of Videtotutoring through IP

Items	Very dissatisfied Tutor / student	Dissatisfied Tutor / student	Neutral Tutor / student	Satisfied Tutor / student	Very satisfied Tutor / student
a) Videoconferencing AVIP one point	8% / 9%	7% / 11%	12% / 11%	37% / 39%	36% / 30%
b) Videoconferencing AVIP multi point	9% / 11%	8% / 8%	10% / 10%	35% / 41%	38% / 30%
c) Videoconferencing AVIP off-line	5% / 4%	6% / 7%	10% / 11%	41% / 43%	38% / 35%

Tutors/Students: 3 items; four-point Likert scale (1–5); mean = 3.31/3.48; standard deviation = 0.37/0.36; N = 301/577

Table 5 presents details of the main tools 2.0 used in AVIP classrooms. Most tutors consider that video (n = 238, 79%), chat (n = 217, 72%), and interactive documents (n = 238, 79%) are the most useful resources in AVIP classrooms; whereas, students consider that chat (n = 415, 72%) and off-line content (n = 467, 81%) are the two most valuable digital resources.

Table 5

Assessment of Main Tools of Videtotutoring over IP

Items	Very dissatisfied Tutor / student	Dissatisfied Tutor / student	Neutral Tutor / student	Satisfied Tutor / student	Very satisfied Tutor / student
a) Video	4% / 5%	5% / 6%	11% / 10%	46% / 41%	34% / 38%
b) Audio	8% / 10%	7% / 8%	11% / 13%	41% / 44%	33% / 38%
c) Interactive whiteboard	15% /14%	16% / 18%	21% / 23%	30% / 31%	18% / 24%
d) Digital documents	5% / 4%	5% / 5%	11% / 10%	47% / 49%	32% / 32%
e) Chat	9% / 10%	7% / 8%	12% / 18%	33% / 39%	39% / 33%
f) Pools	12% / 14%	16% / 17%	21% / 20%	33% / 31%	18% / 18%
g) Off-line content	2% / 3%	5% / 6%	8% / 9%	41% / 45%	44% / 37%

Tutors/Students: 7 items; four-point Likert scale (1–5); mean = 3.30/3.46; standard deviation =0.35/0.35; N = 301/577

Table 6 considers the assessment of the main interactive models. Both tutors and students consider that the model of tutor in the associated center and students at home ($n = 238$, 79% and $n = 467$, 81%) is the best model.

Table 6

Assessment of Interactive Models

Items	Very dissatisfied Tutor / student	Dissatisfied Tutor / student	Neutral Tutor / student	Satisfied Tutor / student	Very satisfied Tutor / student
a) Tutor and students in the same or different associated center	15% / 14%	16% / 18%	21% / 23%	30% / 31%	18% / 24%
b) Tutor and students at home	5% / 4%	5% / 5%	11% / 10%	47% / 49%	32% / 32%
c) Off-line videoconferencing	9% / 10%	7% / 8%	12% / 18%	33% / 39%	39% / 33%

Tutors/Students: 3 items; four-point Likert scale (1–5); mean = 3.29/3.49; standard deviation =0.33/0.34; N = 301/577

The results show key aspects of the way by which AVIP classrooms, based on videotutoring, can improve the distance teaching-learning process when students receive the content through virtual attendance. Tutors and students emphasize that the use of AVIP classrooms improves interactivity between students and tutors. They rated the following tools as the best: multipoint videoconferencing mode, chats, forums, and access to recorded material during the tutorials.

Dimension 3: Training, Challenges, and Difficulties in the Development of Videotutoring on Distance Education

Table 7 shows the importance of tutor training in using videoconferencing and in moderating chats and forums for academic purposes ($n = 485$, 84% and $n = 462$, 80%). Students also perceive the need for training in using chats and forums for academics and for creating collaborative audiovisual materials ($n = 241$, 80% and $n = 280$, 93%).

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Table 7

Training

Items	Not important Tutor / student	Somewhat important Tutor / student	Very important Tutor / student	Essential Tutor / student
a) Specific use of videotutoring	4% / 2%	12% / 11%	31% / 34%	53% / 53%
b) Creating/using audiovisual materials	2% / 0%	8% / 7%	41% / 38%	49% / 55%
c) Moderating/using chats and forums	8% / 4%	12% / 8%	52% / 62%	28% / 26%
d) Knowing security systems.	15% / 16%	56% / 58%	19% / 18%	10% / 8%

Tutors/Students: 4 items; four-point Likert scale (1–4); mean = 3.33/3.47; standard deviation = 0.36/0.36; N = 301/577

Table 8 lists the major difficulties of tutors in using AVIP classrooms: using interactive whiteboard systems and network security (n = 217, 72% and n = 256, 85%). To students, the main difficulty is in creating and using digital material of the interactive whiteboard (n = 421, 73%).

Table 8

Difficulties

Items	Slight Tutor / student	Low Tutor / student	Normal Tutor / student	High Tutor / student
a) Use of 2.0 tools	19% / 23%	22% / 20%	18% / 22%	41% / 35%
b) Use of video	28% / 31%	19% / 23%	15% / 21%	38% / 45%
c) Use of audio	26% / 25%	27% / 28%	21% / 22%	26% / 25%
d) Use of interactive whiteboard	15% / 9%	14% / 18%	19% / 13%	52% / 60%
e) Security systems	7% / 8%	8% / 11%	11% / 10%	74% / 71%
f) Chat	40% / 38%	39% / 29%	12% / 31%	9% / 2%
g) Recording classes	26% / 15%	17% / 18%	31% / 42%	26% / 25%

Tutors/Students: 7 items; four-point Likert scale (1–4); mean = 3.33/3.34; standard deviation = 0.31/0.36; N = 301/577.

Table 9 shows the major challenges faced by tutors and students in developing teaching-learning processes in a virtual context through implementation of AVIP classrooms. From Table 9 one can see that the main challenges faced by the tutors are developing

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electronic evaluation of students and using electronic portfolios for tracking their activities ($n = 253$, 84% and $n = 271$, 90%). Students consider it a challenge to develop social networks and blogs in ways that would help them in dealing with their studies in a more cooperative and collaborative way ($n = 508$, 88%).

Table 9

Challenges

Items	Not important Tutor / student	Somewhat important Tutor / student	Very important Tutor / student	Essential Tutor / student
a) E-evaluation	4% / 2%	12% / 11%	31% / 34%	53% / 53%
b) E-portfolio	2% / 0%	8% / 7%	41% / 38%	49% / 55%
c) Develop social networking	8% / 4%	12% / 8%	52% / 62%	28% / 26%
d) Blogs	15% / 16%	56% / 58%	19% /18%	10% / 8%
e) Wikis	4% / 2%	12% / 11%	31% / 34%	53% / 53%
f) Electronic data bases (Google docs or similar)	2% / 0%	8% / 7%	41% / 38%	49% / 55%

Tutors/Students: 6 items; four-point Likert scale (1–4); mean = 3.30/3.41; standard deviation = 0.31/0.33; $N = 301/577$

The results show key aspects of the ways by which tutors and students perceive their training needs, difficulties, and challenges to improve the teaching and learning processes mediated by ICT in AVIP classrooms. The focus of training is on effective use of the interactive whiteboard and applying the knowledge of security protocols in preparing the content for transmission over the Internet. The main difficulties are in using video (production, creation, and video sharing) and network security programs.

Variables that Influence the Development of Videotutoring over IP

Multiple regression analyses were carried out to assess the influence of background variables of tutors and students (see Tables 10 & 11) on developing audiovisual over IP.

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Table 10

Variables that Influence the Development of Videotutoring; Results from a Multiple Regression Analysis

	B	SE	β	*p*
Intercept	**0.737**	0,343		
Tutor´s gender	**-0.252**	0.071	-0.151	0.001
Tutor´s years of experience	**-0.297**	0.003	-0.126	0.015
Tutor´s age	**-0.210**	0.041	-0.103	0.013
Tutor´s skills in the use of ICT	**0.234**	0.027	0.167	0.014
Hours of training related to using computing tools	**-0.201**	0.025	-1001	0.001

Table 11

Variables that Influence the Development of Videotutoring; Results from a Multiple Regression Analysis.

	B	SE	β	*p*
Intercept	**0.737**	0,343		
Student´s gender	**-0.252**	0.071	-0.151	0.001
Student´s years of study	**-0.297**	0.003	-0.126	0.015
Student´s age	**-0.210**	0.041	-0.103	0.013
Student´s skills in the use of ICT	**0.234**	0.027	0.167	0.014

The results show that tutors who are more confident of their skills in using ICT are more likely to use skill-based ICT applications in their tutoring functions. They consider these applications are better suited to improving the tutoring functions. The age of tutors and their tutoring experience are found to influence their perception of the utility of ICT in AVIP classrooms. Young male students are also more confident about the use of videoconferencing in classes and at home. Students are also more confident about the use of videoconferencing after the first year of studies and if they use ICT resources at home more than four hours per week. There is a direct relationship between perception of students´ skills and the use of videoconferencing and digital resources in their studies. These variables accounted for 65.1% of the variance (Pearson's r = 0.16; $p <$ 0.01).

Young and less experienced tutors are more willing to use ICT in their work, whereas female tutors appear to be less favourable than their male counterparts. These variables accounted for 67.3% of the variance (Pearson's r = 0.16; $p <$ 0.01).

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In addition, a significant relationship was found between the use of digital learning environment and the hours of in-service and at home training in ICT (Pearson's r = 0.40; p < 0.001). To ensure effective functioning of tutors in virtual environments, a substantial shift is needed from the highly theoretical component of the subjects towards more dynamic tutoring techniques involving testing of the proceedings and online activities. The new e-tutoring requires continuous monitoring of the virtual processes in the following dimensions: didactics, network security, evaluation, development of skills, and new ways of creating content by using 2.0 tools.

Conclusions

The implementation of the new design of AVIP classroom at UNED, based on interactive videoconferencing, has led to its widespread use across the country as a useful teaching tool. These classes offer tutoring services with a high level of interactivity in video, audio, and content. They are specifically designed for the needs of collaborative online tutoring within the framework of the EHEA. In March 2009, UNED launched a total of 71 new classrooms of this type, which have now increased to approximately 270, spread over the entire country.

The new technological tools that support "virtual attendance", based on the principles of ubiquity and virtual reality, are poised to improve distance learning for greater interactivity. These methodologies are significantly improved by the new layout of AVIP classrooms, based on videoconferencing services that contributed to their widespread use as a teaching tool all over the country. AVIP classroom is based on a cross-platform and open standards that ensure interoperability by combining different tools (aLF educational platform, digital repositories, etc.), which lend support to the pillars indicated below through the virtual private network, "Network-UNED":

- training methodology, based on "blended learning", augmented to virtual attendance;

- information based on the use of the tools and techniques of Business Intelligence;

- communication-based groupware concept, which encourages collaborative team work.

The research analyzed the tutors and students' perception of the utility of this technology and of the challenges and difficulties they encounter. The analysis shows a high value for both sectors in improving the mentoring process of distance learning. This system has recorded so far more than 13,000 videos for the benefit of the educational community, and trained over 5,500 people in AVIP. These videos, which are kept in the repository Campus UNED, have already attracted more than one million

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visits. This data, along with the General Rating Tool AVIP by users, may indicate how favorably the beneficiaries are disposed to accept this project. The groups´ productivity and the level of teaching activities realization are very satisfactory: most students and teachers ($\geq$ 90%) considered them to be very dynamic. This system encourages collaborative work and motivation of learners, and their competencies with data processing and 2.0 tools of the Internet. The system architecture proposed in this paper will provide useful references for practitioners in developing cooperative learning systems.

Limitations, Recommendations, and Future Research

There are also limitations to this study. Participants in the study are college students and tutors; hence, results of this study cannot be extended to other situations. Therefore, two recommendations are suggested based on the experiences of this research. First, cooperative learning systems should contain better interaction mechanisms to support communication activities among tutors and students in the cooperative learning process. Second, teachers and tutors should be actively involved in online activities with students to stimulate high levels of student interaction. Therefore, this study concludes that establishing a videotutoring comprehensive cooperative learning system and better interaction mechanisms will ensure higher levels of learning performance in the cooperative learning process on distance learning. Finally, a future research direction is suggested: It would be desirable for other researchers in distance universities around the world to establish comparative studies of videoconferencing systems implemented on their campuses.

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Online Learner Self-Regulation: Learning Presence Viewed through Quantitative Content- and Social Network Analysis

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Abstract

This paper presents an extension of an ongoing study of online learning framed within the community of inquiry (CoI) model (Garrison, Anderson, & Archer, 2001) in which we further examine a new construct labeled as *learning presence*. We use learning presence to refer to the iterative processes of forethought and planning, monitoring and adapting strategies for learning, and reflecting on results that successful students use to regulate their learning in online, interactive environments. To gain insight into these processes, we present results of a study using quantitative content analysis (QCA) and social network analysis (SNA) in a complementary fashion. First, we used QCA to identify the forms of learning presence reflected in students' public (class discussions) and more private (learning journals) products of knowledge construction in online, interactive components of a graduate-level blended course. Next, we used SNA to assess how the forms of learning presence we identified through QCA correlated with the network positions students held within those interactional spaces (i.e., discussions and journals). We found that the students who demonstrated better self- and co-regulation (i.e., learning presence) took up more advantageous positions in their knowledge-

generating groups. Our results extend and confirm both the CoI framework and previous investigations of online learning using SNA.

Keywords: Community of inquiry; learning presence; social network analysis; self-regulation; online learning; quantitative content analysis; learning journals; online discussions

Introduction

As online learning continues to grow in higher education, it is critical that we gain a better understanding of the mechanisms by which we can promote its quality. The longstanding community of inquiry (CoI) model (Garrison, Anderson, & Archer, 2000) represents one such mechanism. This model describes the deliberate development of an online learning community, stressing the processes of instructional dialogue likely to lead to successful online learning. It explains formal online knowledge construction through the cultivation of various forms of *presence*: teaching, social, and cognitive presence (Garrison, Anderson, & Archer, 2001).

The CoI model theorizes online learning in higher education as a byproduct of collaborative work among active participants in learning communities characterized by instructional orchestration appropriate to the online environments (teaching presence) and a supportive, collegial online setting (social presence). The teaching presence construct outlines participant instructional responsibilities such as organization, design, discourse facilitation, and direct instruction (Anderson, Rourke, Garrison, & Archer, 2001) and articulates the specific behaviors likely to result in a productive community of inquiry (e.g., Swan & Shea, 2005). Social presence emphasizes online discourse that promotes positive affect, interaction, and cohesion (Rourke, Anderson, Garrison, & Archer, 1999) that supports a functional, collaborative learning environment. The model also refers to cognitive presence, a cyclical process of interaction intended to lead to significant learning within a community of learners.

More than 10 years of research and a recent two part edited special issue of *The Internet and Higher Education* (Swan & Ice, 2010), dedicated to CoI and the advances in our understanding of online learning gained through this theory, are testament to its usefulness. However, with more than 6.7 million college students enrolled in at least one credit bearing online course during 2012 and an accompanying growth rate of more than 9% (Allen & Seaman, 2013), it is clear that we will continue to need a comprehensive model that helps describe, explain, and predict how people learn online.

Recently, in an effort to make the CoI model more comprehensive, we (Shea & Bidjerano, 2010; Shea et al., 2012) suggested another dimension of presence in this model. In analyzing student contributions to online courses using the CoI model, we were unable to reliably identify instances of student generated discourse found in collaborative learning activities (such as online discussions and other areas used for

group work) using indicators of teaching, social, and cognitive presence (see Shea, Hayes, & Vickers, 2010). Upon further investigation, we considered these student contributions to be examples of online learner self- and co-regulation and applied the term *learning presence* to describe this interaction. In our most recent CoI research, we presented learning presence (discussed in more detail below) as a new construct that is meant to complement and expand upon teaching, social, and cognitive presences contained in the CoI model.

Learning Presence Defined

Our conceptualization of learning presence is informed by Zimmerman's (2008) well-researched theoretical construct of self-regulated learning, which refers to "students' proactive use of specific processes [such as setting goals, selecting and deploying strategies, and self-monitoring one's effectiveness] to improve their academic achievement" (p. 167). Self-regulation research conducted in the last two decades has concluded that self-direction (including e.g., setting personal goals, using diverse modes of learning, time management) is predictive of better learning outcomes in classroom-based education (e.g., Zimmerman, 2000; Zimmerman & Schunk, 2001). In a similar vein, reviewing studies that investigated online learning (e.g., Bixler, 2008; Chang, 2007; Chung, Chung, & Severance 1999; Cook, Dupras, Thompson, & Pankratz, 2005; Crippen & Earl, 2007; Nelson, 2007; Saito & Miwa, 2007; Shen, Lee, & Tsai, 2007; Wang, Wang, Wang, & Huang, 2006), Means and her colleagues (2009) also concluded that support for enhancing students' self-regulation (such as initiative, perseverance, and adaptive skill) has a positive impact on their online learning.

Our conceptual framing of learning presence reflects learner self- and co-regulatory processes in online educational environments. The coding scheme we developed to delineate this construct aligns with Zimmerman's concept of self-regulated learning and includes phases for forethought and planning, performance, and reflection, with emphasis on the goals and activities of online learners specifically. Under the forethought phase, we include planning, coordinating, and delegating or assigning online tasks to self and others in the early stages of the course, course module, or specific activity. In the performance phase, we include monitoring and strategy use. This phase is more elaborate and its monitoring component includes checking with online classmates for understanding, identifying problems or issues, noting completion of tasks, evaluating quality, monitoring during performance of the online activity, and taking corrective action if necessary. The monitoring component of performance also includes appraising personal and group interest or engagement in the online learning activity. The strategy use component of the performance phase includes advocating effort or focus, seeking, offering or providing help to complete the online activity, articulating gaps in knowledge, reviewing, noting outcome expectations, and seeking or offering additional information. Finally, the reflective component includes articulation

of changes in thinking and causal attribution of results to individual or group performance in the online activity.

It is important to note that we define learning presence as distinct from the instructional design, facilitation of discourse, and direct instruction associated with teaching presence as well as the dimensions of social presence. Additionally, we define learning presence as distinct from each of the phases of cognitive presence (i.e., triggering event, exploration, integration, and resolution). (See Appendix A for additional details and examples of learning presence.)

