Critical Thinking Dispositions in Online Nursing Education

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Abstract

In this study, the critical thinking dispositions of post-RN (post-diploma) nurses continuing their education at a mid-sized university were measured before and after the intervention of a three-credit online course. The tool used to measure the changes in critical thinking disposition was the California Critical Thinking Dispositions Inventory (CCTDI). There were no statistically significant increases in the participants' overall measures of critical thinking dispositions as a function of online study. A time interaction effect suggested that students generally show gains in a critical thinking disposition called truthseeking as a function of university experience.

Résumé

Dans cette étude, les dispositions à la pensée critique d'infirmières post-RN (déjà diplômées) poursuivant leur éducation dans une université de taille moyenne ont été mesurées avant et après l'intervention d'un cours en ligne de trois crédits. L'outil utilisé pour mesurer les changements dans la disposition à la pensée critique était le « California Critical Thinking Dispositions Inventory » (CCTDI). Il n'y a pas eu d'augmentations statistiquement significatives des dispositions à la pensée critique en fonction du cours en ligne. L'interaction avec l'effet « temps » suggère que les étudiants montrent généralement des gains dans leur disposition à la pensée critique, appelée recherche de vérité, en fonction de leur expérience universitaire.

Context and Theoretical Framework

Since the mid- to late 1990s, nursing in Ontario has experienced significant growth in its use of computers and Internet-based technologies. Over the same general time period, Ontario chose to support a baccalaureate entry-to-practice requirement for nurses to become effective January 2005 (Council Highlights, May 2000). Distance-based programs including online learning were identified as an appropriate response to this need (Council Highlights, May 2000). Given the renewed interest in critical thinking in the latter part of the century and the role of thinking in nursing process, the combination of critical thinking and online nursing education was chosen as a primary focus in this study.

There are important distinctions between critical thinking skills and critical thinking dispositions. The former pertains to thinking applications; the latter to character tendencies to think and act critically. Critical thinking dispositions were selected for consideration based on today's learning culture. Because learners require certain dispositions in order to be able to respond to ever-changing information and to adapt to new learning formats, it is valuable to know if online learning settings have an impact on critical thinking dispositions.

The critical thinking dispositions or habits of mind explored are based on character attributes as suggested by Facione, Giancarlo, Facione, and Gainen (1995). They include truthseeking, openmindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and maturity in judgment.

The learning theory underpinning the study is constructivism blended with select components from transmissive and experiential learning. A short overview of constructivism, observations regarding its limitations in relation to nursing education and instructional design, and the final configuration of the constructivist learning theory used in this study are presented in the next few paragraphs.

As Ally (2004) points out, many teachers and educational researchers regard the online classroom to be the ideal arena for exploring the assumptions of constructivism. It is a place where knowledge can be constructed through interaction with other students and the instructor (Murphy & Cifuentes, 2001); it is similarly an environment where collaborative and cooperative learning can be facilitated (Hooper & Hannafin, 1991; Johnson & Johnson, 1996; Palloff & Pratt, 1999).

While constructivism and online learning are, in many ways, a natural combination, some learning experts suggest that constructivism is not an appropriate learning theory in the context of nursing education. Critics suggest that nurse-learners require immersion in transmissive and experiential learning to acquire the scientific knowledge base that is central to safe nursing practice. Controversy can also emerge when the relationship between online distance education and constructivism is considered from an instructional design point of view, with some arguing that the idea of designing for constructivist learning is contradictory. Airasian and Walsh (1997) point out, the "constructivist model is descriptive, not prescriptive."

Constructivist learning and learning strategies based in transmissive and experiential learning theories are not necessarily conflictual. For instance, an online lecture such as instructor-prepared notes is a transmissive learning experience that can assist in knowledge construction; online case studies based on authentic clinical experiences may also build knowledge. Additionally, the curriculum covered by a

course is an important determinant of its supporting learning theory. In the course targeted by this study, the topics included care of healthy individuals and families, teaching and learning with families, and reflective practice. The course did not focus on data-intense areas such as pharmacology or the development of specific hands-on skills; in other words, it did not include content that aligns foremost with transmissive or experiential learning.

Further support for constructivism in nursing education is found in nursing theory. Watson (1999) has suggested that there are areas in nursing where multiple truths may exist. In these domains, it seems reasonable that constructivism would be the most appropriate learning framework since constructivism challenges learners to build and discover truth(s) as supported by evidence. While, in days past, nursing education was called training, today in Canada, nursing education is positioned within universities. Thus, externally defined standards co-exist with a culture that encourages learners across all disciplines to build knowledge. Last is that, in today's knowledge economy, working professionals such as nurses need to be able to discover and generate new knowledge constantly. This new professionalism and its relationship to lifelong learning foreshadow sustained practice of constructivism in all professional fields (Duffy & Orrill, 2001; van Weert, 2006).

A second area of controversy in the discussions around constructivism involves instructional design, a field of growing importance in web-based education since its earliest days (Bates, 1995, 2000). Significantly, online learning requires convergence of many variables which the advanced planning and supports of instructional design typically address. This noted, there are some educational experts who suggest that there is a contradiction between designed online learning settings and constructivist learning. As a person with a background in instructional design for online distance education settings, the writer suggests that constructivist-based learning does require design, albeit design towards knowledge construction in contrast with knowledge transmission.

