An Investigation
of Instructors' Perceptions of Elements
in the Audio-Teleconferencing Environment

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Abstract

The research reported in this paper is part of a research program investigating a proposed instructional model for audio-teleconferencing. The model proposes that instructional strategies are, in part, determined by instructors' perceptions of elements in the instructional environment. This phase of the research examines these perceptions.

For the purposes of the study, a Q-Sort instrument was constructed and administered to a sample of instructors using audio-teleconferencing at the post-secondary level. The results of the Q-Sort were then subjected to cluster analysis.

The data resulting from the Q-Sort suggest that audio-teleconferencing may be a more democratic form of education than the traditional classroom. In addition, the cluster analysis identified two easily distinguished types of instructors who differ in the importance they attach to the practical aspects of audio-teleconferencing.

The paper concludes by identifying issues emerging from the current research that will be investigated in the future.

Résumé

Ce texte fait état d'un des éléments d'un programme de recherche enquêtant sur le modèle didactique proposé pour les audioconférences, selon lequel les stratégies d'enseignement seraient déterminées en partie par les perceptions des formateurs quant à certaines composantes de l'environnement pédagogique. Ces perceptions sont l'objet de la présente étude.

Aux fins de cette étude, on a conçu et appliqué une classification « Q » à un échantillon de formateurs faisant usage d'audioconférences au niveau

post-secondaire. Les résultats de la classification « Q » ont ensuite été soumis à une analyse par grappes.

Les données provenant de la classification « Q » semblent indiquer que l'audioconférence serait une forme d'éducation plus démocratique que celle dispensée dans les classes traditionnelles. L'analyse par grappes a également identifié clairement deux types de formateurs, se distinguant par l'importance qu'ils accordent aux aspects pratiques des audioconférences.

Les questions soulevées par la recherche en cours sont ensuite identifiées, en vue de recherches subséquentes.

Introduction

The increasing demand, by non-traditional students, for access to post-secondary education has focused attention on the field of distance education and the different modes of delivering a course to remote sites. Among the technologies available to educators to facilitate the delivery of courses at a distance, audio-teleconferencing remains a consistently popular choice because of its interactive capability and its relatively economical operating costs. Despite its comparatively long history of use as a distance education technology and its wide application, little has been done in the way of investigating the medium from a perspective of educational theory. In an attempt to redress this, a model was proposed by Kirby and Boak (1987) based on the work of Crocker, Brockenshire, and Boak (1978) and Crocker (1985) to depict the audio-teleconferencing teaching process.

The model suggests that antecedents in the audio-teleconferencing environment, such as student characteristics, institutional environment, remote site environment, and so forth, influence teaching strategies and instructional processes and these, in part, determine instructional outcomes. Previous research on this model has focused on developing a system (Kirby & Boak, 1987) to analyze the interactions occurring during an audio-teleconferencing instructional session. The purpose of that research was to characterize and understand what goes on during the session. The resulting system, SATA, a system for audio-teleconferencing analysis (Kirby & Boak, 1989), was successfully used to investigate a variety of courses, delivered by the distance education group at Memorial University in Newfoundland. The current phase of the research program, as reported here, is to investigate the perceptions by instructors of the various antecedents in the distance education environment.

The importance of the set of circumstances that surround the instructional process has received considerable attention in the literature, particularly in studies relating to the traditional classroom setting. Terms such as

"objective situation" (Stebbins, 1975), "frame factors" (Lundgren, 1977), and "surrounding conditions" (Dyer, 1968) have been used in discussing various elements in the global instructional environment and their impact on determining teaching behaviours. The interaction of these factors with teacher predispositions constitutes the definition of the situation (Stebbins, 1975), and according to the proposed model determines teacher behaviour. In a typical audio-teleconferencing instructional situation, such factors as instructor characteristics, student characteristics, the elements of the instructional situation, the remote site characteristics, and elements in the community external to the institution can all be seen as contributing to the global instructional environment and in turn may be seen as influencing instructional strategies.

In an "ideal" situation, it might be possible to control elements in the global instructional environment and, hence, to examine instructor predispositions. However, in "real life" such a situation is not possible. Thus, consideration must be given to the use of other techniques whereby the reaction of instructors to elements in the global instructional environment can be examined. One such technique, which was utilized in this study, is Q methodology, as implemented through the application of a Q-Sort. Stephenson (1953) originated the Q-Sort as a way of rank ordering items and statistically analyzing the results. This technique has become a powerful tool in the measurement of subjective phenomena such as attitudes and beliefs, despite adverse criticisms of the technique on statistical grounds (Kerlinger, 1973, pp. 595–596). As generally constituted, a Q-Sort consists of a set of cards, on each of which is an item, such as a phrase or a picture, which is given to an individual to rank order according to a criterion. Such a technique allows the items to be arranged "in order of the degree of response which the individual subject experiences" (Caggiano, 1970). In this study, a forced Q-Sort was used since the purpose was to identify the importance, as perceived by instructors, of elements in the global instructional environment in determining instructional strategies.

If, as the model suggests, teaching strategies are, in part, determined by the instructor's perception of factors in the global instructional environment, then a question of interest is to what extent is the population of instructors homogeneous in its perception of these factors? Do different types of instructors exist as determined by their perceptions of the global instructional environment? To answer this question, the data resulting from the Q-Sort was analyzed using cluster analysis. Cluster analysis is a group of statistical procedures that enable clusters to be identified within a set of data and in this case would identify relatively homogeneous sub-groups of instructors in the population of the study.