Research Questions

Building on this expanded version of the CoI model, we hypothesized that for students who are asked to design and facilitate a portion of an online course (in this case, course discussions), this added responsibility might heighten their self- and co-regulatory behaviors, resulting in higher levels of learning presence. Further, when students collectively focus on knowledge construction in online discussions, they create a network, and the messages they post provide clues to the structure of that network and the relative positions that each student occupies within it. As a result, certain advantageous positions can emerge as indicators of relative prominence among participants (Aviv, Erlich, Ravid, & Geva, 2003; deLaat, Lally, Lipponen, & Simons, 2007a). With this understanding, our second hypothesis was that assigning facilitation roles to students might provide them with increased interaction with their peers, resulting in more prominent roles and network positions influencing the flow of information in the discussions. To test these two hypotheses, we sought to explore online learner self- and co-regulation (learning presence) reflected in quantitative content analysis of student discourse and advantageous positions reflected in social network analysis (descriptions of these methods of analysis are in the sections that follow). With these analyses, we sought to examine the effects of a scaffolded transfer of some instructional roles from the instructor to the learners in online discussions on the expression of learning presence and student location within the resulting network of interaction in those discussions. We theorized that elements of the learning presence construct may possibly be more or less evident in different components of the learning activities designed for the course. For example, we conjectured that we might find more instances of student reflection in activities designed to promote such reflection, such as learning journals. As such, the specific questions we asked were as follows:

1) When part of the instructional role is shared with students (elements of design and facilitation of discourse) to what extent is there an impact on the expression of self- and co-regulation (learning presence) as measured through quantitative content analysis of student discussion postings and learning journals?

2) What impact does the shared instructional role (learner design and facilitation of online discussions) have on metrics reflected in social network analysis? Do facilitators occupy more advantageous (e.g., central) locations in the social network?

3) How does student learning presence manifest when we compare more public, interactive forms of online learner self and co-regulation as documented in student discussions versus more private venues such as individual learning journals? How are the three categories of learning presence and their constructs distributed across these two learning activities?

4) What network positions do students with high levels of combined learning presence in discussions and journals occupy relative to their peers?

5) How do prestige and influence correlate with combined learning presence in discussions and learning journals and in each of these activities when considered separately?

Method

Data

The data for this study consisted of students' learning journals and transcripts of their online discussions collected from a doctoral level research methods course that used blended instruction. The course, which was offered during the 2010 fall term at a large state university in the northeastern United States, met face-to-face for three weeks at the start of term then switched to fully online instruction for the remainder of the semester. There were 18 students enrolled in this blended course. The online components of the course consisted of eight modules, with each module lasting for about two weeks. We report on the results from two sets of three concurrent discussions from one of the modules (Module 6) and the learning journals for that module.

Overall, the discussions we analyzed had an aggregated count of 223 student postings, each of which served as our unit of analysis. In each set of discussions, one discussion was required and there were two others from which students could select to participate. Student postings by discussion were as follows for Weeks 1 and 2 of Module 6: Week 1: Mandatory Discussion: 72; Option One: 30; Option Two: 28; and Week 2: Mandatory Discussion: 43; Option One: 18; Option Two: 32.

In Module 6, there were also a total of 16 journal entries posted to a blog forum. These learning journals were a course requirement and they were available for members of the whole class to read. In their journal entries, students were simply asked to include their

comments, questions, insights, concerns, and other reactions to the content of the assigned readings. Although the journal entries were posted to the blog forum, they did not require continuous student interaction. Each student was expected to respond to only one or two other students' journal posts. There were a total of 19 comments made by students to the journals we analyzed from Module 6.

Scaffolding support for shared instructional roles.

Our hypothesis was that having students explicitly share the teaching presence role might foster additional expression of the kinds of self and co-regulatory actions reflected in the learning presence construct. To test this hypothesis, we turned to the online discussion component of the course where students took more responsibility for aspects of teaching presence, specifically the facilitation of the discussions on course topics that they selected.

The online discussions students engaged in (described above) were a requirement in the course and they were scheduled in each of the eight modules. At the beginning of the semester, students divided themselves into teams of two to three students. Each team agreed to be the discussion facilitators for one module of instruction covering one of the course topics. Working with the instructor, each team selected key readings and devised leading questions and activities to facilitate the discussions around these readings. Following instructor guidelines, modeling, and suggestions, facilitators were expected to guide the class discussions, ask questions, raise issues, and state their agreements and disagreements with appropriate support and evidence from the literature.

Data Analysis

We employed two methods of inquiry to analyze the data: quantitative content analysis and social network analysis (hereafter referred to as QCA and SNA).

QCA includes the process of searching text for recurring trends to identify frequencies (Adler & Clark, 2011). We conducted QCA using a revised version of the original learning presence coding scheme that was developed for a prior study (Shea et al., 2012). At the start of this study, two researchers who developed the original coding scheme refined it to align it more closely with Zimmerman's (1998, 2000) three phases of self-regulation: forethought, performance, and self-reflection. This was accomplished by adding several new indicators and a new reflection category and re-categorizing the existing monitoring and strategy-use sections to sub-categories under a more inclusive organizing principle for self-regulation (i.e., performance, see Appendix A). After the refinement of the coding scheme, additional coders were trained to identify and count every occurrence of a learner presence code in the discussion transcripts and learning journals. No instructor posts were coded because the learning presence construct is specific to students.

In studies that employ QCA, rigorous coding protocols are crucial to reliability. To establish reliability, we began our coding with a test sample of learning journals and

discussions from the course with the goal of identifying and negotiating our coding differences. Repeating the coding and negotiation processes with sample texts allowed us to establish an adequate level of inter-rater reliability (IRR), which we calculated using Holsti's coefficient of reliability (CR). This method looks at percent agreement using the following formula: $2M/(N_1+N_2)$ where M represents the total agreed-upon observations, N_1 represents the number of total observations for coder 1, and N_2 represents the total number of observations for coder 2 (Holsti, 1969; Krippendorf, 2004; Neurendorf, 2002). For exploratory research of this nature, an IRR of 0.70 is considered acceptable (Lombard, Snyder-Duch, & Bracken, 2002; Neurendorf, 2002). Although Lombard et al. (2002) recommend multiple matrices for establishing IRR, we chose to use the single measure of IRR, again due to the exploratory nature of our research. To ensure rigor and consistency, we avoided sampling, and instead used one-hundred percent of the data in calculating IRR, and coders used ongoing negotiation to improve both IRRs and the coding scheme. For student learning journals, the average initial CR was 0.773 and the negotiated CR was 1.0000. For discussions, coders reached an average initial CR of 0.775 and negotiated CR of .991. (See Appendix B for itemized journal and discussion IRR CRs.) All of these are acceptable measures of IRR for the purposes of this research.

We selected SNA as our second inquiry method because it offers the potential to explain the nature of networked relationships resulting from the flow of information and influence found among participants' interactions. Within networked learning environments, SNA provides both visual and statistical analyses of interactions. Given the importance of interaction in the CoI framework, SNA has been adopted by several researchers as a method to better understand individual and group dimensions of online learning (e.g., Aviv, Erlich, Ravid, & Geva, 2003; Cho, Gay, Davidson, & Ingraeffea, 2007; Dawson, 2008, 2010; Dawson, Bakharia, & Heathcote, 2010; Dennen, 2008; Lowes, Lin, & Wang, 2007; MacFayden & Dawson, 2010; Russo & Koesten, 2005; Yang & Tang, 2003; Zhu, 2006). While previous researchers have employed other constructs from the CoI model with SNA (for example, deLaat, Lally, Lipponen, & Simons, 2007b, used SNA for teaching presence), most previous SNA research in online learning has lacked a comprehensive conceptual framing for knowledge construction that reflects the three core elements of the CoI model (social presence, teaching presence, and cognitive presence) that contribute to a meaningful online learning experience.

In this study, our purpose was to better understand the nature of the relationship between the fourth and new element of the CoI model, namely, learning presence, and students' networked positions that may be advantageous in the support of online shared knowledge construction. To accomplish this, we used a key SNA measure: centrality. Centrality is a measure of prominence based on the number of mutual and unreciprocated ties or relations students have with each other. Centrality is an important measure because previous research on online learning has found that it correlates with positive learning outcomes (see Aviv, Erlich, Ravid, & Geva, 2003; deLaat, Lally, Lipponen, & Simons, 2007b; Heo, Lim, & Kim, 2010). We calculated

students' overall network centrality (Freeman degree) by combining measures of in-degree centrality, which are counts of inbound ties with other students, and out-degree centrality, which are counts of outbound ties. These same measures, when considered separately, are indicators of network prestige (in-degree centrality) and influence (out-degree centrality). In online discussions, prestige measures the number of incoming responses directed to a student's discussion post and represents the degree to which other students seek out that student for interaction (deLaat, et al., 2007a). Students with high prestige are notable because their thoughts and opinions may be considered more important than others in the class. In contrast, students with high influence are in contact with many other students, as evidenced by the large number of discussion posts that they initiate to others. Students with low influence post fewer messages and are not as actively engaged with building or sustaining relationships with other students.

We used all three measures (Freeman degree centrality, in-degree centrality [prestige], and out-degree centrality [influence]) to quantify students' interactions in three aggregated online discussions and the learning journal entries. We also developed network graphs to illustrate these relationships and to explore the relative measures of students' learning presence found in the discussions and learning journals. To this end, we used a new software tool called SNAPP (Social Networks Adapting Pedagogical Practice) (Dawson, 2008, 2010; Dawson et al., 2010; Dawson, Bakharia, & Heathcote, 2010). SNAPP was used to capture student discussion posts from all of the discussions in Module 6. We aggregated these data into adjacency matrices that represented all student interactions across all module discussions, and then we created a separate attribute file containing learning presence frequency counts for each student found in each module's learning journals and discussion posts, as well as individual measures of prestige and influence calculated using UCINet software. Finally, we imported these files into the NetDraw software package to generate a series of network graphs which are analyzed in the Results section.

Results

Research question 1: When part of the online instructional role is shared with students (elements of design and facilitation of discourse) to what extent is there an impact on the expression of self- and co-regulation (learning presence) as measured through quantitative content analysis of discussion postings and learning journals?

When comparing mean learning presence in the combined averaged discussions and learning journals of the Module 6 student facilitators (02, 09, 13, and 19) and the rest of the class, we found that the facilitator group exceeded their peers with an average of 11.3 versus 8.8 learning presence occurrences across the two learning activities. Thus, the facilitators exhibited 31% more learning presence indicators than their non-facilitating peers (see Table 1).

Table 1

Comparison of Average Combined Learning Presence (LP) of Student Facilitators and the Rest of the Class

Student facilitators	Combined M6 LP occurrences
S02	13.0
S09	12.0
S13	16.0
S19	4.0
Total	45.0
Mean	11.3
Median	12.5

Rest of class	Combined M6 LP occurrences
S01	4.0
S03	9.0
S04	6.0
S05	19.0
S06	17.0
S08	3.0
S10	3.0
S11	9.0
S12	3.0
S15	8.0
S16	8.0
S17	10.0
S18	13.0
S20	11.0
Total	123.0
Mean	8.8
Median	8.5

Note. Numbers 07 and 14 are not included in this and other tables because one was the instructor and the other was a guest

Mann-Whitney *U* was performed to determine whether student facilitators and non-facilitators differed with respect to levels of learning presence beyond statistical chance. Median combined occurrences of learning presence were 12.50 and 8.5, respectively. Although the student facilitators as a group had a higher average rank ($M_{rank} = 7.0$) than the student non-facilitators ($M_{rank} = 10.21$), the differences in the distribution of learning presence within the two groups were not statistically significant (Mann–Whitney $U = 18.00$, $n_1 = 4$, $n_2 = 14$, $p = .286$ two-tailed).

Research question 2: What impact does the shared instructional role (learner facilitation of online discussions) have on metrics reflected in social network analysis? Do facilitators occupy more advantageous locations in the social network?

When we examined student interactions using a network graph (see Figure 1) to visualize the ties that emerged between students as a result of their postings in all of the

discussions we analyzed, we found the following students were most centrally positioned in the network: 17, 13, and 09. Two members of this group were student facilitators (students 13 and 09). These three students were most active in initiating posts and responding to other students, as evidenced by the number of ties that connected them to their peers. In contrast, student facilitator 19 was somewhat more central, and student 02 was located on the edge of the network, because he had fewer peer relationships.
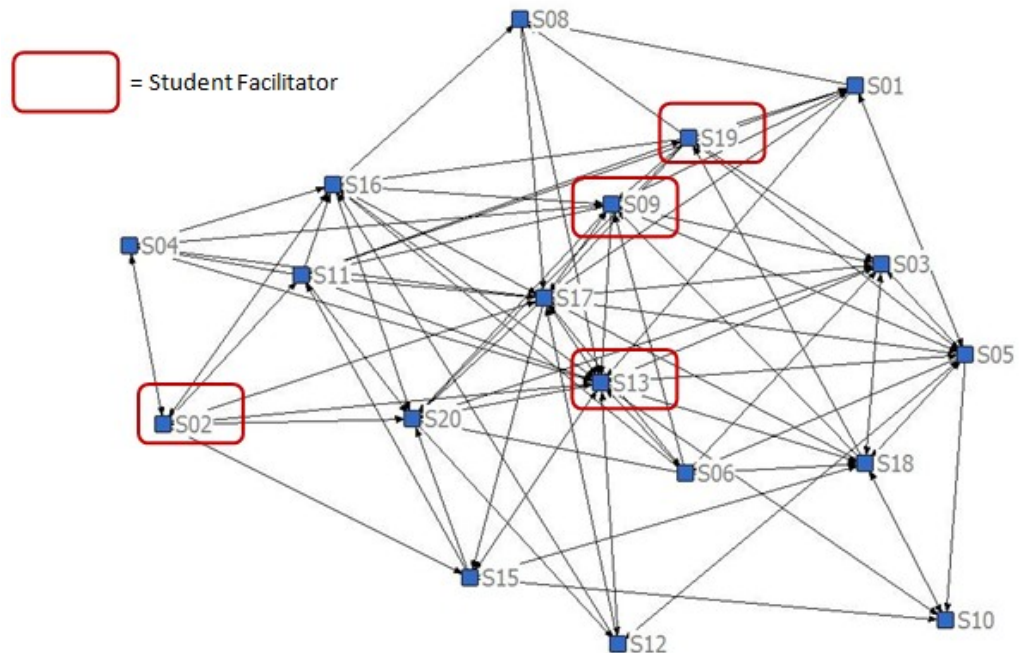
Figure 1. Network graph for combined Module 6 discussions.
Network positions of student facilitators.

Overall, the student facilitators demonstrated more prominent network positions for prestige (in-degree centrality) and influence (out-degree centrality) than the rest of the class when these two measures were aggregated and averaged across the group (see Table 2). In terms of prestige, the facilitators had a median of 12.0 incoming ties versus 8.0 for the rest of the class. The median of outbound ties (influence) for the facilitator group was 12.0 versus 9.0 for their peers. In both cases, the facilitators had higher measures than non-facilitators.

Results from Mann-Whitney U, testing differences in prestige and influence between student facilitators and non-facilitators, indicated that although the student facilitators had higher medians of in-bound and out-bound messages than their counterparts, statistically significant differences in the metrics for influence (Mann–Whitney $U = 17.00$, $n_1 = 4$, $n_2 = 14$, $p = .24$ two-tailed) and prestige (Mann–Whitney $U = 19.00$, $n_1 = 4$, $n_2 = 14$, $p = .337$ two-tailed) were not found.

Table 2

Comparison of Centrality, Prestige, and Influence for Student Facilitators and Non-Facilitators

Student facilitators	Freeman degree centrality all M6 discussions (in + outbound ties)	Prestige (in-degree centrality) in all M6 discussions	Influence (out-degree centrality) in all M6 discussions	Rest of class	Freeman degree centrality all M6 discussions (in + outbound ties)	Prestige (in-degree centrality) in all M6 discussions	Influence (out-degree centrality) in all M6 discussions
S02	13.0	4.00	9.00	S01	8.0	4.00	4.00
S09	30.0	18.00	12.00	S03	18.0	11.00	7.00
S13	67.0	47.00	20.00	S04	16.0	7.00	9.00
S19	18.0	6.00	12.00	S05	32.0	9.00	23.00
Total	128.0	75.00	53.00	S06	20.0	3.00	17.00
Mean	32.0	18.75	13.25	S08	5.0	3.00	2.00
Median	18.5	12.0	12.0	S10	7.0	5.00	2.00
				S11	19.0	10.00	9.00
				S12	10.0	3.00	7.00
				S15	15.0	4.00	11.00
				S16	20.0	10.00	10.00
				S17	45.0	24.00	21.00
				S18	24.0	11.00	13.00
				S20	22.0	15.00	7.00
				Total	261.0	119.00	142.00
				Mean	18.6	8.5	10.14
				Median	19.0	8.0	9.0

Research question 3: How does student learning presence manifest when we compare more public, interactive forms of online learner self and co-regulation as documented in student discussions versus more private venues such as individual learning journals? How are the three categories of learning presence and their constructs distributed across these two learning activities?

In comparing the distribution of the three learning presence categories, forethought and planning, performance, and reflection, in the two sets of learning activities in Module 6 (discussions and journals), the monitoring construct was most frequently reported in both discussions (58.4%) and learning journals (51.6%) (see Figure 2). From here

patterns diverged. The six discussions accounted for 32.1% of strategy use, with no evidence of forethought and planning, and low levels of reflection (9.5%). In contrast, student learning journals demonstrated more evidence of reflection (22.6%) which occurred more frequently than strategy use (19.4%) and forethought and planning (6.5%). This provides evidence that the categories reflect the intended constructs; one would expect to see more reflection in activities such as learning journals in which students are asked to think about their learning.
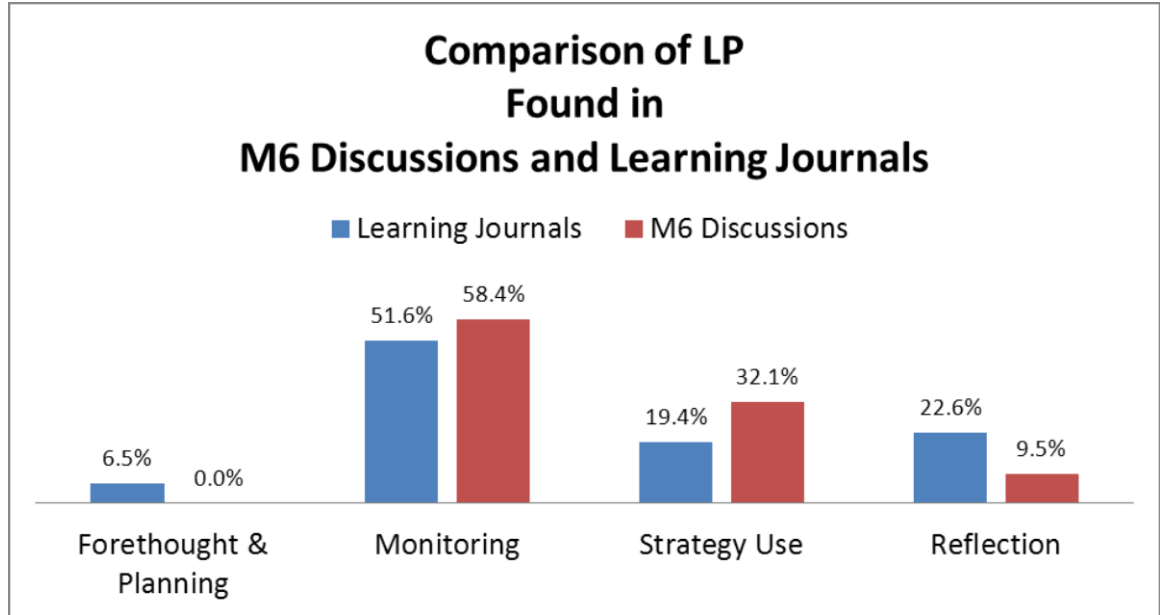
Figure 2. Comparison of LP in all Module 6 learning activities .
*The performance LP category is comprised of monitoring and strategy use.