In summary, the majority of activities completed by the nurses in this study derived from the constructivist model. For instance, the nurse-learners were required to post their course-related assignments and to interact with ideas, each other, and the instructor via a threaded bulletin/discussion board. The course also included practices commonly regarded to be transmissive and experiential in nature: teacher-prepared notes and a family assessment learning activity fall into these categories. This mix of strategies was made possible through the use of best practices in instructional design. Last is that this study incorporated the components of reflection, writing, and andragogy. Figure 1 provides a

pictorial representation of all these elements and their relationships which, taken together, represent the study's theoretical framework.

Literature Review

Educational Needs of Ontario's Nurses

More than ever before, registered nurses in Ontario are seeking baccalaureate-level education through online distance education. This same trend is evident among nurses striving to achieve their continuing professional development (CPD) goals. The reasons for this growth are Ontario's 2005 baccalaureate entry-to-practice requirement and the circumstance that nursing is a constantly changing field.

With respect to the 2005 baccalaureate requirement, the number of Ontario nurses currently seeking university-level education is substantial.
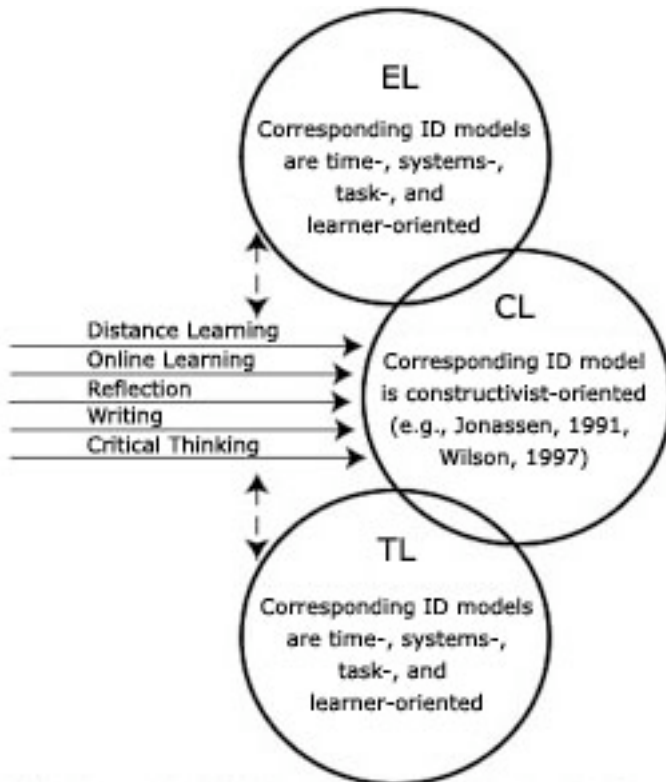

Figure 1. An inclusive constructivist theoretical framework coalescing from competing models and constructed variables. Note: EL = experiential learning; CL = constructivist learning; TL = transmissive learning; ID = instructional design. Solid arrows represent "influence/impact on." Broken arrows represent "borrowing components from."

For example, in Spring 2000 when the baccalaureate requirement was first announced, only 20% of all nurses in Ontario had graduated with a baccalaureate degree while 80% of nurses held nursing diplomas (Council Highlights, May 2000). Competing for positions of leadership and responsibility with their younger colleagues, many nurses who graduated before 2005 are now pursuing their degrees.

The increase in continuing education activity among nurses stems from the fact that health care is a constantly changing field. There are also incentives related to salary increases and promotion opportunities. The results of this situation are unprecedented numbers of nurses taking additional courses, programs, certificates, and other forms of instruction (Canadian Nurses Association, 2006).

While most registered nurses are aware of the educational opportunities available to them, accessing them can be a complex undertaking. For this reason, online distance education with its flexibility around time and place has grown in popularity among nurses. Historically, nurses have been seen as reluctant users of computers and other technologies (Gibson & Rose, 1986). This situation changed, however, in the late 1990s-early 2000s when computer-based applications emerged in most areas of nursing practice.

Ontario's Registered Nurses as Learners

Nurses represent a unique learner group within Ontario's working population since nursing continues to be a female-dominated profession. Nurses frequently hold other fulltime roles as wives, mothers, and active community members (Billings & Rowles, 2001; Bonk & King, 1998; Cragg, Andrusyszyn, & Fraser, 2005).

The literature uses the term disincentives to describe the barriers and challenges that nurses face in participating in education (Leonard, 2003). Such disincentives include financial concerns, difficulties with academic credit transfers, non-availability of courses in areas of personal and professional interest, inadequate access to support services, and geographic inaccessibility (Leonard, 2003). Equally complex for nurses are factors that influence implementation of new knowledge within clinical practice. For example, nurses may not make new knowledge a priority in clinical practice if they think that the barriers to implementing this knowledge are greater than its benefits (Barriball, While & Norman, 1992).

None of this will be surprising to those who work in adult education (Knowles 1975, 1980; Merriam & Carafella, 1999). According to Knowles, adult education should be seen as a process experience rather than a content event and adult learners are considered proactive learners who take responsibility and choose direction. The adult education experience, however, is also understood to be uniquely challenging given the

complexity of adult learners' lives (Cranton, 1994) and the need to recast important teaching and learning assumptions including responsibility, relevance, relatedness, and rewards so that the outcome is learner-centred practice (Burge, 1988). As Burge points out, when adult education is happening through distance, such modifications need to be made in the context of the "alleged and actual constraints" of distance education (p. 21).

Critical Thinking: Conceptual Distinctions and Measurement Issues

During the last century, critical thinking became an area of special educational interest, tracing directly to the work of philosopher John Dewey who wrote on the centrality of critical thinking in the educational experience (Dewey, 1933). Just as the interest in critical thinking grew rapidly during this period, so too did the number of understandings of critical thinking. Some popular understandings of critical thinking of contemporary time are identified in Table 1. Although all of these understandings are important, the views offered by the American Philosophical Association (APA) informed this study.

The ideas about critical thinking as proposed by the APA are the outcome of a 1987 Delphi project involving a group of 36 cross-disciplinary American and Canadian scholars. Based on the project, the ideal critical thinker is described as follows: a person who is inquisitive; informed; trustful of reason; open-minded; flexible, fair-minded in evaluation; honest in facing personal biases; prudent in making judgments; willing to reconsider; clear about issues; orderly in complex matters; diligent in seeking relevant information; reasonable in the selection of criteria; focused in inquiry; and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit (Facione, Facione & Giancarlo, 2000).

Because critical thinking skill often occurs in specific contextual situations, an important measurement means is the context-based test (Norris & Ennis, 1989; Pascarella & Terenzini, 1991; Pendarvis, 1996). Confounding variables with this kind of test are that the test taker's score is likely to be affected by prior knowledge of the discipline and that validation can be problematic: for instance, in the case of nursing, a context-specific measure of a nurse's critical thinking skills could only be validated by direct observation of the nurse in practice. By comparison, measurements of the attitudinal components of critical thinking dispositions are easier to ascertain.

The literature on critical thinking dispositions wears several guises. Sometimes called "mindfulness" or "critical spirit, these dispositions are innate traits which the literature says can be nurtured and measured. The

Table 1. Understandings of Critical Thinking in the Late 20th Century

Understanding	Source
deciding what to believe or do based on reasonable, reflective thinking	Ennis, Millman & Tomiko, 1985
critical thinking … being appropriately moved by reasons and … to generate and seek out good reasons	Siegel, 1988
to think critically is to examine assumptions, beliefs, propositions and the meanings and uses of words, statements, and arguments	Bandman & Bandman, 1988
reflective thinking	Brookfield, 1987; Mezirow, 1981, 1990; Watson & Glasner, 1980
a productive and positive intellectual activity … a process … varies according to context	Brookfield, 1987
a process of purposeful, self regulatory judgment, which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological contextual considerations upon which that judgment is based	American Philosophical Association (APA), 1990

Note: From "Teaching and measuring critical thinking," by S. Staib, 2003, *Journal of Nursing Education, 42*(11), p. 502.

previously noted 1987 Delphi project by the APA led to the development of the California Critical Thinking Disposition Inventory (CCTDI), a test that provides an overall score for critical thinking disposition as well as for seven discrete dispositional areas. The seven discrete critical thinking dispositions measured by the CCTDI are as follows: truthseeking, openmindedness, analyticity, systematicity, critical thinking confidence, inquisitiveness, and maturity (Table 2).

There are two main reasons for measuring a person's dispositions towards critical thinking: first, a relationship between critical thinking disposition and critical thinking skill has been demonstrated (McCarthy, Schuster, Zehr & McDougal, 1999). Second, if a person knows that he or she is disposed to a particular critical thinking element, the person may be motivated to cultivate this element (Bartlett & Cox, 2000; Facione et al., 1998).

Table 2. Seven Subscales of the California Critical Thinking Dispositions Inventory

Disposition	Description
Truthseeking	Measures intellectual honesty, the courageous desire for best knowledge in any situation, the inclination to ask challenging questions and to follow the reasons and evidence wherever they lead.
Openmindedness	Measures tolerance for new ideas and divergent views.
Analyticity	Measures alertness to potential difficulties and being alert to the need to intervene by the use of reason and evidence to solve problems.
Systematicity	Measures the inclination to be organized, including focus, diligence and perseverance.
Critical thinking confidence	Measures trust in one's own reasoning and ability to guide others to make rational decisions.
Inquisitiveness	Measures intellectual curiosity and intention to learn things even if their immediate application is not apparent.
Maturity	Measures judiciousness which inclines one to see the complexity in problems and to desire prudent decision-making, even in uncertain conditions.

Note: From *California Critical Thinking Disposition Inventory*, by P.A. Facione, N.C. Facione, and C. Giancarlo, 2001, Millbrae, CA: California Academic Press, pp. 2-3.

A specific reason for using the CCTDI with nurses is that it focuses on dispositions that are valued in the leadership positions that baccalaureate-trained nurses often hold. Additionally, some nurses returning to study at the baccalaureate level may choose to continue to the graduate level. The critical thinking dispositions articulated by Facione et al. (1998) will be advantageous to these nurses and others who work in administrative and leadership roles in the health field.