Wilcoxon signed-rank test was used to examine if an overall difference in occurrences of learning presence in discussion posts and learning journal entries exists. The results indicated that 14 participants had higher learning presence occurrences in the discussion posts and four participants had higher occurrences of learning presence in the learning journals. The median occurrence of learning presence in discussions (Mdn = 7.50) was significantly higher than was evident in learning journals (Mdn = 1.50, $z = -3.51$, $p < .001$).

Research question 4: What network positions do students with high levels of combined learning presence in discussions and journals occupy relative to their peers?

The network graphs in Figures 3 and 4 use scaling to change the node size to correspond to the relative percentages of each student's combined learning presence occurrences based on all of the analyzed discussions and learning journals. With one exception, all of the students who were ranked with highest learning presence were near the center of the

network, indicating they had the greatest interaction with their peers. All of the students with the lowest learning presence were found at the periphery of the network.
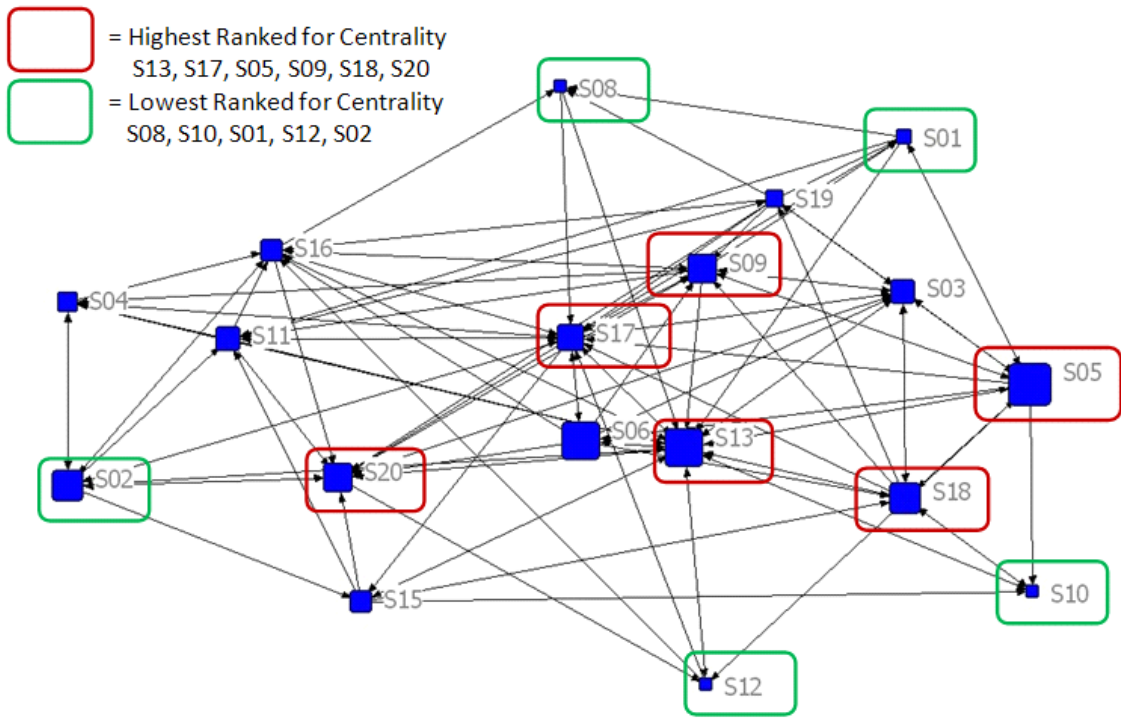
Figure 3. Network graph: Module 6 discussions node size by combined discussion and journal LP and rankings for high vs. low centrality.
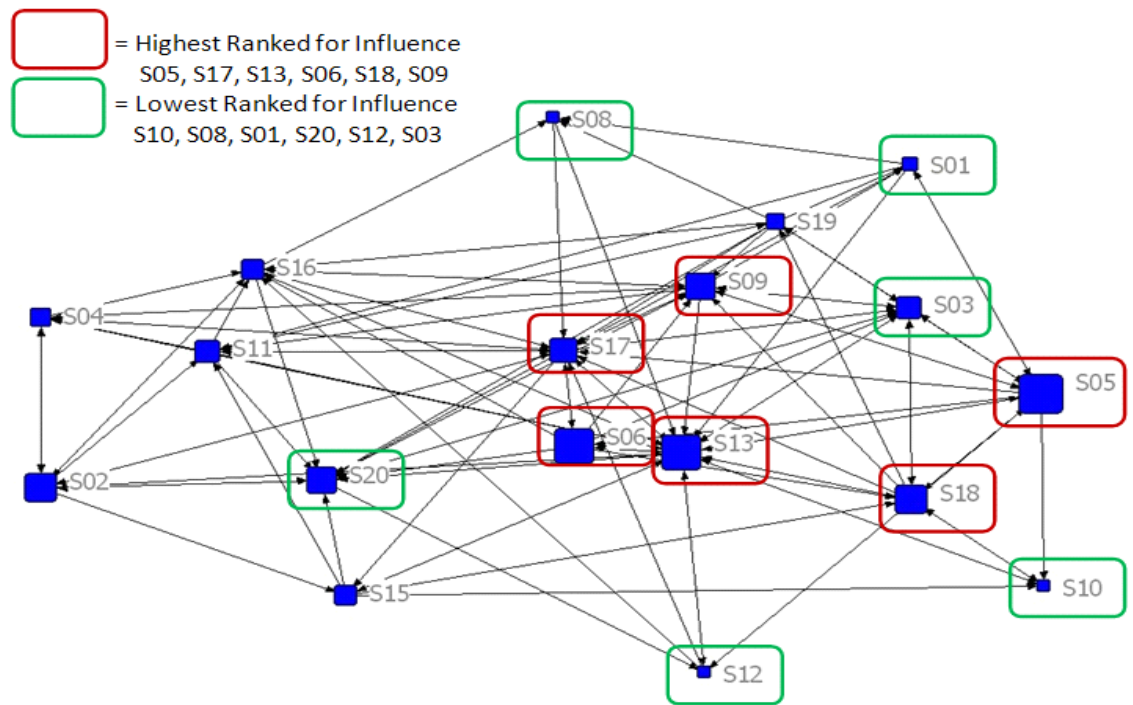
Figure 4. Network graph: Module 6 discussions node size by combined discussion and journal LP and rankings for high vs. low influence (in-degree centrality).

To further analyze the effect of learning presence on online activity, a median split was used to identify students with high and low levels of combined learning presence from both discussions and journals (see Table 3). The newly created variable served as grouping to examine differences in centrality, prestige, and influence. As mentioned earlier, we calculated Freeman degree centrality by combining measures of in-degree centrality, which are counts of inbound ties with other students, and out-degree centrality, which are counts of outbound ties. These same measures, when considered individually, are indicators of network prestige (in-degree centrality) and influence (out-degree centrality) (see Table 4). With students' ranks as a dependent measure, learning presence levels (high vs. low) had an effect on the overall centrality of student positions on the network (Mann–Whitney $U = 6.50$, $n_1 = 8$, $n_2 = 10$, $p = .003$ two-tailed).

Table 3

Comparison of LP in Discussions and Learning Journals by Students

Student	All M6 discussions total LP occurrences	As percent	M6 learning journal total LP occurrences	As percent	Combined M6 learning LP occurrences	As percent
S01	4.0	2.9	0.0	0.0	4.0	2.4
(F) S02	8.0	5.8	5.0	16.1	13.0	7.7
S03	7.0	5.1	2.0	6.5	9.0	5.4
S04	6.0	4.4	0.0	0.0	6.0	3.6
S05	16.0	11.7	3.0	9.7	19.0	11.3
S06	13.0	9.5	3.0	9.7	16.0	9.5
S08	1.0	0.7	2.0	6.5	3.0	1.8
(F) S09	11.0	8.0	1.0	3.2	12.0	7.1
S10	0.0	0.0	3.0	9.7	3.0	1.8
S11	9.0	6.6	0.0	0.0	9.0	5.4
S12	2.0	1.5	1.0	3.2	3.0	1.8
(F) S13	15.0	10.9	1.0	3.2	16.0	9.5
S15	6.0	4.4	2.0	6.5	8.0	4.8
S16	7.0	5.1	1.0	3.2	8.0	4.8
S17	9.0	6.6	1.0	3.2	10.0	6.0
S18	10.0	7.3	3.0	9.7	13.0	7.7
(F) S19	4.0	2.9	1.0	3.2	5.0	3.0
S20	9.0	6.6	2.0	6.5	11.0	6.5
Total	137.0	100.0	31.0	100.0	168.0	100.0
Mean	7.61	5.6	1.7	5.6	9.3	5.6
Median	7.5	5.5	1.5	4.9	9.0	5.4

Table 4

Rankings of Student Measures of Centrality, Prestige, and Influence for all Module 6 Discussions

Student rankings	Centrality Freeman degree) (in + outbound ties)	Student rankings	Prestige (in-degree centrality) (in-bound ties)	Student rankings	Influence (out-degree centrality) (out-bound ties)
(F) S13	67.0	(F) S13	47.0	S05	23.0
S17	45.0	S17	24.0	S17	21.0
S05	32.0	(F) S09	18.0	(F) S13	20.0
(F) S09	30.0	S20	15.0	S06	17.0
S18	24.0	S03	11.0	S18	13.0
S20	22.0	S18	11.0	(F) S09	12.0
S06	20.0	S11	10.0	(F) S19	12.0
S16	20.0	S16	10.0	S15	11.0
S11	19.0	S05	9.0	S16	10.0
S03	18.0	S04	7.0	(F) S02	9.0
(F) S19	18.0	(F) S19	6.0	S04	9.0
S04	16.0	S10	5.0	S11	9.0
S15	15.0	(F) S02	4.0	S03	7.0
(F) S02	13.0	S15	4.0	S12	7.0
S12	10.0	S06	3.0	S20	7.0
S01	8.0	S08	3.0	S01	4.0
S10	7.0	S12	3.0	S08	2.0
S08	5.0	S01	4.0	S10	2.0
Total	389.0	Total	194.0	Total	195.0
Mean	21.6	Mean	10.7	Mean	10.8
Median	19.0	Median	9.0	Median	10.0

Note. (F) = Faciliator

With students' ranks in terms of influence as a dependent measure, the results indicated that students with high learning presence ranked higher on influence (Mann–Whitney $U = 10.50$, $n_1 = 8$, $n_2 = 10$, $p = .008$ two-tailed) (see Figure 4). A somewhat similar pattern of network positions found in Figure 3 appears in Figure 4, with a core group comprised of students 05, 09, 13, 17, and 18, all ranking among the highest in both graphs for centrality and influence. The results from independent samples test with prestige ranks as a criterion showed no differences in students' ranks of prestige depending upon high and low levels of LP (Mann–Whitney $U = 19.50$, $n_1 = 10$, $n_2 = 8$, $p = .068$ two-tailed).

Research question 5: How do prestige and influence correlate with combined learning presence in discussions and learning journals and in each of these activities when considered separately?

When we examined combined learning presence found in discussions and learning journals, results from correlation analysis indicated that, as a whole, this measure has a positive and moderate correlation with prestige (Spearman rho (18) = .451, p= .06) and a positive and large correlation with influence (Spearman rho (18) = .737, p < .001).

When discussions were considered separately from learning journals, the relationship between learning presence in discussion posts and prestige was moderate, Spearman rho (18) = .569, p =.014. Even though the results from direct group comparisons were not statistically significant, the students with prominent positions on the variable prestige tended to also have higher ranks on LP in discussion, Mann–Whitney U = 7.00, n_1 = 3, n_2 = 15, p = .065 two-tailed. Further, the relationship between influence and learning presence in discussion posts was large and statistically significant, Spearman rho (18) = .781, p < .001. Furthermore, when grouped based on influence, students with higher positions tend to have also higher ranks on the variable LP in discussion, Mann–Whitney U = 3.00, n_1 = 4, n_2 = 14, p = .008 two-tailed.

Non-significant correlations between journal learning presence and prestige (Spearman rho (18) = -.211, p = .40) and journal learning presence and influence (Spearman rho (18) = .081, p = .75) confirmed that journal learning presence and prestige and influence are unrelated. The results from Mann-Whitney showed that high and low prestige within the network cannot be reliably linked to levels of journal learning presence, Mann–Whitney U = 15.00, n_1 = 3, n_2 = 15, p = .363 two-tailed. Also, journal learning presence did not differ between students with high and low influence in the network, Mann–Whitney U = 20.00, n_1 = 4, n_2 = 14, p = .385, two-tailed. Again, this suggests that certain students, perhaps those who are less active in public forums do, nonetheless, exhibit elements of learning presence in more private forums, and that asking them to facilitate a module may result in higher expressions of learning presence.

Discussion

With regard to results for our first research question, we found patterns that were suggestive, yet not statistically significant. While student facilitators expressed more evidence of learning presence than their peers, these patterns within a single module were not significant. It seems possible that with a larger sample size, more definitive conclusions could be reached and further research is warranted. In response to our second research question, regarding the occurrence of learning presence among facilitators, we found similarly suggestive patterns of centrality. However, although facilitators occupied more central locations within the network, associated metrics were not significantly different. When we consider our third research question, it is not

surprising that students engaged in more reflection in the learning journals than in the discussions. The journals asked students to reflect on their learning processes and they did so. It is somewhat illuminating that students engaged in more learning presence overall in the discussions and that the most frequent form of self-regulation in both journals and discussions was monitoring. Lastly, results for our last research question indicated that metrics of self-regulation evidenced in QCA appear to identify students who are both influential and prestigious as measured by SNA. It seems probable that the capacity to self-regulate in online environments results in more relevant or more sophisticated discourse, making students with better learning presence more attractive interlocutors for their classmates.

Scholarly Significance of the Study

As noted by previous researchers (e.g., deLaat, Lally, Lipponen, & Simons, 2007b) the combination of QCA and SNA may allow for a compatible research approach illuminating some of the qualities of both form and content of interactions in online learning environments. Through the combination of these kinds of analysis, we are able to uncover important patterns bearing on the effects of approaches to new online pedagogy generated from the CoI framework. We have also extended the use of SNA in analyzing a new construct (learning presence) within the CoI framework.

Facilitating learner self-regulation has proven to have advantageous outcomes in much research in classrooms (e.g., Zimmerman, 2000) and in emergent research in online environments (Means et al., 2009). In past research, it has been suggested that providing students with more complex collaborative tasks results in higher levels of self and co-regulatory performance (Shea et al., 2012). This study sought to extend previous findings by implementing learner centered forms of instruction in which we analyzed levels of learning presence of student facilitators and non-facilitators in online discussions and journals through QCA and SNA.

Specifically, in this paper, we analyzed a new element in the CoI model reflecting online learner co- and self-regulatory processes – learning presence. We examined the impact of providing a scaffolded shift in instructional roles in which learners were supported to take on more of the responsibility for design and facilitation of discourse (elements of teaching presence) and observed the resulting variation in associated indicators of self- and co-regulatory performance (learning presence) reflected through QCA of different learning activities. Through research questions 1, 2, and 4 we discovered that lead student facilitators exhibit higher levels of learning presence and occupy more advantageous locations reflected in SNA.

Through the results reflected in our third research question, we disclosed significant and illuminating patterns in categories of learning presence in different learning activities. Perhaps not surprisingly, forethought and planning are not very evident in

either online discussions or learning journals where strategy use and reflection are more common. That learners are exhibiting forms of strategy use more during performance (online discussion) and greater monitoring and reflection in journal activities validates the intended categories within the learning presence construct. We would expect to see these patterns, that is, more reflection and monitoring in journals and greater strategy use during performance, and we found them.

Research question 5 is significant in that results suggest that students with high discussion learning presence also have high in-degree centrality, indicating that other students sense that they are valuable partners for interaction and the knowledge building meant to result from it. These results suggest that higher levels of learning presence in online discussions are reflected in important metrics associated with SNA. Also of note is the finding that learning presence dimensions that are evident in certain activities (learning journals) are not automatically associated with metrics important in SNA.

Overall, these findings are significant in that they support and extend previous research seeking to enhance one of the dominant theories (the CoI framework) that describes, explains, and predicts learning in online environments. Results here represent important support for the validity of learning presence as a complementary construct to this framework. Findings indicating that learning presence can be fostered through shared instructional roles and that this form of self- and co-regulatory performance is associated with advantageous locations in social networks suggest that the construct is useful. We conclude that the long standing belief that online learners require greater self-direction, time management, and the like is supported and better explained through the more inclusive theoretical construct of self-regulated learning and the related construct of online learning presence. We further conclude that the online environment creates demands for new forms of self-regulation that are under articulated in the current CoI model. We believe that the model can be enhanced through additional research into the specific roles of learners qua learners in collaborative online education.

This paper contributes to the literature on constructivist online learning and on SNA. Specifically, the paper contributes to SNA by adding analysis of a new theoretical construct, learning presence, to it. A weakness of SNA in online educational research has been its lack of a relevant theoretical framing for metrics of centrality. We don't know, for example, based on the numbers of ties between participants in online learning contexts, whether such connections reflect the quality of the discourse or other processes important to learning. We assume that through interaction, learners increase their opportunity to activate processes known to support knowledge construction. For example, in line with constructivist theories of online learning, Chi (2009) explains that interaction involves co-construction of knowledge and enhances understanding by allowing learners to do things like building upon each other's contributions, defending and arguing positions, challenging and criticizing each other on the same concepts or points, and asking and answering each other's questions. Chi argues that such

interaction is constructive in nature, because learners are generating knowledge that goes beyond the information that would typically be provided in learning materials. The cognitive benefits of such interaction include that a partner's contributions can provide additional information, new perspectives, corrective feedback, reminders, or a new line of reasoning which can enhance learning through added guidance, hints, and/or scaffolds that either enrich knowledge or support additional inferencing. Given our results with regard to SNA metrics of influence and prestige, it seems probable that the capacity to self-regulate in online environments leads to more relevant or sophisticated discourse, making students with better learning presence more attractive interlocutors for their classmates. Chi's rationale for the importance of interaction thus lends weight to the significance of learning presence in courses that depend on online discourse to promote learning.

Through the analysis of learning presence within SNA, we sought to understand whether learners who evince higher levels of online self-regulated learning (learning presence) in their discourse also occupy more central locations within the interaction networks reflected through SNA. In other words, do indicators of learning presence correlate with indicators of prestige and influence measured through SNA meant to indicate richer interactive opportunities of the type that support knowledge creation? Is SNA a promising research method for examining theoretically grounded explanations of online learning? Results reported here suggest that SNA does reflect constructs that are grounded in theories of how people learn, as adapted for online environments. Specifically, these results indicate that students with higher levels of learner presence occupy more advantageous positions, indicating that they are more active and more sought after in networks of interaction. This represents a promising conclusion and additional research into the relationship between learning presence and interaction is warranted.

Finally, we believe that this research continues to provide evidence for the validity of the learning presence construct. Learning presence patterns revealed in this study indicate that student self-regulation as defined here is both logical (the learning presence patterns make sense) and important (learning presence correlates with metrics assumed to be advantageous for interaction). We, therefore, suggest that the inclusion of learning presence in the CoI model may be warranted.

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Appendix A. Learning Presence Coding Scheme

Revised Coding Scheme for Learning Presence (LP)

Categories	Code	Indicator	Description	Example	Comments	Source
Forethought Planning	FP1	Goal setting	Deciding upon specific actions and outcomes	At the end of next week, as a team, we have to submit a summary of our discussion points. Our goal is to submit a two page position paper defending the position against outsourcing.		Zimmerman (2000)
	FP2	Planning	Deciding on methods & strategies appropriate for the task	Why don't we list (all of us) what we perceive to be the cons of outsourcing. I was thinking we should decide what arguments we want to use in this paper.	Methods and strategies are used to meet goals	Zimmerman (2000)

	FP3	Coordinating, delegating or assigning tasks to self and others	Distributing, sequencing tasks and sub-tasks to others/self for future completion	Are you picking this [task] up next? I will take care of the intro and the summary. I have to work all night tonight. I will submit it for the group tomorrow evening sometime	Methods and strategies are accomplished through tasks	Emergent
Performance	M1	Checking for understanding	Seeking verification of understanding of tasks, events or process	...Are we sure that everything has been cited correctly? I submitted my proposal a couple of different ways but don't know if it is viewable to the class. I don't see anybody else's either. Is there something I am missing?		Zimmerman (1989)

			If we paraphrase… I am pretty sure the in-text citations is not required. You can check: https://esc.angellearning.com/section/resources/default.asp		
M2	Identifying problems or issues	Identifying difficulties related to materials, technologies, understanding (e.g. confusion) etc. that interfere with completion of tasks, performance, products or other outcomes.	I believe the assignment is 500 words or less so we may need to skimp down a bit.		Emergent
			…then I realize that it has scrambled my idea of what I thought I knew.		

M3	Noting completion of tasks	Comments that indicate that certain tasks or activities have been finished to support attaining a goal.	I did some research and then typed up the employer section.	Look for statements expressed as past tense. These are easy to overlook.	Emergent
M4	Evaluating quality	Evaluating the quality of a product, its content or its constituent parts as students work toward completion		Must be substantive and provide some evidence or explanation "why." "Great job" or "nice work" are insufficient. Formative or summative evaluation	Azevedo et al. (2004)
M5	Observing or monitoring during performance and taking corrective action	Statements that monitor individual or group performance that result in corrective action based on feedback or reflection	I think we need a solid intro and conclusion. As the paper stands now, we have none.	What I am hearing is that I need to think more abstractly about structuralism.	Zimmerman (2000)
M6	Appraising personal interest, engagement or reaction.	Comments about self or others' engagement, interest, comittment or participation. Also includes personal	As I travel extensively for my job, by interaction is a bit sporadic	In this statement, student is monitoring their level of participation	Azevedo et al. (2004)

			"reactions" to tasks, materials and activities.		Statement must be related to the completion of the task, not the content of the discussion.
				I found that information [in the chapter] all new and a little scary.	
	M7	Recognizing learning behaviors of self or group (i.e., metacognitive knowledge)	Statements about individual or group's preferences, strengths or weaknesses as learners.	I am more of a hands on learner. I am one....who likes to explore new programs and put totether an object without reading directions.	Statement must be related to the completion of the task or process. Avoid coding content of the discussion.	Emergent

M8	Advocating effort or focus	Encouraging others to contribute or focus on tasks, materials and activities.	Has everyone contributed their pieces? I'd encourage my classmates not be intimidated by the boring title of "ethics."		Curtis & Lawson (2001) & Zimmerman (2000)
M9	Noting use of strategies	Statements that illustrate that students are mindful and aware of the strategies that they are using	I was almost hyperventilating, so I decided to stop and think what I would do next in order to make my endeavor to read more productive. I decided to extract concepts from the graphic organizer on page 26 and Google each word to try and make sense how the concepts tie together.		

S1	Seeking, offering or providing help	Requesting, offering, or providing assistance related to learning materials, tasks, processes or products.	If you need any assistance, please let me know what I can do to help you out.	M1 should only be applied after all other more specific codes have been ruled out.	Curtis & Lawson (2001)
S2	Recognizing a gap in knowledge	Statements indicating that students are aware of a gap in knowledge and its connection to the current task, process or product.		- -	-
S3	Reviewing	Comments noting the need to review or the completion of reviewing content related to the course.	I would need to refer to this chapter in otder to review the principles of this philosophy		
S4	Noting outcome expectations	Statements in which students acknowledge the relevance of current tasks or processes to a future outcome	At present, all I know is that grasping the epistemology of inquiry will help me read research in a more informed and holistic way.		

				As I grow in the doctoral program I fully expect to read...with more foresight	Zimmerman (2000)
	S5	Seeking / offering additional information	Looking beyond course content and materials to locate additional information to deepen understanding	The answer to my question was provided by The "Research Methods Knowledge Base .Trochim (2005).	
				I went to AERA's web site and it looks like the Foreword has been updated since the book was published.	
Reflection	R1	Change in thinking	Statements that indicate a change in thinking as a result of process, product or outcome	I can now understand some of their points and I feel the biggest misconception I had was that outsourcing does not necessarily entail taking jobs out of	Emergent

			the country		
			This issue is not as simplistic as I once thought…		
			It was a huge eye-opener for me when I viewed interactions through this new lens.		
R2	Causal attribution of results to personal or group performance	Statements in which students credit their results to their performance (i.e., use of forethought/planning, monitoring, strategies)	I think this was because I was now able to make associations with time periods.		Zimmerman 2000

Appendix B. Inter-Rater Reliability

Table 1

Inter-Rater Reliability for Journals

	Journal M2		Journal M3		Journal M5		Journal M6		Journal M8	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
C R	0.83 67	1.000 0	0.754 4	1.000 0	0.682 9	1.000 0	0.692 3	1.000 0	0.750 0	1.000 0

Table 2

Inter-Rater Reliability for Module 6 Discussions

	Discussion 1		Discussion 2		Discussion 3	
	Pre	Post	Pre	Post	Pre	Post
Week 1	0.8219	1.0000	0.7576	0. 9706	0.7119	1.0000
Week 2	0.7179	1.0000	0.8052	1.0000	0.8571	0.9778

Athabasca University

Pedagogical Roles and Competencies of University Teachers Practicing in the E-Learning Environment
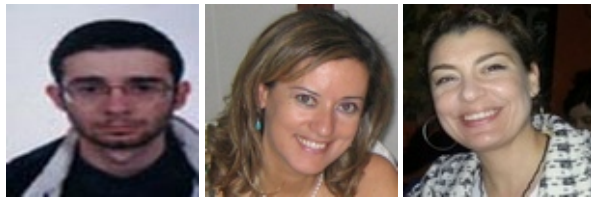
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Abstract

Identifying the roles and competencies of faculty performing in virtual environments is crucial to higher education institutions in order to build a common frame for teaching and training initiatives. One of the goals of this study is to identify and systematize faculty's roles through a review of the most representative surveys. There has also been an effort to identify competencies associated to every role, with an emphasis on those of the pedagogical scope, by means of a focus group. Furthermore, a cross-sectional survey with 166 faculty participants has been conducted in order to identify faculty's level of proficiency on the pedagogical competencies and the interest in training programs. Teacher perceptions on both these aspects constitutes a relevant reference for the design of faculty training programs. Results reveal that content drafting is the aspect in which the subjects declare the highest level of proficiency as opposed to assessment. Faculty also appear to be willing to improve their training, being aware of the changes and requirements entailed by e-learning.

Keywords: Online teaching; online teacher roles; competencies; pedagogical competencies; interest in training

Introduction

The integration of information and communication technologies (hereinafter ICT) in the education environment represents a complex process which depends on factors of a political, administrative, organizational, strategic, cultural, professional, and personal nature. These factors are particularly relevant for higher education because of the peculiarities of university institutions, regarding their management and structure, as well as their functioning and social projection.

In spite of the initial difficulties, the incorporation of ICT and e-learning into universities has experienced exponential growth, both in quantitative and qualitative terms (Bates & Poole, 2003; Bates & Sangrà, 2011; Barro & Burillo, 2006; Bullen & Janes, 2007; Carr-Chelleman, 2005; Hanna, 2002). As a consequence the teaching, research, management, and cultural extension patterns have been modified (Burbules & Callister, 2000; Epper & Bates, 2001; Lokken & Womer, 2007; Sangrà & González Sanmamed, 2004a).

As regards teaching, it is necessary to take into account that the design, development, and assessment of virtual education introduce particular features and require specific teaching tasks (Major, 2010; Spector, 2007). Therefore it is necessary to assess all the changes that teaching in virtual environments entail for the teacher, both at institutional and academic levels, and this from at least a dual perspective: clarifying the profile of the teacher who is going to be acting in the virtual classroom – which implies defining the roles and competencies of the teacher – and establishing the training required. This is the framework of the present survey.

Literature Review

Several authors have studied and made proposals regarding the roles and competencies of the teachers who participate in teaching programs in virtual environments. The surveys carried out on this subject are both of a theoretical and empirical nature and are meant to offer guidelines for the training, selection, and certification of online teachers.

The literature on the roles and competencies of the online teachers reveals two trends. Some authors understand that they are similar to those of a teacher in a face-to-face environment, since they both need to possess the knowledge necessary to effectively integrate ICT into teaching. Bautista, Borges, and Fores (2006) emphasize that although the competencies are similar, the roles to be assumed are different. In the international context, Goodyear, Salmon, Spector, Steeples, and Tickner (2001) recognize the similarities between face-to-face teaching and online teaching, but point out the differences in the way efficient teaching takes place.

Many other authors state that the prominence of ICT in online instruction modifies the elements of the teaching and learning process and conclude that there are teaching

competencies that are specific to online teaching (Ardizzone & Rivoltella, 2004; Belisle & Linard, 1996; Espasa, Guasch, & Álvarez, 2009; Laat, Lally, Lipponen, & Simons, 2007; Muñoz Carril & González Sanmamed, 2009; Yeung, 2003). For example, it is argued that teachers need to know how to use synchronous and asynchronous communication systems (Collison et el., 2000; Guasch, Álvarez, & Espasa., 2010; Kearsley, 2000).

Bawane and Spector (2009) assert that the teachers performing online must assume a multidimensional role and are urged to integrate a range of different and numerous competencies. They also underline the fact that the teaching competencies required derive from the context in which the teaching is performed: the characteristics of the training program, the specific role of the teacher, and the financial, functional, and human resources available (e.g., the equipment of administrative staff, designers, technicians, etc.). Some researchers, such as Kreber and Kanuka (2006; quoted by Baran, Correia, & Thompson, 2010), indicate that virtual education environments promote the exploration of new teaching approaches, derived from enhancing collaborative work or practices which incorporate social learning.

Based on these arguments, over the past few years there has been a certain interest in rigorously arranging and categorizing those roles and competencies that lead to an accurate definition of the online teacher profile.

On the other hand there have been international initiatives from several institutions that have drafted proposals of performance standards for online teaching, which specify the teaching competencies. Due to their particular relevance in this field, we may cite the proposals of the International Board of Standards for Training, Performance and Instruction (IBSTPI), of the International Society for Technology in Education (ISTE), or those from the European Institute for E-Learning (EIfEL). The work of these organizations has been considered to be a valuable reference for prestigious universities around the world.

Table 1 introduces an effort to offer a synthetic overview of the most representative surveys on the roles of the online teacher. This draft gathers the proposals of 14 authors regarding the roles of the online teacher. Subsequently Table 2 identifies the competencies associated with the various roles, with a special emphasis on those relative to the pedagogical scope.

In the preparation of these tables, different sources of information have been used: ERIC (*Education Resources Information Centre*); DOAJ (*Directory of Open Access Journals*); DIALNET (*Hispanic scientific production portal*); LATINDEX (*Regional Cooperative Online Information System for Scholarly Journals from Latin America, the Caribbean, Spain and Portugal*), and ISOC (*Higher Centre Portal for Scientific Investigation of Spain*).

The data compiled in Table 1 reveals the diversity of roles expected from an online teacher. In any case it is worth mentioning that in online environments teachers are not the only actors. Depending on the support offered to them as well as on the teaching context, they can interact with other professionals, such as instructional designers, graphic designers, technology experts, multimedia producers, media designers, managers, and so on (Guasch, Álvarez, & Espasa, 2010; Marcelo, 2006). In this sense, Guasch, Álvarez, and Espasa (2010) stress the difficulties encountered by a teacher in developing such diverse competencies as those described in the proposals made by Williams (2003) or Egan and Akdere (2005). These authors defend collaboration between different professionals and propose three reference profiles within the e-learning environment: the teacher, as an expert in the subject matter plans the methodology and the activities; the tutor, as an advisor and guide for the student; and the management staff, in charge of administrative and technological aspects.

In spite of the differences between the various proposals, some similarities can be identified. These commonalities appear between authors who share a certain historic moment and therefore share a vision regarding the competencies required for the online teacher. For example, the proposal made by Berge (1995) concurs with the proposal drafted by Wiesenberg and Hutton (1996), and – according to Baran, Correia, and Thompson (2010) – these roles were proposed when the e-learning practice was emerging and the main activities were designed around online discussions. However, the growing increase in new teaching environments, such as virtual worlds, metaverses, and other types of platforms, led Berge (2008) to change some parameters of his initial proposal, considering new approaches such as informal education, collaborative work, reflexive learning, and user generated content. Other proposals, such as those developed by Coppola et al. (2002) or Williams (2003), still focus mainly on the roles associated with communicative situations, though assuming the possibilities of asynchronous teaching as well as the different interactions that can take place between the teacher and the students, between the students, and between the teacher, the students, and the content.

On the other hand, coincidences arise from the fact that some authors build their proposals on those drafted by other authors. Thus, Egan and Akdere (2005) replicate those compiled by Williams (2003), while Aydin (2005) adapted Goodyear et al.'s (2001) study.

Other aspects to be analyzed derive from the different approach followed by various authors in their proposals. Thus we encounter very detailed taxonomies such as that of Thach and Murphy (1995), while Anderson et al. (2001), Bawane and Spector (2009), Salmon (2004, 2000), and Varvel (2007) make more general proposals as a bases to define the competencies to be taken into account in the selection, training, and professional development of teachers. This approach is also adopted by the two surveys carried out within the Spanish framework (Marcelo, 2006; Guasch, Álvarez, & Espasa, 2010).

Table 1

Roles Associated with Online Teaching

Studies

Roles	Guasch, Álvarez & Espasa (2010)	Bawane & Spector (2009)	Varvel (2007)	Marcelo (2006)	Aydin (2005)	Egan & Akdere (2005)	Salmon (2004); Salmon (2000)	Williams (2003)	Coppola et al. (2002)	Anderson et al. (2001)	Goodyear et al. (2001)	Wiesenberg & Hutton (1996)	Berge (1995)	Thach & Murphy (1995)
Advisor, Counselor, Tutor		X		X	X						X			
Affective									X					
Cognitive									X					
Knowledgeable about online processes							X							
Content expert					X		X							
Content facilitator											X			
Designer-planner/ Instruccional designer/ Organizer	X		X	X	X	X		X		X	X			X
Evaluator/ assessor/evaluation specialist		X	X		X	X		X			X			X
Facilitator/site facilitator-proctor/process facilitator					X	X		X			X			X
Graphic designer						X		X						X
Direct instructor/ Instructor/ Instructor-facilitator/ Pedagogical	X	X	X			X		X		X		X	X	X
Interpersonal communicator/ Communicator							X							
Leader/change agent						X		X						

Studies

Roles	Guasch, Álvarez & Espasa (2010)	Bawane & Spector (2009)	Varvel (2007)	Marcelo (2006)	Aydin (2005)	Egan & Akdere (2005)	Salmon (2004); Salmon (2000)	Williams (2003)	Coppola et al. (2002)	Anderson et al. (2001)	Goodyear et al. (2001)	Wiesenberg & Hutton (1996)	Berge (1995)	Thach & Murphy (1995)
Librarian						X		X						X
Manager/ administrator/ Administrative manager, course manager	X	X	X	X	X	X		X	X		X	X	X	X
Material producer					X									
Media publisher, editor						X		X						X
Personal (personal qualities and characteristics)			X				X							
Professional		X												
Researcher		X									X			
Social / Discourse facilitator	X	X	X							X		X	X	
Systems expert/ Consultant						X								
Support staff						X		X						X
Technician						X		X						X
Technological expert/ Technologist	X	X	X	X	X	X	X	X			X	X	X	X
Trainer						X		X						

The task of synthesizing and comparing the different proposals proved to be difficult because there is no unified voice when it comes to terminology. Some terms are used with equivalent meanings, but in some cases they present certain nuances. Nonetheless, in spite of this complexity, it can be observed how the different experts and researchers contemplate categories with very similar main or basic roles in their proposals: the "technologist" role, the "administrator or manager" role, the "assessor" role or the "pedagogical" role. The latter, as can be seen in Table 1, appears to be the one identified most frequently (specifically in nine proposals). Indeed, Bawane and Spector (2009) state that the pedagogical role is the most relevant.

Below, based on the structure of roles identified, we propose in Table 2 a classification in which the competencies associated with each of the diverse roles are described. The identification of these competencies and their link with the teaching roles has been built on the basis of the analysis of surveys collected in Table 1 as well as on the discussions that took place in a focus group organized at the A Coruña University. This focused group was formed with nine teachers, who were representative of the faculty characteristics and experienced in online teaching. There were five men and four women, six of them belonged to a scientific–health and technical background whereas three of them to a human sciences and social-legal background. There were six full time faculty and three hired teachers[1]. A whole day work session was carried out with the focus of analyzing and discussing the different authors' proposals collected in Table 1. The goal of this discussion was to delimit the aspects considered to be relevant in the profile of the classroom faculty, who would perform as virtual teachers. The reference competences for this study, collected in Table 2, are those associated to the pedagogical role. They are compiled in the applied questionnaire items (Table 5).