While individual educators and researchers may have preferences for other tools that measure critical thinking dispositions in the health education field (Stone et al., 2001), there is much precedent for using the CCTDI in health education contexts. In Canada, Profetto-McGrath (1998) used the CCTDI with a group of baccalaureate nurses as part of her doctoral study through the University of Alberta. The CCTDI is also used

by the health sciences faculties at the University of Western Ontario and McMaster University. Other work in the health sciences wherein there is use of the CCTDI is described in Table 3.

Table 3. Studies and Articles about the Use of the CCTDI in the Health Sciences

Author/Researcher/Title	Observation
Facione, N.C., & Facione P.A. (1997). *Critical thinking assessment in nursing education programs: An aggregate data analysis*. Millbrae, CA: California Academic Press.	Examined CT dispositions among 145 predominantly undergraduate samples at 50 programs of nursing education programs throughout the United States ($n = 7, 926$).
	Significant relationships revealed between two measures of critical thinking (the CCTST and the CCTDI) and a wide variety of academic achievement indicators.
	Modest cross-sectional increases and longitudinal gains demonstrated in critical thinking skills and habits of mind. Strength in scores tended to occur in programs where nursing faculty reported being engaged in discussions about critical thinking. Disposition scores were higher for BScN stream students than for generic (college level) students.
	This discrepancy raised concerns about curriculum for students studying in generic programs. This study is the largest aggregation of CT skills and dispositions test data to date.
Colucciello, M.L. (1999). Relationships between critical thinking dispositions and learning styles. *Journal of Professional Nursing, 15*, 294-301.	Examined relationship between CT dispositions and learning styles of baccalaureate nursing students. Used the CTTDI and Kolb's Learning Style Inventory. Relationships were demonstrated between specific CT dispositions and learning modes.
Leaver-Dunn, D., Harrelson, G.L., & Malissa, M., & Wyatt, T. (2002). Critical thinking predisposition among undergraduate athletic training students. *Journal of Athletic Training, 37*(4), 47-151.	Used the CCTDI to assess 91 students in undergraduate athletic training education programs for tendency to think critically. Participants showed a general but weak trend towards CT. The study suggests that classroom and clinical instructors need to assess and possibly change teaching methods to better facilitate CT by students.

Author/Researcher/Title	Observation
Rapps, J., Riegel, B., & Glasser, D. (2001). Testing a predictive model of what makes a critical thinker. *Western Journal of Nursing Research, 23*(6), 610-626.	Examined if knowledge base, CT skills, CT dispositions, and experience predict the cognitive development of nurses. The three levels of cognitive development studied were dualism, relativism, and commitment. CT dispositions contributed to all three levels of cognitive development.
Ip, W.Y., Lee D.T., Lee, I.F, Chau, J.P. Wootton, Y.S., & Chang, A.M. (2000). *Disposition towards critical thinking: A study of Chinese undergraduate nursing students. Journal of Advanced Nursing, 32*, 84-90.	Examined dispositions among 122 Chinese baccalaureate nursing students. Showed a negative disposition among the majority of the sub-scales. Also revealed a significant relationship between CT dispositions and grade point average. Implications for nursing education, curriculum, and research delineated.
Colucciello, M.L. (1999). Relationships between critical thinking dispositions and learning styles. *Journal of Professional Nursing, 15*, 294-301.	Examined relationship between CT dispositions and learning styles of baccalaureate nursing students. Used the CTTDI and Kolb's Learning Style Inventory. Relationships were demonstrated between specific CT dispositions and learning modes.
Profetto-McGrath, J., Hesketch, K.L., Lang, S., & Estabrooks, C.A. (2003). A study of critical thinking and research utilization among nurses. *Western Journal of Nursing Research, 25*(3), 322-227.	Investigated relationship between CT disposition scores and research utilization habits. Results found positive correlation between CT disposition score and overall research utilization.

Methods

Participants

The study included 84 participants: 34 post-RN nurse-participants, 28 undergraduate nursing students, and 22 undergraduate sociology students. The 34 post-RN participants who comprised the experimental group were registered nurses enrolled in a baccalaureate-level online course as part of a post-RN degree program in its fifth offering at Laurentian University in Sudbury, ON. Laurentian University is a mid-sized university with several health education programs including nursing, midwifery, social work, and medicine. Laurentian also has a

centralized unit for continuing and distance education called the Centre for Continuing Education.

All programs offered by Laurentian University's School of Nursing including the post-RN program are committed to "the scientific component of the practice of Nursing [that] involves abstract and logical thinking skills and the generation and utilization of research findings, knowledge and experience" (Laurentian University School of Nursing Student Manual, 2006). According to the Director of the School of Nursing at the time of this study, the School's nine articulated goals are "conceptual and broad-based in nature" and are "inclusive of critical thinking and reflection. We include these concepts within the delivery of all programs" (S. Mossey, personal communication, April 5, 2006).