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[1] Faculty in the Public Spanish University System belong to two administrative categories. Full time faculty become civil servants after a public examination. Hired teachers are hired for certain periods of time either to temporarily substitute for full time faculty or to participate in research projects. It is not possible to exactly assimilate these categories to those of other international universities. That's why the translation avoided such terms as assistant professors, associate professors, tenured, or tenure-track.

Table 2

Competencies Associated with the Roles of the Teachers Performing Online

Main roles	Secondary roles	Competencies
(1) Pedagogical	Instructional designer and developer	- Design the teaching proposal at a general level and in each of its phases or elements - Draft and develop digital materials - Draft and develop learning activities - Draft and develop assessment activities
	Content expert	- Draft and develop course contents - Link the subject with scientific, social and cultural phenomena
	Tutor	- Organize and promote different tutorial modalities
	Organizer and facilitator	- Organize and facilitate student participation
	Professional	- Organize and promote self training and teacher professional development
(2) Social		- Maintain a cordial learning environment - Resolve conflict in an amicable manner - Refrain from undesirable behaviours - Act as information facilitator - Improve the learning environments - Send messages to support students - Give feedback to student interactions and communications - Dynamize and promote interaction with the students - Keep the classroom/course/university degree coordinator informed about the progress and the possible problems that may arise
(3) Evaluator		- Assess students' work according to established criteria - Monitor individual and group progress - Assess individual and group performance - Evaluate the course/program

Main roles	Secondary roles	Competencies
(4) Administrator/ manager		- Manage time and course - Demonstrate leadership qualities - Establish rules and regulations - Follow efficiently management and administrative procedures (e.g.: request to create online classrooms, request to integrate technological support for performing learning activities, enrolment management, student enrolment in the online environment, etc.) - Maintain contact with the rest of the teaching and administrative team
(5) Technologist		- Select the appropriate resource for learning - Awareness of the technical procedures to develop multimedia content and to adapt them to e-learning environments - Suggest resources to the students (resource provider) - Stay up to date with and learn about new software needed for the teaching process - Awareness of the features and uses of the main platforms, resources and virtual tools - Awareness of the procedures required to manage as a teacher both synchronous and asynchronous communication tools
(6) Advisor/ Counsellor		- Suggest measures to enhance performance - Provide guidance based on student needs - Offer advice, suggestions and clarify doubts - Motivate the students
(7) Personal		- Comply with ethic and legal standards - Adopt a positive attitude and commitment to e-learning - Show sensitivity during the communication process and in online contacts
(8) Researcher		- Conduct research into classroom teaching - Interpret and integrate research findings in teaching - Develop reflexive processes about, in and for the teaching practice

Note. Adapted from Bawane and Spector (2009)

Purpose of the Study

Taking into account that many higher education institutions, originally offering traditional classroom teaching, are introducing e-learning practices, it is important to identify how the teaching staff, used to face-to-face interactions, are affected by their incorporation into online teaching, specifically the changes they face with regard to the new required competencies. A cross-sectional survey of a descriptive and explorative nature has been conducted in order to answer these concerns. Its core objective has been focused on obtaining information about the level of proficiency that faculty say they have with respect to the pedagogical competencies of an online teacher and about their interest in training programs (understood as their willingness to amplify and improve their training in these competencies). In particular, the study has been carried out with faculty who are incorporating ICT as well as developing online teaching initiatives as a complement to their face to face teaching.

The research proposed the following hypotheses:

- Hypothesis 1: The level of proficiency shown by university teachers regarding pedagogical competencies for e-learning systems is associated with occupational variables (in particular, academic category, scientific sphere, and university teaching experience in virtual environments).

- Hypothesis 2: The interest of university teachers in training programs for the acquisition of pedagogical competencies associated with e-learning systems is associated with occupational variables (in particular, academic degree, scientific environment, and university teaching experience in virtual environments).

- The connections between the proficiency level and the training interest regarding the pedagogical competencies relative to e-learning have also been analyzed.

Study Context

The survey was carried out at the A Coruña University (hereinafter UDC). UDC is a public university, located in the north-west of the Iberian Peninsula (www.udc.es), and it has 25 education centres. It offers 42 official bachelor degree programs, 53 master degree programs, and 46 PhD programs. Table 3 collects the numerical data of faculty and students at UDC, according to gender.

Table 3

UDC Teachers and Students

	Women	Men	TOTAL
Teachers	512	946	1458
Bachelor students	9829	9752	19581
Master degree students	618	436	1054
PHD Students	682	680	1362

Between 2000 and 2005 UDC developed the "Plan de Innovación Tecnolóxica" or "Technologic Innovation Plan" (INNOVATE) to integrate ICT into myriad fields: information, management, education, and research. On the other hand, in order to improve university teaching through the use of ICT, the project ITEM (Innovación Tecnológica y Enseñanza Multimedia – Technological Innovation and Multimedia Teaching) was drafted. Bates and Sangrà (2011) chose UDC as one of their case studies. Subsequently, new measures were taken into consideration in order to increase the virtual educational offering and to enhance the training of the teaching staff in order to take over the development of online subjects. The impulse and the increased use of online teaching have brought about an institutional debate on the requirements that such an initiative might imply, specifically in terms of teaching. It is against this background and under these premises that the study we present here arose.

Methodology

A nonexperimental quantitative survey was designed (Cohen & Manion, 1990; McMillan & Schumacher, 2005). An online questionnaire was drafted and sent via electronic media.

This article presents the results reached in Section II within the questionnaire relating to the pedagogical competencies of the university teaching staff associated with the use of e-learning. The analysis focuses on their current level of proficiency, as well as on their interest in increasing their training. Each item is assessed on a 5-point Likert scale. This scale collects teacher's perceptions, understanding 5 is the higher rate and 1 the lowest.

In order to guarantee the validity conditions, the first version of the questionnaire went through a subject-matter expert content validation and was subjected to a pilot study. As for its reliability, Cronbach's alpha internal reliability index was used. The internal consistency coefficients obtained in the "pedagogical competencies" section have turned

out to be considerably high: the category "level of proficiency": α = 0,944; the category "training needs": α = 0,953.

Participants

The sampling technique was non-probabilistic, an accidental or convenience sample (Cohen & Manion, 1990; McMillan & Schumacher, 2005). The sample population was defined by the teaching staff practicing within the online teaching system from the A Coruña University.

The sample collected (166 questionnaires) exceeded the sample required according to the formula for finite populations as proposed by Arnal, del Rincón, and Latorre (1992). The distribution of the participants in the survey is shown in Table 4.

Table 4

Characteristics of the Sample Population Arranged by the Categories: Administrative, Scientific Environment And Teaching Experience within Virtual Environments

Identification variable		*n*	%
Administrative category	Full time faculty	107	64,5
	Hired teachers	59	35,5
Scientific environment	Scientific –health and technical	104	62.7
	Human sciences and social- legal	62	37.3
Teaching experience in virtual environments	Less than 1 year	26	16.3
	Between 1 and 2 years	37	23.1
	Between 3 and 4 years	55	34.4
	Between 5 and 6 years	17	10.6
	More than 6 years	25	15.6

Data Results

Below we present an analysis of the responses for the items from the section entitled "pedagogical competencies of the university teaching staff regarding the use of e-learning", both at a global level and taking into account various sampling segments.

At a descriptive level we find that, according to the "level of proficiency" in pedagogical competencies applied to the e-learning environment, as shown in Table 5, the mean scores obtained show that the teaching staff from the UDC possesses what could be categorized as an average level of proficiency.

Table 5

Mean Difference on the Level of Proficiency and Training Needs Regarding Pedagogical Competencies Applied to E-Learning

	Level of proficiency		Training needs		Mean differences							
								95% Confidence interval				
	Mean	Standard deviation	Mean	Standard deviation	Mean differences	Standard deviation	Standard error of the mean	Superior	Inferior	t	df	Significance (bilateral)
Design the teaching proposal at a general level and in each of its phases or elements	2.53	1.209	3.18	1.619	-.651	1.719	.133	-.914	-.387	-4.876	165	.000 Relative significance
Draft and develop course contents	2.78	1.130	3.28	1.590	-.500	1.698	.132	-.760	-.240	-3.795	165	.000 Relative significance
Draft and develop learning activities	2.53	1.174	3.39	1.590	-.855	1.721	.134	-1.119	-.592	-6.405	165	.000 Relative significance
Draft and develop assessment activities	2.37	1.198	3.34	1.632	-.970	1.784	.138	-1.243	-.697	-7.006	165	.000 Relative significance
Draft and develop digital materials	2.43	1.257	3.39	1.606	-.952	1.808	.140	-1.229	-.675	-6.781	165	.000 Relative significance
Organize and promote teacher training and professional development programs	2.46	1.163	3.43	1.593	-.970	1.653	.128	-1.223	-.717	-7.560	165	.000 Relative significance

|											
Organize and facilitate student participation	2.52	1.169	3.57	1.566	-1.048	1.658	.129	-1.302	-.794	-8.145	165	.000 Relative significance
Link the content of the course with scientific, social and cultural phenomena	2.52	1.148	3.53	1.567	-1.006	1.650	.128	-1.259	-.753	-7.857	165	.000 Relative significance
Organize and promote different tutorial methods	2.54	1.204	3.46	1.556	-.922	1.618	.126	-1.170	-.674	-7.339	165	.000 Relative significance

The competencies in which the teaching staff indicated they had higher levels of proficiency were the following: "draft and develop course contents (item 2)" with a mean of 2.78; "organize and promote different tutorial methods (item 9)" with a mean of 2.54; "draft and develop learning activities (item 3)" with a mean of 2.53; and "link the content of the course with scientific, social and cultural phenomena (item 8)" with a mean of 2.52, similar to item 7 ("organize and facilitate student participation").

On the other hand, item 4 ("draft and develop assessment activities") obtained the lowest mean score with 2.37.

Regarding "training needs" (Table 5), certain aspects appear to reach a medium-high level, such as the following: "organize and facilitate student participation" (3.57 mean); "link the content of the course with scientific, social and cultural phenomena" (3.53 mean); and "organize and promote different tutorial methods" (3.46 mean). The items with the lowest scores are those related to "design the teaching proposal at a general level and in each of its phases or elements" (3.18 mean) and "draft and develop course contents" (3.28 mean).

On the whole, the means are considered to be quite high, meaning that the faculty from UDC show a considerable interest in teaching training programs in order to enhance their pedagogical competencies within the e-learning environment.

In the following lines there is a comparison, through mean ranking, between the level of proficiency and the training needs for the acquisition of pedagogical competencies within the e-learning environment (Figure 1). As shown below, the training needs obtain higher mean ranks than the training level manifested by the teaching staff in each and every one of the different items.
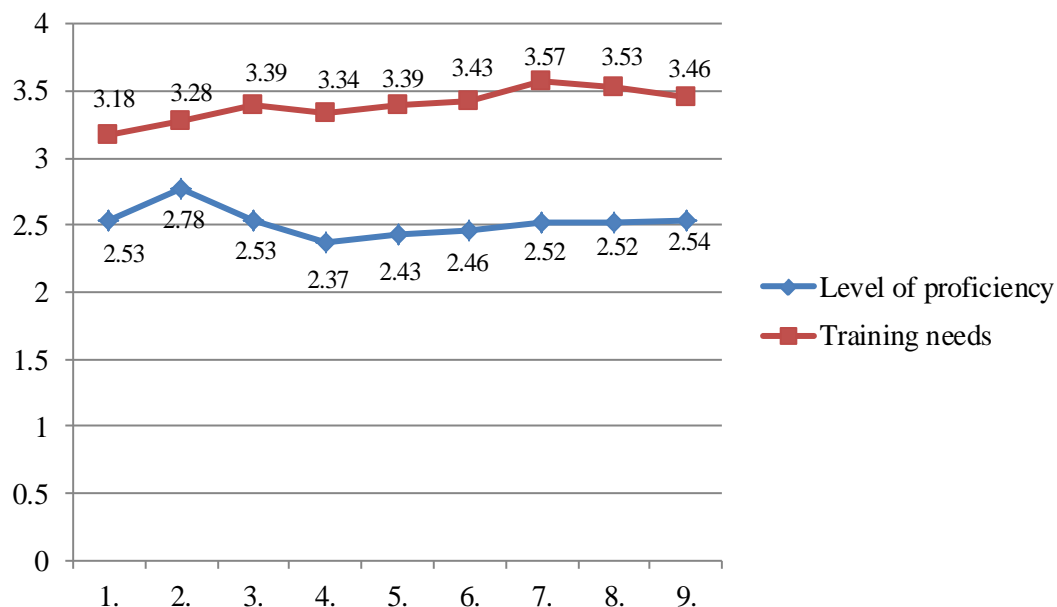
1= Design the teaching proposal at a general level and in each of its phases or elements

2= Draft and develop course contents

3= Draft and develop learning activities

4= Draft and develop assessment activities

5= Draft and develop digital materials

6= Organize and promote teacher training and professional development programs

7= Organize and facilitate student participation

8= Link the content of the course with scientific, social and cultural phenomena

9= Organize and promote different tutorial methods

Figure 1. Comparison between the proficiency level and the training needs for the acquisition of pedagogical competencies within the e-learning environment.

It is worth mentioning that the items with a minor difference between the proficiency level and the training needs are "draft and develop course contents" (a difference of 0.5 points) and "design the teaching proposal at a general level and in each of its phases or elements" (a difference of 0.65 points).

As for the items with a higher difference, they are "organize and facilitate student participation" (a difference of 1.05 points), and "link the content of the course with scientific, social and cultural phenomena" (a difference of 1.01 points).

The results of the Student t test (Table 5) show how, for a confidence interval of 95%, there are significant mean differences between the items belonging to both categories

(level of proficiency and training needs for the acquisition of pedagogical competencies within e-learning environments).

Next, we carried out an inferential analysis of the university teachers' pedagogical competencies in e-learning, according to the "administrative category" variable.

Table 6

Mann-Whitney Test ("Administrative Category" Variable)

Compared variables	Administrative category	n	Average range	Rank summary	Contrast statistics	
Level of proficiency in pedagogical competencies	Full time faculty	105	77.09	8094.50	Mann-Whitney U Wilcoxon W Z	2529.500 8094.500 -1.949
	Hired	59	92.13	5435.50		
	Total	164			Asymptotic significance (bilateral)	.051
Training needs for the acquisition of pedagogical competencies	Full time faculty	105	79.45	8342.00	Mann-Whitney U Wilcoxon W Z	2777.000 8342.000 -1.106
	Hired	59	87.93	5188.00		
	Total	164			Asymptotic significance (bilateral)	.269

According to the results obtained in Table 6, we can affirm that for the variable "level of proficiency in pedagogical competencies", the p-value of 0.051 is within the non significance limit. Based on the mean ranges analysis, it can be concluded that the hired teachers possess a higher level of proficiency in pedagogical competencies compared to the full time faculty. As for the training needs for the acquisition of pedagogical competencies, and taking into account the 0.269 p-value, we can assert that there are no significant differences according to the administrative category of the teachers.

As regards the inferential analysis according to the "scientific environment" variable and taking into account the results in Table 7, the conclusion is that there are no significant differences either.

Table 7

Mann-Whitney Test ("Scientific Environment" Variable)

Compared variables	Scientific environment	*n*	Mean rank	Rank summary	Contrast statistics	
Level of proficiency in pedagogical competencies	Scientific and health and technical	104	82.22	8550.50	Mann-Whitney U	3090.500
	Human sciences and legal and social	62	85.65	5310.50	Wilcoxon W	8550.500
					Z	-.446
	Total	166			Asymptotic significance (bilateral)	.655
Training needs for the acquisition of pedagogical competencies	Scientific and health and technical	104	79.75	8294.00	Mann-Whitney U	2834.000
	Human sciences and legal and social	62	89.79	5567.00	Wilcoxon W	8294.000
					Z	-1.311
	Total	166			Asymptotic significance (bilateral)	.190

Based on the results obtained in Table 8, it can be asserted that there are significant differences in the level of proficiency in pedagogical competencies in e-learning according to the level of teaching experience in virtual environments (p-value = 0.001). Thus, the higher the level of teaching experience in distance education, the higher the level of proficiency in pedagogical competencies. Simple observation of the mean ranges bears out this fact.

On the other hand, the p-value of 0.702 leads to acceptance of the null hypothesis of variable independence for the variables "training needs for the acquisition of pedagogical competencies" and "university teaching experience within virtual environments".

Table 8

Kruskal-Wallis Test (Variable: "Teaching Experience in Virtual Environments")

Compared variables	Teaching experience in virtual environments	n	Mean rank	Contrast statistics	
Level of proficiency in pedagogical competencies	Less than 1 year	26	55.69	Chi -square df Asymptotic significance	18.298 4 .001
	1 - 2 years	37	67.47		
	3 - 4 years	55	87.45		
	5 - 6 years	17	92.21		
	More than 6 years	25	102.32		
	Total	160			
Training needs for the acquisition of pedagogical competencies	Less than 1 year	26	71.10	Chi -square df Asymptotic significance	2.184 4 .702
	1 - 2 years	37	88.07		
	3 - 4 years	55	79.80		
	5 - 6 years	17	78.09		
	More than 6 years	25	82.26		
	Total	160			

Discussion and Implications

When the study was carried out, faculty possessed different levels of proficiency and experience in the use of e-learning. Some of them had already participated in the Innovate Plan for the integration of ICT and developed blended-learning modality subjects. An aspect to be considered is that the research also incorporated faculty who were beginners in the intensive use of the ICT and, specifically, in the virtualization project of their subjects. This explains the dispersion on the frequencies obtained on the Likert scale and, as a consequence, the means reached during the inquiries of the level of proficiency. Anyway, and in spite of the fact that the means are very close, it is worth discussing the two aspects that obtained the highest and the lowest means. Content drafting is the aspect in which the subjects declared the highest level of proficiency. This shows that it is surely the one that is used the most, and probably one of the first actions performed by a teacher when first engaging in e-learning. On the contrary, the item with the lowest score refers to assessment. And, indeed, assessment represents one of the most controversial actions and it remains problematic within virtual environments (John & Wheeler, 2008).

The results obtained regarding training needs are considerably higher and they reflect not only the willingness of the teaching staff to improve their training, but also their awareness of the changes and requirements entailed by e-learning. Facilitating student participation is what faculty identify as their greater training need. The commitment of students to their own training is a fundamental element in an active and constructivist learning model and thus student participation turns out to be essential (Bach, Haynes, & Smith, 2007).