In the course taken by the post-RN nurses, there was, as noted earlier, a mix of learning activities building on different learning theories. For instance, the clinical or experiential work in the course required each student to visit a family four times for the purposes of assessment and teaching as well as to experience and reflect on the concept of a helping relationship. Transmissive learning was facilitated through instructor-prepared notes found in the WebCT learning space. Important to this study were the formal or "for grades" writing assignments and the written interaction that occurred on the threaded bulletin board/discussion forum. Students were asked to prepare two bulletin board postings: the first dealing with reflective practice and the second with critical thinking. Postings were evaluated on the basis of their content and references to evidence-based nursing practice literature. A further expectation was that the students would, to the best of their ability, comment on each other's postings. In the first posting, students were asked to explore a personal clinical experience in which caring had been demonstrated. For the second posting, students were provided a case and asked to respond to a number of questions. In their responses, students were asked to display their thinking.

The main comparison group included Laurentian University undergraduate nursing students taking a term-length, university-level face-to-face course. This group, in contrast with the group of post-RN learners, did not experience the intervention of online delivery. Instead, the class met with their instructors once a week for three hours. Because development of critical appraisal and research skills were key goals in this course, learning was largely constuctivist in nature with students building knowledge through reading, writing, and interactive discussions. The main assignment involved development of a critical literature review on a nursing-related topic, grouping similarly-focussed articles together and identifying gaps and limitations.

The age differences between the post-RN and undergraduate nursing students were not regarded to be problematic: in general, the critical thinking dispositions literature does not suggest that there are significant differences related to dispositional scores and age (Claytor, 1997; Clizzizza, 1970; Facione et al., 1995; Feely, 1975; Rudd, Baker et al., 2000). Sensitivity to research design issues was demonstrated in the decision to use a pre and postdesign whereby each participant acted as his or her own control. A second comparison group was also included.

The second comparison group was composed of students taking a term-length, university-level online course in sociology. The sociology course, like the course taken by the post-RN nurses, was designed by the Centre for Continuing Education. In this course, students completed two online quizzes, five short bulletin board postings, one longer written assignment, and a final exam. In their postings, students completed instructor-designed learning activities as outlined in the WebCT notes. Interaction among students was not a central course expectation. The longer assignment asked the students to prepare a reflective autobiographical examination of adolescence.

It is interesting to note that the participation rates for the comparison groups were higher than for the experimental group. In the case of the undergraduate nursing students, 60% (28 out of 47) of students agreed to participate while 50% (22 out of 44) of the sociology students participated. These higher participation rates in relation to a lower participation rate by the post-RN nurses (26%, 34 out of 130) may point to the situational uniqueness of the post-RN learners as employed professionals with complex lives.

Study Design

Considered in its entirety, this study was conceptualized as a mixed methods, quasi-experimental (before and after) design with quantitative and qualitative components (Creswell, 2003). Data were generated in five ways: two questionnaires completed in pre and postcourse contexts, writing samples completed near the end of the term, bulletin board contributions, observations made by the researcher of the bulletin boards, and semi-focused interviews. While all of the data collecting strategies yielded valuable insights into the participants as learners and thinkers, the questionnaires as they garnered demographic data and included the CCTDI are the focus of this paper.

The researcher purchased the right to use the CCTDI and designed a number of additional questions to elicit relevant demographic data about the participants. All researcher-designed questions were reviewed by peers for validity and clarity.

The CCTDI is a validated 75-item attitudinal measure that uses a six-point forced-choice Likert scale ranging from 1 (strongly agree) to 6 (strongly disagree) to generate a profile of a person's overall disposition towards critical thinking. Seven specific sub-scales are also assessed: they are truthseeking, openmindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and maturity of judgment.

Because of the forced-choice nature of the scale and the item format, scores for the seven sub-scale scores range from 10 up to 60. The recommended cut-off as a positive score is 40; any score below 40 is considered weak since scoring below 40 requires scoring some items negatively. The suggested targeted score is 50.

Overall scores are based on the sum of the seven separate scores and range from 70 up to 420; a score of 280 is regarded to be the cut-off indicator of overall deficiency in disposition. An overall score of 350 or greater is a general indication of "across the board" strength in disposition towards critical thinking. In interpreting scores, it should not be assumed that a person who scores well on a sub-scale can be predicted to score well across all seven sub-scales. Rather, it is suggested that persons often show significant strength in some areas and significant weakness in others. Because of this, evaluation of the sub-scales may be more meaningful than analysis of a total score which may obscure important differences across the sub-scales (Facione et al., 1998). Plotting a person's CT dispositions across the sub-scales and providing information to interpret them is a way of identifying stronger and weaker areas.

Cronbach's alpha internal reliability indices of the seven scales range from .71 to .80 and have been consistently replicated: truthseeking .71, openmindedness .73, analyticity .72, systematicity .74, critical thinking confidence .78, inquisitiveness .80, and maturity of judgment .75 (Facione et al., 1998). The alpha reliability for the overall instrument, measuring overall disposition towards CT, is reported to be .91.

Data Collection Procedures

Excluding the participants in the face-to-face nursing course, all participants completed the questionnaires on line. A web link with an explanatory note was provided to the participants via their bulletin boards. This link took the participants to the survey which took approximately 15-20 minutes to complete. The decision to use a web-based tool was logical since these participants were enrolled in web-based courses. The first survey was available to students during the first two weeks of the term while the second survey was available beginning the second last week of the term.