The analysis of the mean differences through the student *t* test (Table 5) reveals the fact that in every case the training needs exceed the level of proficiency recognized by the faculty.

Regarding the hypotheses presented in the survey, the inferential analysis allows us to conclude that the level of proficiency is higher for the hired teachers (they are younger teachers and with less teaching experience who teach face to face and deal with higher pressure regarding training to consolidate their careers in the Spanish University System). The teachers with more teaching experience in virtual environments, regardless of their administrative category, report a higher level of domain in the pedagogical competences. On the contrary, neither the administrative category, the scientific environment, nor teaching experience in virtual environments implies significant differences regarding training needs.

The information obtained through this survey is highly relevant at both a local and a global level. In the particular context of UDC, the results have been decisive in informing policies on the integration of ICT and e-learning (especially regarding teaching training). On the other hand, we also hope that our survey contributes to enriching the knowledge available on the roles of teachers performing online and on the training they may need to carry out their tasks. We could also add that, in a certain way, we accomplished one of our initial objectives regarding the use of the literature available to support the actions that we needed to undertake and, by making the voice of the faculty heard through the investigation we conducted, to build a body of knowledge that has been doubly validated (by experts and their publications and by teachers involved in online teaching).

The survey was not meant to merely develop theoretical knowledge, but rather one of its key features was to place a marked emphasis on practice. The survey context required responses which were supposed to facilitate the decision making process. This double inquiry turned out to be both valuable and productive.

With this survey, we also tried to question and avoid the lineal transfer of the tasks of traditional classroom teaching to online teaching, especially in its more deficient aspects, as Baran, Correia, and Thompson (2011) warn us. Hence the emphasis on identifying and systematizing the roles and competencies of the faculty performing in virtual environments and on promoting awareness and evaluation of the same among the teachers involved. The questionnaire was not a mere research tool, as it also

constituted a reference document for individual and collective critical reflections on virtual teaching. Indeed, it served not only to collect data, but also to help faculty to reflect on the competencies characterizing their task in online teaching and to revise their performance as well as their possibilities for professional training in their particular context.

The analysis of the different proposals available and their classification in Tables 1 and 2 turned out to be complex – and even puzzling – at the beginning of the survey. Identifying the disparity of purposes, starting points, and methodological designs supporting such proposals helped us understand the differences. On the other hand, by means of the focus group discussion, we could draft our own list of pedagogical teaching competencies, as a basis on which to define the online teacher profile at A Coruña University, since the debate on the roles and competencies of the online teacher must be placed within the framework of reflections on the teacher model (whether implicit or explicit). And any reference to the teacher model inexorably leads to consideration of the teaching training model.

We are aware of the current controversy regarding teaching competencies and competence based training, and, above all, we understand and support the warnings of those who perceive these approaches as a return to the past and as a revival of technological models based on efficiency and accountability. Nonetheless, according to the current view of the competencies movement and based on the definitions elaborated by several authors (Zabalza, 2003; Le Boterf, 2000) and organizations (UNESCO, 2008), we consider that its use could be beneficial as another reference point in the configuration of teaching performance and training (McDiarmid & Clevenger-Bright, 2008). We reject technological models of teacher training like those developed in the '70s through CBTE programs. The premise of considering faculty as adult students is indisputable, and, as a consequence, it is essential to recognize their autonomy as well as their learning and transformation capacity (Darling-Hammond & Sykes, 1999; Feiman-Nemser, 2008). As Borko and Putnam (1996) pointed out, new learning is built on previous knowledge and experience. Hence the importance of identifying and making the teaching staff aware of their basic knowledge. This will be of use to filter, interpret, and/or question future acquisitions. For this reason, training cannot be conceived as a static process directed by experts who establish rigid learning sequences. Its purpose is not, and must not be, solely to develop technical routines and skills, but to promote teacher empowerment, facilitating thus professional development (Minott, 2011).

The training initiatives carried out at the UDC were developed under diverse formats, both of a vertical and a horizontal nature. There has been an organization of courses and workshops with an expository and directive approach, but the development of collaborative training strategies was also encouraged: through the creation of working groups among the teachers to analyze the changes derived from the incorporation of technology and to draw up innovation projects by using ICT. In any case, the approach of the survey as well as that of the promoted training proposals implied the integration

of technology and pedagogy. Online teachers are first and foremost teachers (Bawane & Spector, 2009). According to the conceptualization proposed by Shulman (1987) regarding the three types of professional knowledge – subject matter knowledge, pedagogical knowledge, and pedagogical content knowledge – we consider that technology must be integrated accordingly in these three types of professional knowledge. This would improve the teaching process and facilitate teaching innovation. In short, technology should support pedagogy, no matter the approach chosen by the teacher: (a) technology functioning as replacement, (b) amplification, or (c) transformation (Hughes, 2005). Furthermore, technology should also serve to boost the learning process and the professional development of the teaching staff (Sangrà & González Sanmamed, 2004b).

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Athabasca University

First Year Chemistry Laboratory Courses for Distance Learners : Development and Transfer Credit Acceptance
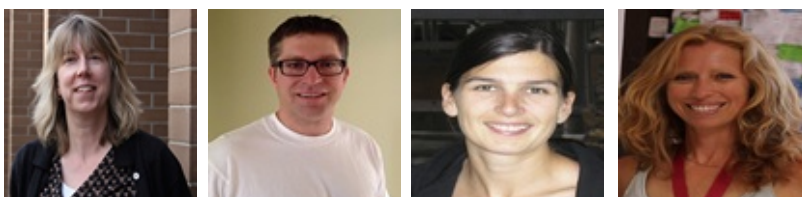
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Abstract

In delivering chemistry courses by distance, a key challenge is to offer the learner an authentic and meaningful laboratory experience that still provides the rigour required to continue on in science. To satisfy this need, two distance general chemistry laboratory courses appropriate for Bachelor of Science (B.Sc.) students, including chemistry majors, have been recently developed at Thompson Rivers University. A constructive alignment process was employed which clearly mapped learning outcomes and activities to appropriate assessment tools. These blended laboratory courses feature custom home experimental kits and combine elements of online and hands-on learning. The courses were designed for flexible continuous enrollment and provide online resources including tutor support, instructional videos, lab report submission, and student evaluation. The assessment of students includes laboratory reports, safety quizzes, reflective journaling, digital photo documentation, and invigilated written and online practical exams. Emphasizing the quality and rigour in these distance laboratory learning experiences allowed both courses to be accepted for B.Sc. transfer credit by other institutions, an important criterion for students. This paper will outline the design and development process of these new blended laboratory courses, their course structures and assessments, and initial student results.

Keywords: First year; general chemistry; laboratory; distance education; blended; hands-on; home experimental kits; online; learning outcomes; instructional design; transfer credit

Introduction

There is general agreement on the fundamental role of the laboratory component in any first year general chemistry course in a Bachelor of Science program. The exact form or nature of the laboratory experience, however, has been the subject of much debate in the literature (Bennett, Seery, & Sovegjarto-Wigbers, 2009; Buntine et al., 2007; Domin, 1999; Elliott, Stewart, & Lagowski, 2008; Pickering, 1993; Reid & Shah, 2007; Talanquer, 2012). Reid and Shah (2007) presented a general set of goals that chemistry laboratory experiences should include, such as making chemistry real to the student, allowing the student to learn practical and scientific skills, and developing general skills such as problem solving ability. When a general chemistry course is being delivered to a distance student, a key question is how to provide this student with the laboratory portion of the course to accomplish the desired learning objectives.

Many educational institutions have tackled this problem by requiring distance students to attend on-campus laboratory courses offered on weekends or in a multi-day block (Lyall & Patti, 2010). Expecting a distance student to attend a physical lab course during a narrow and intensive time-frame eliminates the main advantage of distance education, namely flexibility. Another solution is offering distance chemistry students the opportunity to complete the laboratory component of the course from home using home experiment kits. Several academic institutions have adopted this approach by successfully developing and offering these laboratory experiences for their distance general chemistry students in B.Sc. programs (Casanova, Civelli, Kimbrough, Heath, & Reeves, 2006; Jeshofnig & Jeshofnig, 2011; Kennepohl, 2007; Lyall & Patti, 2010). Removing students from the "traditional" laboratory setting typically found in our post-secondary institutions does raise questions around how authentic and rigorous the home laboratory learning experience is, especially to other institutions asked to accept these experiences as equivalent for transfer credit. Accordingly, several authors have reported a general resistance in chemistry to accepting non-traditional experiences or alternate delivery modes as being equal to the traditional forms of laboratories (Bradley, Durbach, Bell, Mungarulire, & Kimel, 1998; Casanova et al., 2006; Forinash & Wisman, 2001; Reeves & Kimbrough, 2004).

The Open Learning division of Thompson Rivers University (TRU) had offered distance general chemistry laboratories as separate courses requiring students to attend intensive, one week, on-campus sessions since the early 1980s. This requirement of travelling to the Kamloops campus of TRU to complete the traditional, face-to-face lab experiences presented financial and scheduling barriers for students, particularly those students typically enrolled in distance courses who often work full-time, have a variety of other time commitments, and do not live in the area (thus incurring additional travel and accommodation costs). Removing these barriers by offering true distance versions of the laboratory courses would provide greater flexibility and accessibility to our learners. This approach would involve developing lab courses that combine home experiment kits with online instruction and assessment. The ultimate goal was to

capitalize on the flexibility and accessibility of online distance education while still providing authentic and rigorous, hands-on laboratory learning experiences. This paper will outline the design and development process of these new blended laboratory courses, their course structures and assessments, and initial student results.

Background and Context of the Blended Distance Laboratory

The current literature does not present one common definition of distance education or of online education that is subscribed to by all (Benson, 2004; Moore, Dickson-Deane, & Galyen, 2011). Because of the lack of consistency in terminology used to describe courses with different delivery modes, it is crucial to provide a clear statement and description of the course context in order to understand its purpose and allow for research comparisons (Moore et al., 2011). In fact, our study combines elements of distance, online, and hands-on learning and, as such, requires a brief discussion and background on the various terms used to set proper framework and context of our course development.

Historically, distance education was defined as all levels of study by students not under direct and continuous instructor or tutor supervision (Holmberg, 1989), and currently refers to education where the student and instructor are physically separated by a geographical distance (Moore et al., 2011). Schlosser and Simonson (2010) define the term more specifically by stating that, along with the separation of instructor/tutor and student, true distance education must be offered by an educational institution, must have interactive communication between the student and instructor, and must share the results of learning experiences with the student. Advances in technology have allowed distance education to evolve from a traditional correspondence model to one that incorporates online learning into the course itself (Harasim, 2011; Karadeniz, 2009). Subsequently, many recent definitions of distance education found in the literature reflect the learning environment and the impact of technology (Moore et al., 2011).

Online learning is considered to be the younger form of distance learning that grew from remarkable advances in technology (Downing & Holtz, 2008). It has been described as using web-based delivery and software to provide a structured learning environment (Watson, Murin, Vashaw, Gemin, & Rapp, 2012) and where the Internet, or a computer network, serves as the primary environment for course interaction and discussion in an online course (Harasim, 2000). The key feature of these definitions is accessing the Internet for educational purposes.

The term e-learning is also found in the literature although there are many different opinions on what it means (Coryell & Chlup, 2007; Larreamendy-Joerns & Leinhardt, 2006; Moore et al., 2011; Oblinger & Hawkins, 2005). A recent study aimed at generating a definition of e-learning that would be acceptable to the majority of the scientific community published the following:

> E-learning is an approach to teaching and learning, representing all or part of the educational model applied, that is based on the use of electronic media and devices as tools for improving access to training, communication and interaction and that facilitates the adoption of new ways of understanding and developing learning. (Sangrà, Vlachopoulos, & Cabrera, 2012, p. 152)

While often used interchangeably in the literature, Downing and Holtz (2008) remind us that e-learning and distance education terms are not interchangeable even though distance education now typically involves e-learning. Likewise, since e-learning involves technology but does not have to include use of the Internet (Sangrà et al., 2012), online learning is considered a subset of e-learning in accordance with the description of educational context provided by Downing and Holtz (2008).

Blended learning is another term used to describe course environments and has been described in a multitude of ways, yet it currently lacks a generally adopted definition. Blended instruction has been defined as an appropriate mix of face-to-face instruction with learning technologies to support learning and foster achievement of learning outcomes (Lim & Morris, 2009), as a combination of different delivery methods and styles of learning (Wu, Tennyson, & Hsia, 2010), and as a combination of traditional face-to-face learning with online learning activities in authentic combinations that further facilitate student understanding (Macaulay, Van Damme, & Walker, 2009). Blended courses have also been recognized as a type of online course (Mayadas, Bourne, & Bacsich, 2009) when they contain online components. Since 2004, the Sloan-Consortium has organized conferences and workshops focused on blended learning and from these adopted a definition of blended learning that includes courses that have planned integration of online learning with face-to-face activities in a pedagogically sound manner, and courses that have some portion of face-to-face learning defined by an institution being replaced by online activity (Picciano & Dziuban, 2007). More recent articles focused on blended learning in chemistry describe blended as the combination of face-to-face teaching with online instruction and feedback (Brouwer & McDonnell, 2009; Williams, Bland, & Christie, 2008) or with online modules prepared for specific topics (Busstra, Hulshof, Houwen, Elburg, & Hollman, 2012). Osguthorpe and Graham (2003) point out that when creating a blended learning opportunity, it is important to capture the strengths of the learning environments being combined, and leave out the weaknesses. Often a blended learning experience is attractive pedagogically when it combines some of the advantages of face-to-face teaching with the flexibility of online instruction and access (Williams et al., 2008). The definition of blended learning we favour is learning facilitated by the effective combination of different delivery modes, teaching models, and styles of learning put forth by Heinze, Procter, and Scott (2007).

The fundamental question emerges of how to effectively blend the required course learning characteristics into an authentic laboratory educational experience by distance. In a traditional lecture format, a key interaction that occurs exists between the instructor and the student. In a laboratory setting, we argue the key advantage of the "face-to-face" experience is the opportunity to have direct, hands-on interaction with the chemicals, apparatus, and instrumentation of a real experiment. This direct "student-experiment" interaction is the whole objective of the laboratory learning experience. Laboratory experiences that feature real equipment needed to perform the experiment physically set up in the same physical location as the experimenter are characterized as hands-on labs (Ma & Nickerson, 2006). The main attribute of having students physically present with the real lab equipment in a real investigative process distinguishes hands-on labs from other types of laboratory experiences, such as simulated (virtual) labs or remote labs (Ma & Nickerson, 2006).

Bringing a hands-on experience directly to a distance learner's home can involve the use of kitchen chemistry experiments or home experimental kits. Kitchen chemistry is described in the literature as experiments done at home using commonly available household materials and equipment; however, these experiences are not considered adequate for a general chemistry course and those students considering a career in chemistry-related disciplines (Lyall & Patti, 2010). Some variations of kitchen chemistry labs where minimal equipment (such as thermometers or pH paper) is provided have been developed for distance, non-chemistry major students (Boschmann, 2003; Jackson, 1998). In contrast, a home experimental kit uses actual laboratory chemicals, apparatus, and experiments similar to those in a traditional university general chemistry lab setting (Lyall & Patti, 2010). Laboratories using home experimental kits with procedures delivered to the student via the Internet have been termed hands-on distance labs (Downing & Holtz, 2008). In a discussion of practical work in online science, Downing and Holtz (2008) describe the use of home laboratory kits for introductory science courses, such as general chemistry, as an appropriate and viable instructional strategy. Many institutions have incorporated this approach in their chemistry course offerings including Athabasca University (Kennepohl, 2007; Lyall & Patti, 2010), Monash University (Lyall & Patti, 2010), and Cape Fear Community College (Casanova et al., 2006; Reeves & Kimbrough, 2004).

Our goal for this project was to use the successful strategies reported in the literature to develop two new blended, distance laboratory courses using hands-on, home experimental kits and online instruction and assessments. These blended chemistry laboratory courses would involve mixed modes of delivery including online course management and assessment, simulated (virtual) experiments, direct, hands-on experimentation, and remote laboratory opportunities. It was imperative that these courses satisfy TRU's first year B.Sc. program requirements for general chemistry laboratories and meet specific standards for transfer of credit to other institutions.   In addition, the courses would need to meet the challenges of acceptance that arise when traditional courses are offered via alternate modes of delivery. This recognition helped

define our collaborative process and emphasized the need for clearly defining our learning outcomes and aligning them to a rigorous assessment scheme.

Method of Course Development

In 2005, provincial legislation creating Thompson Rivers University from the University College of the Cariboo and the British Columbia Open University stated the new institution must serve the open learning needs of the province (Thompson Rivers University Act, 2005). Up to this point, students could enroll in either the traditional, on-campus chemistry lecture/laboratory courses or the print-based chemistry lecture courses offered by distance. The only opportunity for distance students to engage in chemistry laboratory courses was by physically travelling to campus and participating in intensive, one week, on-campus laboratory courses. These limited yearly offerings, together with the associated time and travel costs, did not match well with our new open and accessible educational mandate. In addition, condensing an entire laboratory course in a short time period has been shown to cause confusion on the part of the student (Lyall & Patti, 2010).

To address these concerns, we began a process of creating two new first year general chemistry laboratory courses designed to meet the needs of distance learners and satisfy provincial articulation requirements for credit and transferability. These courses would run as self-paced, hands-on, home laboratory experiments offering continuous, year round enrolment, with online resources, tutor support, submission, and evaluation. The courses would allow for a flexible learning experience in both time and place, two features recognized as advantageous to distance students (Al-Shamali & Connors, 2012; Mawn, Carrico, Charuk, Stote, & Lawrence, 2011), with students performing experiments according to their preferred schedule and location.

Instructional Design Process

In developing our distance chemistry laboratory courses, we employed a backward design process (Wiggins & McTighe, 2005) or results-focused approach that first established the learning outcomes desired for the course, then mapped these outcomes to clearly-defined assessment tools, and finally developed appropriate laboratory experiments to achieve these outcomes. MacLean and Scott (2011) identify that this process of creating constructive alignment (as per Biggs, 2003) by mapping outcomes to activities and assessments increases the likelihood that the resulting learning materials and learning experiences will achieve the desired outcomes for a particular learning event. This process has been recognized as key to encouraging deeper learning (Bennett et al., 2009). Our list of laboratory learning outcomes for each distance course was generated by examining our traditional, on-campus, general chemistry lab courses and constructing an overall set of learning outcomes (some examples are shown in Table 1). From this list, a variety of evaluation and assessment tools were identified to measure student learning. The learning outcomes and assessment tools provided a solid

framework from which to develop new laboratory experiments or select suitable existing experiments and adapt them to address our educational goals and needs.