All students in the two online courses received a letter of information about the project and a consent form through regular mail. Signed

consent forms were returned in postage-paid envelopes to the researcher. As required, ethics approval for the project had been procured through the Research Ethics Boards (REB) at Laurentian University and the University of Windsor.

In the case of the participants in the face-to-face course, the researcher made a classroom visit in the first week of classes to invite participation, collect signed consent forms, and administer a hard copy version of the same presurvey. A second visit was made in the second last week of classes to distribute the second survey. The instructors were not present on either occasion in order to minimize the situation that students might feel pressured to participate.

Data Analysis

Descriptive statistics were prepared based on the information offered by the participants. Data pertaining to gender, age, educational status and goals, employment status, and geographical communities were collected.

The primary statistical analysis for the data based on participants' completion of the CCTDI was a 3 x 7 x 2 three-way ANOVA with repeated measures on the last two variables. The independent variables were Group (experimental, comparison #1, comparison #2); Scale (truthseeking, openmindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and maturity in judgment); and Time (pretest, posttest).

Results

Gender and Age

The experimental group was exclusively female. With the exception of a single male in comparison group #1, the two comparison groups were also female. When age was configured in terms of two categories, it was apparent that the experimental group was made up of a larger portion of older students, $\chi^2(2) = 21.73$, p < .001.

Educational Status and Goals

Asked about their highest level of education beginning the course, 4.5% of respondents in the experimental group indicated Grade 12 while 9.1% reported that Grade 13 was their highest level. The participants who reported no postsecondary education were the more experienced participants who had "trained" to become nurses within the hospital training programs that dominated nursing education before nursing became a discipline of study offered by community colleges and universities. All participants in the two comparison groups reported university education to be their highest level of education.

Table 4 presents the participants' educational goals. Participants were free to choose as many items as applied from six choices. The goal of career advancement was the only goal different at a statistically significant level.

Employment Status

Asked about employment status, 67.6 % of participants in the experimental group indicated that they were working full-time while 29.4% reported working part-time. The kinds of nursing reported by the post-RN nurses were public health, clinical education, community health, and management.

In comparison group #1, 48.1% reported working part-time; 44.4% not working at all; and 7.5% full-time. These nurse-learners in contrast with the nurses in the post-RN program were undergraduate students with fewer financial, family, and community obligations. In comparison group #2, 35.0% indicated that they were working full-time; 53.0% part-time; 12.0% not at all. The kinds of work reported varied from the retail and service industries to counselling, teaching, management, and social service.

Geographical Communities

The geographical communities of the nurses from the experimental group and comparison group #2 are found in Table 5. All participants in comparison group #1 were living in the Sudbury region at the time. As Table 5 also reveals, 14.7% of participants in the experimental group and 54.4 % of participants in comparison group #2 were from Sudbury, suggesting that online courses are being taken not solely by those who live at geographic distance from a university.

Table 4. Educational Goals with Chi-Squared Analyses p-values Reported

Goal	Experimental ($n = 34$)	Comparison #1 ($n = 28$)	Comparison #2 ($n = 22$)	p
University degree	90.6%	96.%	100.0%	.28
University credits	9.4%	21.4%	28.6%	.19
Continuing education	59.4%	32.1%	33.3%	.06
Career advancement	62.5%	28.6%	2.5%	.03
Personal growth	71.9%	60.7%	57.1%	.49
Other	3.1%	7.4%	0.0%	.40

Table 5. Geographical Communities

Region	Experimental (n = 34)	Comparison #2 (n = 22)
Greater Region of Sudbury	14.7%	54.4%
Northeastern Ontario		
(excluding Sudbury)	32.4%	22.7%
Northwestern Ontario	0.0%	0.0%
Central Ontario	0.0%	4.5%
Greater Toronto Area	14.7%	0.0%
Southwestern Ontario	23.5%	4.5%
Eastern Ontario	2.9%	9.1%
Other	2.9%	4.5%

Profile of Non-participants

All non-participating nurses were female. When the nurses' home communities were organized by area (Greater Region of Sudbury, Northeastern Ontario, Northwestern Ontario, and so forth), the breakdown of regions matched those noted in Table 5. No additional data were available regarding the non-respondents.

CCTDI Scores

Participants' completion of the CCTDI in the pre and postcourse settings generated two sets of scores for each participant. Each set of scores included an aggregate score and seven discrete scores for the seven critical thinking dispositions. The scores are summarized in Table 6.

A three-way (3 x 7 x 2) ANOVA was run on the data using Group (experimental group, comparison group #1, comparison group #2), Scale (truthseeking, openmindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, maturity), and Time (pretest, posttest) as the independent variables, with Scale and Time treated as repeated measures. There was a main effect for group, $F(2, 81) = 2.28$, $p = .05$, and the posthoc tests indicated that this was due to a difference between the two comparison groups (comparison group #1 M = 294.84, SD = 21.87; comparison group #2 M = 312.59, SD = 40.05, $p < .05$). Group did not interact with scale or time ($p > .1$). The main effect for scale, $F(6, 76) = 60.12$, $p < .001$, is qualified by a scale by time interaction effect, $F(6, 76) = 2.91$, $p < .025$. The interaction effect is due to greater scores on truthseeking at posttest, $t(83) = 1.98$, $p = .05$, as may be seen in Figure 2. It seems that students generally demonstrate gains in truthseeking as a function of their university experience.