Table 1

Example Learning Outcomes and Assessments for Selected Experiments in the New Laboratory Courses

Learning outcome ("The student should be able to satisfactorily…")	Type of learning outcome	Assessment	Experiment
Create a series of dilute solutions from a stock solution	Psychomotor/ cognitive	Submit a photo that demonstrates the successful creation of a dilution series	Beer's Law and Colorimetry
Operate a simple colorimeter with a multimeter display	Psychomotor	Submit a photo of the multimeter display showing the resistance of the 3 ppm standard	Analysis of Phosphate in Water (and lab exam)
Perform a titration using a pH indicator within the precision limits of the apparatus	Psychomotor	Submit a photo of the titration clearly showing the phenolphthalein end point	Titration for Acetic Acid in Vinegar (and lab exam)
Tabulate titration data and use the data to calculate the concentration of an unknown solution	Cognitive	Use data to calculate the concentration of calcium carbonate in a water sample	Determination of Water Hardness (and lab exam)
Interpret experimental results and form conclusions	Metacognitive/ affective	Reflective journal entry summarizing the learning experience, relating the experiment to its objectives, and highlighting challenges and successes	All experiments (and lab exam)

At this point in the process, a decision was required on whether to develop our own home experimental kits containing all the chemicals, glassware, and materials necessary to perform the course lab experiments (as others have done, see Lyall & Patti, 2010) or to work with a commercial kit manufacturer. We began by evaluating the strengths and

weaknesses of many commercially available kits and experiments, with an eye on finding those that best fit our open learning philosophy, learning outcomes, and pedagogy. Although we entered into this evaluation stage with a healthy dose of skepticism about the quality and rigour of these commercial products, we were ultimately suitably impressed by the learning opportunities these kits could provide. After this review of available kits and suppliers, a decision was made to work with Hands-On Labs, Inc., producers of LabPaq® kits for a variety of disciplines and learners (Jeschofnig & Jeschofnig, 2011).

The entire catalogue of Labpaq® experiments was investigated and those most suitable for general chemistry laboratories in a first year science program were selected for further evaluation. This iterative process involved testing each experiment from a student's perspective, making recommendations for improvements, and then reassessing whether the experiments could meet our desired list of learning outcomes. The end result was a list of experiments suitable for the two new one-semester laboratory courses (see Table 2).

Table 2

List of Experiments Included in the New Laboratory Courses

Course	Experiments
CHEM 1505: Chemistry Laboratory I	1 - Observation of Chemical Changes and Separation of a Mixture of Solids 2 - Laboratory Techniques and Measurements 3 - Liquids and Solids 4 - Determination of Water Hardness 5 - Beer's Law and Colorimetry 6 - Analysis of Phosphate in Water 7 - Stereochemistry and the Hydrolysis of Acetylsalicylic Acid
CHEM 1525: Chemistry Laboratory II	1 - Qualitative Anion Tests and Identification of Cations 2 - Properties of Gases 3 - Caloric Content of Food 4 - Le Châtelier's Principle 5 - Reaction Order and Rate Laws 6 - Titration for Acetic Acid in Vinegar 7 - Determination of Ka for a Weak Acid 8 - Using Buffers 9 - Oxidation-Reduction/Activity Series 10 - Electrochemical Cells and Cell Potentials

Each experiment was then subjected to rigorous and repeated testing and modification by chemistry faculty and students. Specific learning outcomes, including those focused on both the cognitive and psychomotor learning domains, were assigned and tied directly to assessments. New laboratory manuals were created for each course to provide sound pedagogical structure for student learning and to suit our desired learning goals and teaching philosophy. Hands-On Labs Inc. was very amenable to this process and worked together with us to incorporate the modifications into the experiments and manuals. Final student testing and revisions were conducted on prototype Labpaq® home experimental kits incorporating the new laboratory manuals.

Once the new course laboratory kits and manuals were finalized, online multimedia resources, including videos and photographs, were developed to aid the distance learner (see Table 3). These resources demonstrated and emphasized proper safety procedures, laboratory techniques, and equipment assembly and were accessed through the online course management systems developed for each laboratory course. We considered the development and inclusion of these multimedia resources to be mandatory for our lab courses since both photographs and instructional videos are important for student distance learning.

Table 3

List of Instructional Videos Developed for the New Laboratory Courses

Course	Videos
CHEM 1505: Chemistry Laboratory I	Introductions Dispensing Chemicals Dropping Chemicals Heating Chemicals Proper Use of Pipet Test Tube Assembly Titrator Assembly Colorimeter Set-Up Model Kit Volumetric Flask Balance Filter Folding and Ice Water Bath
CHEM 1525: Chemistry Laboratory II	Dispensing Chemicals Dropping Chemicals Heating Chemicals Proper Use of Pipet Titrator Assembly Volumetric Flask Balance Filter Folding and Ice Water Bath Using Indicators Gas Collection Flame Test Electrochemical Cell

Student Assessment

From the learning outcomes identified for the new distance laboratory courses, a formative assessment scheme was developed for each lab experiment as well as an overall summative evaluation to ensure rigour and transfer credits at other postsecondary institutions. Students were provided with a comprehensive assessment package linked to the course management system detailing the expectations, valuations, timelines, and instructions for student assessment. Each laboratory course included a safety quiz, online laboratory journals, written laboratory reports, and invigilated written and practical final lab exams (see Table 4).
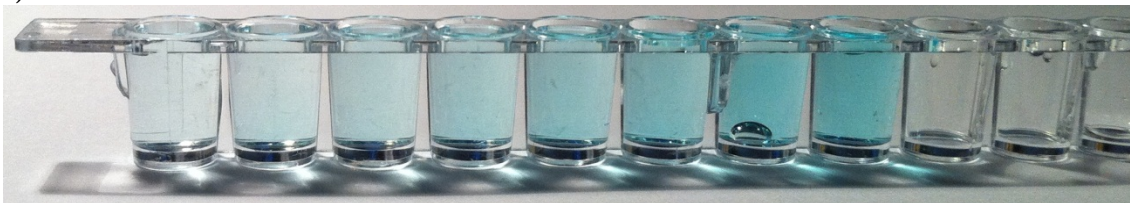
Table 4

Assessment Tools and Valuations for the New Laboratory Courses

Assessment tool	Percentage of final mark
Safety quiz	5%
Online laboratory journal	25%
Laboratory reports	40%
Final lab exams	30%
Total	100%

At the beginning of each course, students are expected to sign a safety checklist and also complete and pass an online safety quiz that emphasizes the awareness of potential hazards and proper chemistry laboratory conduct. The quiz is written prior to performing any experiments and may be attempted more than once; however, the student's grade for this assessment reflects the average of all the attempts. The online laboratory journal includes features which allow students to demonstrate their abilities in completing the experiments using proper techniques and skills, and also document their metacognitive learning process. The journal postings include uploading photos and associated descriptions of their equipment set-up, experimental observations, or laboratory results. Figure 1 shows actual student photographs of experimental results used later by the course instructor to qualitatively assess lab performance and compare to quantitative data. (For example, Figure 1a clearly shows the expected increase in colour associated with increasing concentration; whereas, the deep pink colour in Figure 1b suggests the student overshot the phenophthalein endpoint of the titration.) Students are also evaluated on their response to a reflective question about what was learned over the course of each experiment (see Table 5). As a whole, the online laboratory journal entries are designed to encourage students to reflect on their learning and understanding of the experiments, to document their learning process, and to

highlight any challenges or successes. Each experiment also requires online submission of a laboratory report including any associated data or observations, results, graphs, calculations, summaries, or answers to questions that may be required.

a)

b)

Figure 1. Student photographs showing a) a series of dilutions and b) the results of a titration.

Table 5

Rubric for Evaluating Reflective Learning Journal Questions

Excellent (4-5 marks)	Satisfactory (2.5-4 marks)	Minimal (0-2.5 marks)
Evidence of experimental observations leading to concepts learned in experiment	Some evidence of experimental observations leading to concepts learned in experiment	Minimal evidence of experimental observations leading to concepts learned in experiment
Clearly summarized what was learned in the experiment	Summarized what was learned in the experiment, but may have missed some key points	Learning not summarized
Overall conclusions well-formulated	Conclusions formulated, but may have missed some points	Conclusions not formulated
Clear links/relation between observations in the experiment and experimental theory	Some links/relation between observations in the experiment and experimental theory	Minimal links/relation between observations in the experiment and experimental theory
Demonstrated self-reflective learning by clearly outlining an experimental challenge and/or an experimental success	Demonstrated self-reflective learning by mentioning an experimental challenge and/or an experimental success	No self-reflective learning demonstrated

The final summative evaluation component consists of invigilated (proctored) written and practical laboratory exams. These may either be supervised in-person at a predetermined examination location or by live-streaming video over the Internet. The written component examines knowledge and application of the techniques and calculations encountered throughout each laboratory course. The practical final exam involves performing a complete experiment to demonstrate proficient laboratory techniques and skills. Students are asked to open an examination package containing a previous experiment they performed in the lab and repeat the experiment on a new, unknown sample. The tutor evaluation may be done via a live video streaming session or an invigilated video recording submission. This intensive and comprehensive assessment of a student's laboratory techniques and skills fulfills a key requirement of each distance laboratory course and ensures quality and rigour for transfer credit

purposes. An aggregate percentage of at least 50% must be achieved on the sum of the lab reports and the two, equally weighted final exams in order to receive a passing grade for each course.

Outcomes

The laboratory courses were fully developed and open for student enrolment in 2009. Thompson Rivers University anticipates enrolment numbers, orders the home experimental kits from Hands-On Labs Inc., stores these kits at the TRU distribution warehouse, and then ships them to students upon registration. All student support, including dealing with missing or broken kit items, is provided by TRU and students have no interaction with the kit vendor. Our microscale experiments involve very small amounts of chemicals and there have been no problems shipping these laboratory kits outside our province of BC. As part of the distance lab course enrolment process, students are assigned a tutor as their key contact for questions and course assessment, including grading lab reports and invigilated final exams.

Enrolments into the newly developed, home distance laboratory courses began in 2009 with the first student completions and grades assigned early in 2010. In the two years prior to implementing these new courses, a total of 28 students completed the week-long, intensive, on-campus laboratory offerings. The first two years of the home experimental kits and online blended versions of these laboratories saw a jump in student enrolments and, overall, a total of 44 final grades were assigned to students originating from TRU and other academic institutions. The number of course registrants and completions continues to grow, perhaps in part due to meeting student scheduling and location needs by increasing flexibility and access.

In comparing the final mark distributions between the two laboratory course delivery methods, there are two noticeable features that appear (see Figure 2). First, we have traditionally seen fairly high achievements in our distance laboratories, irrespective of mode of delivery. This may be attributed to the fact that, originally, students were participating in a week-long, intensive laboratory experience which probably comprised their only scheduled course or activity. Thus, these students were free to devote considerable time and attention to the academics of the course and were very committed, having travelled extensively, in some cases, to participate. Similarly, a vast majority of our students enrolled in the new, blended, distance laboratory courses are most likely participating in part-time academic studies (compared to their traditional, face-to-face colleagues) (TRU Institutional Planning and Analysis, 2012) and can devote more of themselves to the course. In addition, the flexibility afforded the students to complete the course requirements and submit reports and assignments may play a role. The second notable feature from Figure 2 is the increased percentage of students not completing or failing the courses. This is consistent with what others have seen in distance education (Carr, 2000; Howell, Laws, & Lindsay, 2004) and likely reflects the increased student discipline and independence required to remain on track and focused

on their course progression and learning, especially in comparison to the traditional, face-to-face, and cohort delivery models. Overall, the student mark distributions to date are consistent with our expectations and will continue to be tracked.
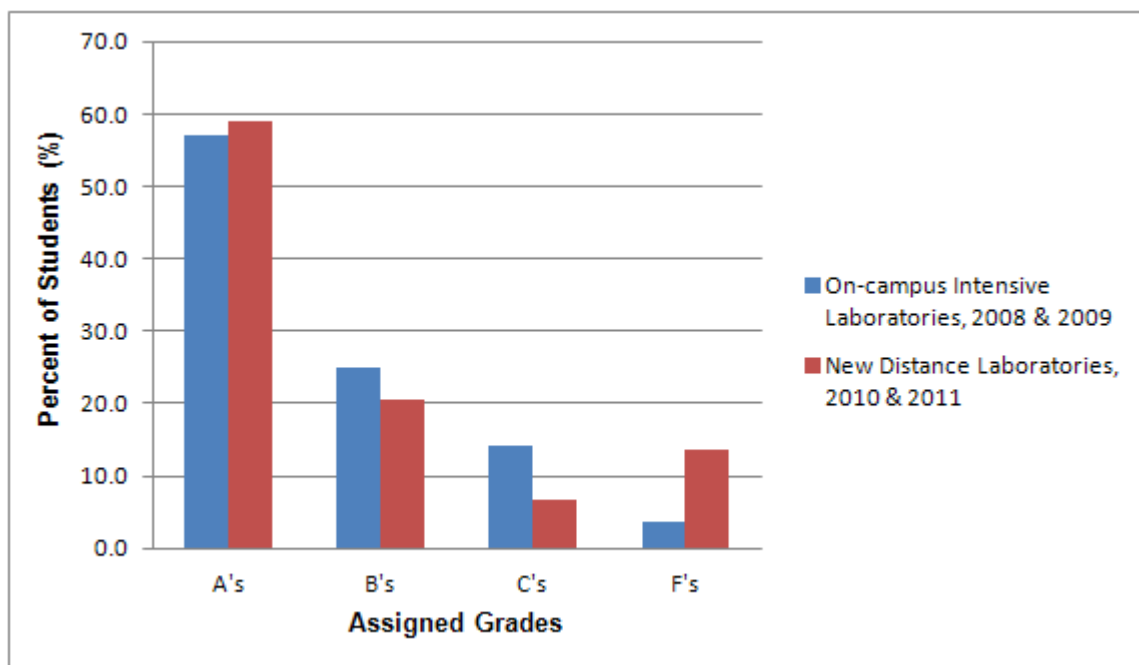

Figure 2. Percentage of students achieving each grade range via the two modes of delivery; on-campus, intensive laboratories in 2008 and 2009, and new, blended, distance laboratories in 2010 and 2011. Assigned grades include all sub-divisions within; for example, A's include A-, A, and A+ letter grades. F grades include those that did not complete or failed the course, but do not include withdrawals.

One key goal of this project was to ensure the newly developed distance laboratory courses would be accepted for credit by other academic institutions in our province of British Columbia (BC). In BC, course transfer credit is facilitated by a provincial articulation system directed by the provincial government (British Columbia Council on Admissions and Transfer [BCCAT], 2012a). Chemistry representatives from all the other provincial post-secondary institutions were presented our approach to first year, general chemistry distance laboratories, and once the new, blended, distance lab course offerings were launched in 2009, course outlines were sent to all receiving institutions in BC with a request for course transfer credit. Review by chemistry educators at each receiving institution resulted in both new courses being accepted for transfer credit at all other educational institutions throughout the province (BCCAT, 2012b). These distance laboratory courses, together with the appropriate first year general chemistry lecture courses, satisfy course prerequisites for admission into second year chemistry

courses. This transfer credit acceptance is significant to our students and a validation of the equivalency, quality, and rigour of the new, blended, distance laboratories.

Finally, we feel those students that successfully completed the new distance lab courses were well prepared when they continued on to second year chemistry courses at our own institution. Future plans include the careful quantitative and qualitative tracking of the distance laboratory students to document their skills and knowledge performance in subsequent chemistry laboratory courses and contribute evidence-based analysis to this continuing conversation.

Conclusions

It is possible to provide distance learners with authentic and meaningful laboratory experiences that satisfy Bachelor of Science program requirements, are accepted for transfer credit by other academic institutions, and offer valid alternate delivery modes. At Thompson Rivers University, two blended, distance general chemistry laboratory courses were developed using a constructive alignment process linking learning outcomes to pertinent assessment strategies. Developing home experimental kits for extensive, hands-on work and online educational resources including videos, course management, and assessment allows our distance chemistry students the open access and flexibility of at-home learning. When compared to our previous intensive on-campus laboratory courses, these new distance laboratory courses have somewhat lower completion rates, have comparable final grades and laboratory competencies, and have been extremely popular with increased student enrolments. By incorporating laboratory reports, safety quizzes, reflective journaling, digital photo documentation, and invigilated written and online practical exams into the student assessment scheme, these laboratory courses provide thorough evaluation of the learner, necessary for first year general chemistry transfer credit and acceptance by other post-secondary educational institutions. Overall, this was a very successful endeavour and we plan to continue with a detailed qualitative and quantitative assessment of these courses and the student learning experience.

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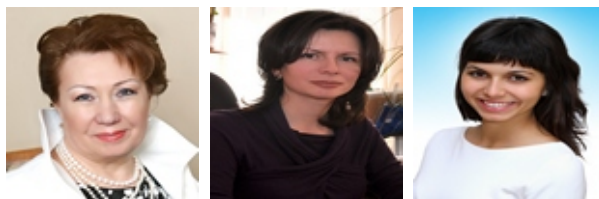
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Abstract

The article is devoted to the unique experience of distance learning development in the conditions of Russian reality. The model of distance learning in the Institute of Economics, Management and Law (Kazan city, Russia) is created on the basis of educational sphere diagnosis taking into account foreign and Russian experience. The specificity of the model is the permanent diagnosis of the components of the educational environment such as teachers' qualifications, level of students' actual knowledge, filling the educational process with information technologies, availability and quality of electronic resources, the correct choice of learning technologies, and policy in the field of the computerization of the professional education process.

Keywords: Distance learning; Russia

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Introduction

During the last decade, a robust system of distance education has been created in Russia, especially in higher educational institutions, where serious attention is being paid to the reform of the existing system of education. The experience of the Institute of Economics, Management and Law (IEML, Kazan city) is a good exemplar of distance education reform. The Institute passed several stages in the development of distance learning in order to implement the most appropriate model of e-learning.

Development of Distance Learning Education in the Institute of Economics, Management and Law

The Institute of Economics, Management and Law began the delivery of educational programs using distance education in 2003. In the first two years, IEML built the technical, pedagogical, methodological, administrative, financial, and organizational foundations for the successful implementation of distance education programs in the following specialties: Finance and Credit, Law, Organizational Management, and Pedagogy and Psychology. As a result, IEML was the first institution in the Republic of Tatarstan to create a multi-service corporate network. This high-speed network was comprised of a telecommunication system with voice-over-IP, which supported direct tele-bridging for both audio- and video-conferencing in real-time with any location on earth. To take advantage of this system, course-relevant e-textbooks were created (Akhmetova, 2009, p. 93).

The first students were admitted to the technology-enhanced distance education programs in 2004. The special organizational structures needed for distance education were created, based on a decision of the institution's Academic board along with orders and instructions from the rector. First, the Center for Distance Learning was established, followed by the Institute of Distance Learning and regional centers for distance learning in five satellite campuses. In 2012, more than 3,000 distance education students were studying in the Institute and its five satellite campuses.

From the beginning distance learning was considered by us as a pedagogical system. We investigated the experience of distance learning organizations in many countries, for example Great Britain, Australia, the Czech Republic, and so on. We studied the status, trends, and basic models of online distance education in the U.S.A, the experience of some universities in the U.S.A, and the historical stages of distance learning development (Jensen, 2005). Special attention was paid to the study of using videoconferencing systems in some countries. We studied the use of the VTC (via video teleconferencing) technologies in Athens, the RESIT non-profit corporation in Greece, whose mission was to establish a centre of excellence for research and education in the areas of software engineering, telecommunications/networking, embedded systems, and electronics (Tomkos, 2005). With great interest, we acquainted ourselves with the experiences of the International Institute of Management LINK, Moscow State

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Industrial University, Peoples Friendship University of Russia, Moscow State University of Economics, Statistics and Informatics, and so on.

We received specific support from the Russian State Institute of Open Education under the jurisdiction of the Ministry of Education and Science of the Russian Federation. We also signed a formal agreement with the Distance Learning Laboratory of the Institute of Learning Content and Methods under the jurisdiction of the Russian Academy of Education. This agreement included carrying out the seminars devoted to the role of information technologies in the development of professional education. Also it included the training of teachers of educational institutions in the region. Taking a scientific approach to the organization of distance learning, as well as to the psychological, pedagogical, and technical aspects, is important for supporting quality. Overall, the technologically enhanced distance learning system is influencing educational processes throughout the Institution. The system is promoting the integration of interactive learning technologies in the teachers' lessons, even among those instructors who are not actively involved in distance learning.

Russian laws, which regulate the organization of distance learning, pre-determine the need for a blended learning model of part-time education using distance learning technologies. For example, physical classroom lessons are required during both the introductory class and the examination sessions. Distance support of the educational process is possible with automated controls to help students absorb the training materials.

The institutional distance education implementation was based on several key principles, integrity, unity, interoperability in a systemic approach, which would support maximum efficiency along with excellent quality of learning. The educational and methodical basis as well as the legal basis for the creation of this model were the following documents; some were developed by the Ministry of Education and Science of the Russian Federation and others were locally produced by IEML:

- Act of the Institute of Distance Learning (IDL) and Act of the Centers for Distance Learning in satellite campuses;

- Duties of leaders, teachers, members of the Institute of Distance Learning and centers of Distance Learning in satellite campuses;

- Training plans and curriculum for the specialties: Finance and Credit, Law, Management of Organization, Pedagogy and Psychology;

- Orders on the establishment of classroom norms (time characteristics) and individual counseling of students using distance learning technologies, specific to student learning;

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- Orders on an individual training schedule for students who can not attend classes in the prescribed manner;

- Order on the organization of training programs for teachers who work in the IEML;

- Other local acts.

We have created a special introductory course, Information and Communication Technologies for Learning, which is aimed at providing students with a smooth entry into the world of information and communication technologies (ICTs); teaching students how to use the educational portal of the Institute; working with electronic textbooks; and showing students how to interact online with teachers, staff, and other students. Practice showed that this has been the right approach: During full-time lessons the potential of students is aligned because of this individualized work, which is carried out with the novices, raising their level of knowledge and skills using ICTs. It is expected that in a distance learning system, the students are significantly more active and responsible than in traditional forms of education (full-time or correspondence study).

The results of surveys on student activity and interviews revealed that the students lack self-organization skills, lack experience in self-study (setting up a study space, preparing for the work, following through on the planned exercises, dealing with difficulties as they arise, etc). This was expressed in procrastination as students put off studying until "the best time" or "when I have free time". Tutors at IEML have developed detailed instructions, which explain how to succeed using the training material (modules) and a concise timetable for task completion in order to support students in the organization of their self-study.

From the very beginning of the distance education implementation, there was a need for specialized training of pedagogical staff in the normative legal requirements stated in documents, which regulate distance learning in the Russian Federation. Six teachers passed this specialized training at the Russian Institute of Open Education and received the certificate "Internet-based Learning" granted by the Russian Public Institute of Intellectual Property under the jurisdiction of the Ministry of Science and Education of the Russian Federation. A program of advanced courses for teachers entitled "Using ICTs in Distance Learning" (with a duration of 72 hours) was developed and published as an electronic textbook for tutors and used in training courses in a blended learning environment (24 hours – full-time lessons, 48 hours – distance lessons). This program included the presentation and evaluation of the participants' creative work and the issuance of an official state certificate. More than 600 IEML instructors passed this training. Individual consultations on the use of multimedia equipment, on the creation of training courses, and on test items, and so on were organized for teachers. Along with the targeted training of teachers and specialists in courses and seminars for higher

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qualifications, other forms of training were used, such as internships in the most successful higher educational institutes, mentoring (supervising of novices by more proficient tutors), and so on. In aggregate form, these measures created an internal institutional system for improving the professional competence of teachers and specialists in distance learning.

The material and technical foundation for distance learning was strengthened not only at the main Institute, but also in the satellite campuses. In addition to the corporate institutional multi-service network of more than 2,000 computers, special computer training classrooms have been set up, equipped with multimedia projectors and screens, both at the Institute of Distance Learning and in the faculties and satellite campuses. If necessary, students can work directly at the Institute if they do not otherwise have access to a computer. These students do their assignments on the computers with internet access in classrooms designated for that purpose.

In order to support the distance learning system a multimedia technologies laboratory was created. It was equipped with the most modern equipment designed to support the learning process, for the wide implementation of ICTs in education. The laboratory is used to conduct research and analyses of existing software and multimedia technologies to determine the most efficient technologies for their possible use in distance learning processes. The laboratory also supports the development of multimedia textbooks in the natural and engineering sciences and humanities as well as the development of modern technologies for the distribution of educational materials based on interdisciplinary themes and heterogeneous sources using a single methodological platform. Other uses for the laboratory include the design, development, and use of digital presentations; the copying of multimedia products using electronic media, as well as on magnetic media for use in both training and promotion campaigns. New learning technologies using portfolios and case studies are also being studied along with multimedia technology and other approaches to learning design using ITCs. The development of materials supporting different teaching methods using the network of distributed resources (educational Web sites, online tutorials, etc.) will also support learning processes.

Special attention was paid to the development of electronic training and practical guides in the Institute of Distance Learning. We created a technology "passport" for electronic guide creation on orders from the director of the Institute of Distance Learning for the replication of these e-guides on disks and placing them in an e-learning portal. A group of experts takes responsibility for the quality of these e-guides along with the author. The department head takes responsibility for ensuring that the guide content conforms to state educational standards. An e-learning design specialist checks to ensure the inclusion of mandatory components. These include the subject matter, the modular structuring of the educational material, assignments for checking on the achievement level of the students (tests, formative and summative evaluations), a glossary, and the time limits set for the completion of the learning tasks. A multimedia specialist creates supplementary video lectures, working with audio and video applications to

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complement the textbook. Every year teachers review the content of the etextbooks in order to improve them, make corrections and changes taking into account new standards and regulations. Students receive etextbooks recorded on a CD-ROM, and at the same time they can access them through the electronic library. Presently, more than 450 electronic manuals are available in this elibrary.

Special attention was paid to the development of video courses. The most qualified teachers recorded introductory or final lectures on video disks which were replicated so that students could learn independently. The main program and technical aide for the implementation of distance learning at IEML was an automated system – a virtual representation of IEML, which was located on a federal government portal RGIOO (http://vueml.openet.ru). This educational portal facilitates the registration of students, teachers, trainees, and elibrary users. They can also access certain (closed) portal resources to carry out their educational activities. Information, training materials, and tests are located on this portal. Maintenance of the software and hardware systems was carried out by the system administrator of the portal.

The IEML uses videoconferencing technologies in real time. They are used in order to promote learning about the latest technologies, as well as for individual work with students who do not have the possibility of personal involvement in class. As an experiment, video conferencing has also been used for carrying out tests and examinations. Videoconferencing is also used to connect the Institute of Distance Learning with its satellite campuses.

In response to the personal request of students, individual training schedules are set for certain categories, for example, for those who are unable to attend due to health or are on maternity leave, students with disabilities or who are on business trips, military personnel, and others who are not able to attend classes due to specific work-related problems. Individual schedules mean special supports for students in the learning process (self-help, test and examination planning, student-teacher meetings, and time management). Students with disabilities and military personnel receive exceptional treatment and are supervised in groups by individual specialists. The Department of Theoretical and Inclusive Pedagogy at IEML looks after these special groups.

The training of military personnel is being carried out as an experiment in Russia. The Institute provided a military unit with a computer classroom loaded with appropriate software. Teachers regularly visited these military units for training sessions. The commander of the unit provided the students, who were all conscripts, with time to focus on their assignments. In addition the IEML has implemented training programs for persons detained in prisons (Akhmetova, 2009, p.100).

IEML distance learning students presently live in Kazan, the capital, and other cities and regions of Tatarstan as well as in all regions of Russia with more than twenty students in the former Commonwealth of Independent States and other countries.

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Distance learning is mainly chosen by people who already have a degree or vocational diploma. They are very strongly motivated to study. Among the main reasons for studying are the need to build a career, a change of profession, and personal development. However, there is a group of students who have just secondary education. Systematic motivational support from teachers, organizers of distance learning, is very important for this category; also it is necessary to help students to organize their self study.

The legal and regulatory framework for distance learning in Russia was imperfect for a long time. Due to the Act of the Ministry of Education № 137 of May 6, 2005, "On using distant educational technologies," the educational institutions may use distance educational technologies for all under the law forms of education or a combination of these forms, for different kinds of educational, laboratory, and practical training practices.[i]

It caused contradictory understanding of distance learning and using blended learning technologies (full-time, part-time education) instead of online education. However, we are thankful for the recent changes in the education legislation in Russia. Due to the Federal Law dated February 28, 2012, "On inclusion of changes to Federal Law "On education" in the part of electronic education, distance educational technologies," the distance and elearning forms of education are now officially equal in status to traditional full-time and part-time forms of education.[ii]

IEML is heavily involved in promoting education in the region of Tatarstan; in the coordination of universities in the field of distance learning; in explaining and promoting the concept of distance education among authorities and, specifically, the scientific and educational communities as well as the public through the media and personal meetings (in governmental offices, educational institutions, and other organizations). Regular seminars and scientific conferences, both national and international, are held in the Institute and online.

Using the Integrated System Moodle and OpenMeetings in the Institute of Economics, Management and Law

In order to develop the distance learning system effectively, not only to maintain it, we need to keep up with the times to improve the distance learning technologies used in the Institute. The Institute investigated a variety of LMS (learning management systems) including MOODLE, Prometheus, Blackboard, and so on. But the choice was to introduce MOODLE, which is widely used in many foreign countries. Despite the enormous capabilities of MOODLE (the presence of a wide variety of content, applications, and forms of communication available in the e-learning system with a detailed description of options), we had to develop an Institution-specific model of distance education. We began to use a videoconferencing system which supports close to real-life interactions between and among people who are at a considerable distance

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from each other because of their inability to be physically present at the lesson at a particular time and place.

The Institute of Distance Learning uses an "organic" mixture of two systems: a videoconferencing server, OpenMeetings, and MOODLE as LMS. The practical importance of these systems is to organize an e-media environment, which supports both synchronous and asynchronous interactions . This media environment, developed by the creative team of the Institute, is a unified virtual space for training sessions that increases the level of interaction between teacher and students. Thus, the system OpenMeetings complements the MOODLE LMS by supporting "live communication" (Zaynullin, 2011, p.48).

Moreover, the Institute has developed an elective author's course Information Technologies in Distance Learning, which is built in MOODLE in order to train teachers how to facilitate students during educational processes. This course allows users to adapt rapidly to the online environment. It helps students to acquire the skills of searching out and finding training information, in MOODLE and the educational portal, and includes open educational resources, Web sites, and other electronic resources which are open access or otherwise available online. The main goal of the author's course is to teach students and educators how to use e-learning tools.

International Projects of the Institute of Economics, Management and Law in the Field of Distance Learning

The ICTs which are used in our Institute and the pedagogical support of distance learning allow us to implement international projects in the field of distance learning. One of them is the online teaching of the Russian language and culture for those who live in foreign countries. This project was rolled out in the Republic of Madagascar, where 50 teachers have passed the courses (Ahmetova, Morozova, Khoroshavina, & Zaynullin, 2012, p. 6). Now our university is preparing projects for the Republic of Nepal, Congo, Slovenia, South Korea, and Brazil. In order to realize these projects we are investigating each country's socio-economic, national, and linguistic features, and other specifications. Then we will develop a customized model of distance learning for each country, taking into account all the factors mentioned above.

Another prospective area of international activity for the Institute is conducting research with foreign partners in the field of pedagogy and the psychology of inclusive pedagogy. We have studied the experiences of inclusive education implementation in Scandinavian countries in the framework of the Russian seminar on Inclusive Education in the Context of the Integration Process, conducted in the Nordic countries.

In order to cooperate, to use creatively and selectively the experience of the Scandinavian countries and the development of inclusive education in Russia, we have created a Department of Theoretical and Inclusive Pedagogy. Today the Department carries out collaborative research with various centers of inclusive education, with

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institutions. Among them are the Folk High School of Karis (Finland), Department of Teacher Education of University of Helsinki, Department of Special Education of the University of Stockholm, and the Agency for Lifelong Learning VOX (Norway), and others.

Our university joined the European Foundation for Quality in E-learning (EFQUEL) in 2012. So, now we are beginning to implement projects and carry out research in collaboration with members of EFQUEL in the following areas: open educational resources (OER), the impact of social media (social networks) on the quality of student learning, providing pedagogical support for the e-learning process, and e-learning quality. This research will be conducted in the European Framework with projects such as Erasmus Mundus, Leonardo da Vinci, and others.

Ideas and prospective areas of research in line with development trends in the educational process in Europe and in the world inspire the employees of our Institute and encourage us to develop strongly and to cooperate with international partners. We believe that a future UNESCO Chair which is now being promoted in our Institute will support this process. Real changes in the legitimization of e-learning and in the development of a firm regulatory basis give confidence that the IEML and other Russian institutions will adequately fit into the global system of education, not as "stepchildren" but as worthy partners and equal players.

Conclusion

Thus, the experience of creation and development of distance learning in a private higher educational institution, the Institute of Economics, Management and Law, and some recommendations for its quality assurance will guide the implementation of new innovative projects in other educational institutions. Today, it is especially important when many universities can share their ideas and experiences in the field of distance learning that they are open to international cooperation in this field. In addition, the experience can be useful to specialists and managers of the education authorities, because it contains both theoretical and practical materials that can be a guide to create a unique system of distance learning in educational institutions at all levels.

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ⁱ Приказ Министерства образования и науки РФ от 6 мая 2005 г. N 137 "Об использовании дистанционных образовательных технологий"[**Act of the Ministry of Education № 137 of May 6, 2005 "On using distant educational technologies"].**

http://www.edu.ru/db-minobr/mo/Data/d_05/m137.html

ⁱⁱ **[Federal Law dated February 28, 2012 "On inclusion of changes to Federal Law "On education" in the part of electronic education, distance educational technologies"]**

http://base.consultant.ru/cons/cgi/online.cgi?req=doc;base=LAW;n=126574

Athabasca University

Book Review

Student Participation in Online Discussions: Challenges, Solutions, and Future Research

In *Student Participation in Online Discussions: Challenges, Solutions, and Future Research*, Hew and Cheung offer a comprehensive review of factors influencing the quantity and quality of content in asynchronous threaded discussions.

The book's 10 chapters are well-organized into three sections to lead the reader through a discussion of the role of course-based, online discussions to the potential for future research on the topic. Chapter One offers context for the role of asynchronous discussions, and Chapter Two explores previous empirical research that presents the current state of online discussions. Chapters Three and Four explore strategies and strategy dilemmas, which are those instances in which the research has been particularly inconclusive. Chapters Five through Seven focus on case studies that highlight suggestions for motivating participants, sustaining discussions, and fostering higher levels of knowledge construction. Chapter Eight relates conditions in which students prefer peer versus instructor facilitation, while Chapter Nine examines the use of audio in asynchronous discussions. Chapter Ten suggests future areas of research.

The layout of the book is also useful in guiding the reader through the information presented. The use of frequent headers situates the information within the greater section, chapter, and book as a whole, while also chunking the material into sensible portions for comprehension, reflection, and application. Tables effectively summarize material presented, such as the highly useful Appendix A which summarizes the empirical studies reviewed within the book, including an alphabetical list by author last name(s), year of study publication, method used in study, purpose of study, sample, and data sources analyzed.

Despite its stated purpose "to identify the various reasons or factors leading to limited student contribution in asynchronous online discussion, and to discuss the possible solutions or strategies that may address these limitations" (p. ix), there is an obvious

omission of research and discussion related to the initial design of the discussions. Instead, the book focuses on facilitation strategies, particularly peer facilitation strategies. While this focus is certainly an appropriate and valid approach, the title of the book could have captured this focus with greater clarity.

Another opportunity to expand the discussion is related to artifacts and their situation within an appropriate theoretical framework. While Hew and Cheung mention artifacts as "useful in helping students externalize their current state of knowledge, and also stimulate feedback and critique" (p. 43), the authors omit recognition that discussion posts represent such artifacts or that the importance of artifacts is related to the theory of social constructionism, a further development of social constructivism.

There were also a few methodological issues that could affect interpretation of the conclusions drawn by Hew and Cheung. For example, a "sustained" discussion is defined in one study as a discussion thread with six levels, and in another study as a discussion thread with only three levels. Another example is the broad definition of higher levels of knowledge construction as four of the five phases of the interactional analysis model (IAM). While the IAM is a validated tool for assessing knowledge construction in asynchronous discussion, the use of all but the first phase is imprecise and would certainly influence the interpretation of results.

Finally, the most important factor to consider in interpreting Hew and Cheung's conclusions is that the majority of the case studies presented were in a blended versus wholly online environment. This point is important because of the possible influence of social presence developed in the face-to-face sessions of the course. The instructors were usually free to design and revise the course requirements, thereby limiting application by instructors who use a standardized curriculum developed by a design team. While there was representation across undergraduate and graduate degree programs, the length of the discussions varied widely across the studies and the data sources relied heavily on subjective student perceptions. There were usually no posting requirements or deadlines; rather, "students were free to post in whichever forums they wished" (p. 68).

Despite these criticisms, Hew and Cheung offer a useful catalog of factors influencing such student participation in asynchronous threaded discussions. The topic is timely and increasing in complexity with the growth of open education. Steven Ross, in his Foreword to the book, accurately captures the contribution of *Student Participation in Online Discussions*: "valuable guidance in a thorough and highly readable manner to inform instructional design, course applications, and research" (p. viii).

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