Table 6. CCTDI Scores

Variables	Group	M		SD	
		Pre	Post	Pre	Post
Truthseeking	Experimental	36.85	38.53	5.93	6.95
	Comp. #1	36.25	36.71	5.60	5.56
	Comp. #2	38.55	39.55	8.43	7.91
Openmindedness	Experimental	42.35	43.09	4.56	4.63
	Comp. #1	42.14	43.11	6.25	6.45
	Comp. #2	45.23	45.82	6.65	7.64
Analyticity	Experimental	45.41	44.56	4.59	5.02
	Comp. #1	42.25	41.68	5.28	5.33
	Comp. #2	43.41	42.77	8.00	7.58
Systematicity	Experimental	42.15	42.97	7.63	8.07
	Comp. #1	39.21	41.36	5.83	5.59
	Comp. #2	43.45	43.18	7.86	7.08
Critical thinking self-confidence	Experimental	45.29	44.15	7.01	6.14
	Comp. #1	42.82	42.46	6.90	6.66
	Comp. #2	46.95	46.91	8.04	8.77
Inquisitiveness	Experimental	49.53	49.21	4.89	6.82
	Comp. #1	47.82	47.79	5.12	5.75
	Comp. #2	51.82	49.32	5.17	7.96
Maturity	Experimental	43.56	44.59	6.39	7.50
	Comp. #1	43.21	42.86	4.95	5.15
	Comp. #2	44.73	43.50	7.83	9.23

Regarding age, the age imbalance with more older students (36+ years of age) in the experimental group (21 vs. 7) and more younger students (< 36 years of age) in the comparison group (42 vs. 12), χ^2 (1) = 21.36, p < .001, analyses indicated that there were no differences on the pretest and posttest total critical thinking scores. All comparisons were non-significant.

Limitations

The most outstanding limitation of the study was its small sample size due to the decision to study participants in online courses offered by the same institution. Many differences exist between and among institutions and their approaches to online learning (Ko & Rossen, 2004). For instance, institutions use commercially available platforms such as WebCT, Desire2Learn, BlackBoard, Angel, and so forth; others use institutionally-developed software programs and/or open source applications. Likewise, the term "online learning" is used in different ways and can
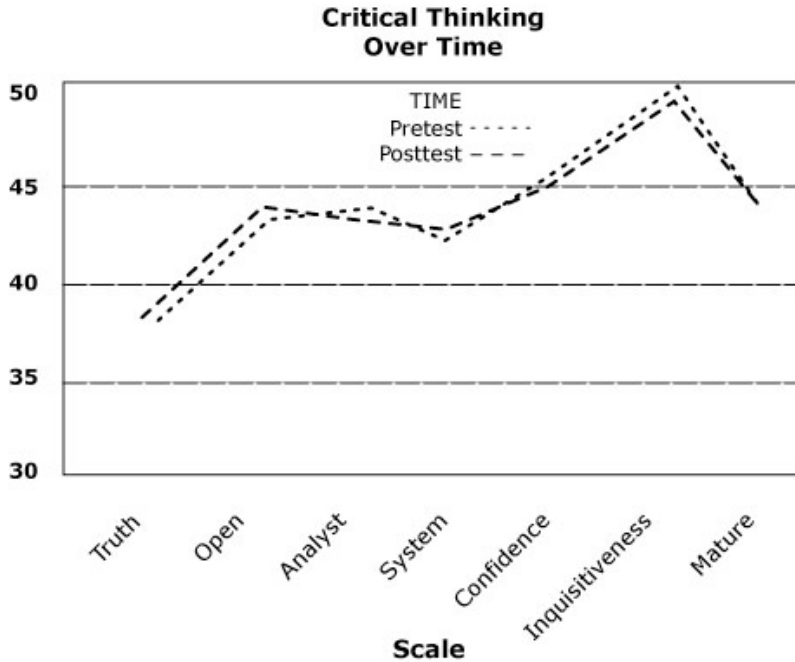
Figure 2. The interaction effect is due to the higher scores for truth in the posttest setting.

refer to courses that are fully and/or partially Internet-based and to courses that include a variety of web-based multimedia components. A further variable emerges when one thinks about online education at different universities and instructional design processes. The fact that this project focused only on courses and students from Laurentian University somewhat addressed these areas of variability.

Surveys such as those used in the study also have certain limitations. They do not provide opportunities to ask follow-up questions or seek clarification (Duffy, 2002). Non-responses are a further limitation of survey strategies (Gray & Guppy, 1994).

The time period of just under four months was likewise a limitation. Although the focus of the study was to examine the impact of a single online course on thinking disposition, given the circumstance that attitudes may be slow to change, it might be valuable to re-assess for change at a later date or after more than one online course.

The persona of the researcher requires mention. As a person in her forties with a busy personal and professional life, she may have been positively biased towards the registered nurses, wanting them to

experience positive growth in their critical thinking dispositions. The researcher's interests are further relevant in that she has considerable experience in online and distance education as an instructional designer and as a faculty member. While these circumstances made the project personally rich and insightful, they have also meant that extra effort was required to ensure objectivity regarding the data and findings.

Conclusions and Recommendations

The study did not reveal statistically significant increases in the participants' measures of critical thinking dispositions as a function of online educational involvement. In disciplines where critical thinking dispositions are especially valued, such as health sciences education facilitated through online educational technologies, this is an important finding (Bartlett & Cox, 2000, 2002; Profetto-McGrath, 2003a, 2003b). As a result, if cultivation of one or more critical thinking dispositions is a desired educational goal, greater understanding of online learning activities and assignments and their impact on dispositions is required. For example, in this study, the activities and assignments completed by participants in all three groups appear to have been helpful in sustaining students' dispositions. This noted, in the course taken by the post-RN nurses, there was a very unique focus on reflection and thinking; while the post-RN nurses did as well as other participants in maintaining their original scores, they did not do any better. Examination of whether or not this was a function of the course being delivered online or some other influence is recommended. As well, further study of the relationship between time and attitudinal change in educational contexts is appropriate since this study was limited to a single term. Such research would impact not only those interested in critical thinking dispositions but also those who maintain, that, without positive critical thinking dispositions in general, critical thinking applications may be substandard (Profetto-McGrath, 2003a).

On the other hand, the finding that dispositions tend to be resistant to change might prompt some educators to choose to focus on critical thinking skills in contrast with critical thinking dispositions. There is a rich literature that suggests that critical thinking applications can be demonstrated in writing (Brown & Sorrell, 1993; Burrows, 1995; Carter, et al., 2006; Carter & Rukholm, 2002; Garrison & Anderson, 2003; Ibarreta, 2004; Ironside, 2003; Kennison & Misselwitz, 2002; McLean, 2005; Sedlak, 1997). Because of the tremendous opportunity for writing in online courses, educators and researchers are strongly encouraged to continue to explore the relationships between writing and thinking in the online educational culture. Again, the issue of instructional design for online

learning emerges since there is evidence that certain tasks and assignments appear to be correlated with different kinds of thinking (Carter et al., 2006; Carter & Rukholm, 2002).

A serendipitous finding was the statistically significant increase in truthseeking scores. While truthseeking generated the lowest scores, it also witnessed the greatest gains. According to Facione, Facione, and Giancarlo (2001), creators of the tool used in this study, truthseeking is intellectual honesty, the desire for best knowledge in any situation, the inclination to ask challenging questions and to follow the reasons and evidence wherever they lead (pp. 2-3). If modern universities value truthseeking as a goal for their learners, this is a positive finding. Those who work in the adult education field can also take heart in knowing that the learners they work with are making progress in the truthseeking domain.

Truthseeking—because it is regarded to be the basis of evidence-based practice—will be of special interest to those who educate healthcare professionals. Based on this study, it appears that contemporary university students including nursing students of different ages studying in different ways do make gains in the truthseeking area. If this gain is not rapid or substantive enough for a specific discipline or profession, university educators may wish to complement this natural evolution over time with educational occasions that target development of this disposition.

Finally, the finding of sustained dispositional scores is certainly more positive than had there been a decrease in these scores. For those who might question the impact of online courses on learners' attitudes, this finding suggests that the influence of the online educational experience on dispositions is comparable to that of other learning experiences. Stated another way, online learners are on par with their peers in terms of disposition development. They do not appear to be at any dispositional disadvantage relative to their peers who study in other ways. The study also reaffirms the efficacy of distance education in those situations wherein online learners are also distance learners such as the post-RN nurses were.

Future Research

Because of the proliferation of online courses around the world and the role that critical thinking plays in post-secondary education, there are many opportunities for further research in this area. Specific to this study, replication of the research design with larger groups of post-RN nurses and with post-RN nurses studying at other universities and in other geographical areas beyond Ontario is suggested. Replication of the study with more closely matched comparison groups is recommended.

It might also be valuable to compare the CCTDI scores of different groups of working learners who are taking online courses: for example, by comparing the scores of nurses and teachers, insights might be generated into how to tailor learning strategies for particular learner groups.

While the overall dispositional changes in this study were not demonstrated to be statistically significant, there is a need for sustained work in the area of university-level education and specific critical thinking dispositions. Work is especially recommended in the areas of truthseeking and inquisitiveness, the dispositions that emerged at the low and high ends of the measurement spectrum. Some questions that emerged from this pattern are as follows: Would the patterns noted in the study sustain over months and years? What are the differences between the critical thinking dispositions of undergraduate and graduate-level students?

Final Thoughts

In closing, this exploratory study has demonstrated that online courses are "as good as" other kinds of courses in supporting critical thinking disposition. It has also unearthed areas for further and new research. While further research has been recommended in a variety of areas, outstanding is the need for additional work in identifying learning strategies that can be successfully developed for and completed within online courses. How these strategies might favourably impact the critical thinking domain as it includes disposition and skill is an important area for study.

Finally, other kinds of research such as qualitative and mixed methods research are recommended for the field of critical thinking disposition and online learning. This way, educators and researchers will acquire more informed understanding of learners' experiences as thinkers and online learners. Given the importance of thinking in university education and the prevalence of online learning in both on-campus and distance-based educational settings, this understanding is essential to twenty-first century universities.

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