Methodology

Construction of the Q-Sort Instrument

The pool of items for the Q-Sort was derived from brainstorming sessions by the authors and by conducting semistructured interviews with six individuals experienced in audio-teleconferencing at The University of Calgary. Five of these individuals were experienced audio-teleconferencing instructors and the sixth was the manager of the distance education unit in the Faculty of Continuing Education. As a result of these interviews, an initial pool of 120 items, reflecting elements in the global environment surrounding audio-teleconferencing instruction, was compiled. These were classified into five distinct but interacting categories—instructor characteristics, student characteristics, environmental characteristics, technological characteristics, and the perceived goals of education.

Further discussion and examination led to the final selection of 79 items that were operationally defined and validated by four educators at The University of Calgary, who were asked to rate the descriptors according to their clarity:

a)   Clear: I know exactly what this means
b)   Ambiguous: I am only partially sure of its meaning
c)   Unclear: I am not at all sure of its meaning.

The procedure was repeated until each definition was clear to at least three of the educators. The final Q-Sort was prepared by writing each of the 79 items and its operational definition on separate cards. The forced choice procedure for the administration of a Q-Sort requires the respondent to sort the cards into a number of piles along a continuum in response to a criterion statement. In this case, the respondents were asked to sort the 79 cards into piles corresponding to a quasi-normal distribution as follows:

	Least Important							Most Important	
Number	4	6	9	13	15	13	9	6	4
Score Value	1	2	3	4	5	6	7	8	9

N = 79

in response to the following criterion statement:

> You are planning a teleconference course in the Fall, 1989. Which factors do you perceive to be the most and least important when considering the teaching strategies for the course you are about to teach?

The reliability of the instrument was ascertained by determining the repeat reliability coefficient. The Q-Sort was administered to a small group

of teleconference instructors and was subsequently readministered to them after a four-week interval.

The repeat reliability coefficient for each instructor was determined. The range of the coefficients for the sample was from 0.44 to 0.97 and the average was 0.74, with a S.D. of 0.16, which compares favourably with values reported in the literature by other researchers using Q-Sorts (Wylie, 1961, Kerlinger, 1966 and Caggiano, 1970).

The Sample

A purposive sample of 120 subjects instructing at the post-secondary level through the media of audio-teleconferencing was selected by a variety of methods. Part of the sample was selected by the principal investigator through collegial contacts. Another part of the sample was selected from the Directory of the Canadian Association of Distance Education, and a third part of the sample was composed of names suggested by individuals in the first two categories. In all, 87 responses to the Q-Sort were obtained.

Although the sample is drawn from different regions of the country and from different kinds of institutions, it cannot claim to be fully representative of the population of post-secondary audio-teleconference instructors in Canada. Thus limitations of the sample should be considered in generalizing the findings of this study.

Analysis of Data

The data were coded by assigning numerical scores ranging from 1 to 9; 1 corresponding to least important, 9 corresponding to most important. That is, the greater the ranking of the item the more important that factor was seen to be when considering instructional strategies. Mean rankings for each of the 79 items were calculated and are reported in Table I.

The data resulting from the Q-Sort was further analyzed by using the Cluster procedure contained in the Clustan software package (Wishart, 1987). Ward's (1963) method was used, leading to the formation of clusters using hierarchial agglomerates. Initially these are in single member clusters, and at each step a pair of clusters is amalgamated whose union leads to the least increase in the euclidean sum of squares. When the data have been partitioned into groups, "the resulting classification may be regarded as approximately optimal in minimizing the euclidean sum of squares as objective function" (Wishart, 1987, p. 43).

Results

Table I
Mean Ranking of Q-Sort Items

Item	Mean
Instructor's Aptitude for Teaching	7.83
Instructor's Verbal Skill	7.63
Instructor's Knowledge of the Structure of the Curriculum	7.31
Quality of Sound	7.00
Student's Motivation	6.74
Student's Ability to Interact	6.62
Student's Personal Goals	6.61
Student's Ability/Aptitude	6.54
Instructor's Teaching Style	6.44
Instructor's Attitude	6.43
Learning Style of Student	6.31
Goal of Education: Self-Learning	6.31
Goal of Education: Problem Solving	6.23
Instructor's Knowledge of Student's Motivation	6.19
Instructor's Knowledge of Classroom Dynamics	6.18
Library Support Services	6.12
Goal of Education: Creativity	6.07
Instructor's Personality	6.07
Student's Attitude	6.07
Goal of Education: Attitude Toward Learning	6.05
Technical Expertise of the Bridge Operators	6.05
Verbal Skills of the Student	6.04
State of Teleconferencing Equipment	6.02
Ease of Use of Equipment by Students	6.01
Time Allocation for Teleconferences	6.00
Instructor's Experience with Audio-teleconferencing	5.94
Instructor's Values	5.93
Student's Values	5.76
Instructor's Exposure to Orientation Programming	5.71
Goal of Education: Knowledge	5.57
Goal of Education: Self-Expression	5.52
Instructor's Knowledge of Evaluation Procedure	5.52
Goal of Education: Personal Growth	5.49
Student's Attendance	5.49
Overall Size of Class	5.46
"Off-Air" Interaction	5.36
Degree of Isolation from Fellow Students	5.36
Scheduling of Teleconferencing Class	5.34
Student's Self-Concept	5.31
Group Size per Site	5.26
Instructor's Academic Background	5.08
Student's Academic Background	5.07

Item	Mean
Goal of Education: Socialization	5.01
Attitude of Faculty of Department towards Distance Education	4.97
Goal of Education: Networking	4.97
Instructor's Knowledge of Student's Background	4.96
Student's Personality	4.87
Student's Experience with Distance Education	4.80
Student as a Teaching Resource	4.76
Perceived Value of Distance Education	4.67
Distribution of Students at Remote Site	4.57
Administration Policies Governing Teleconferencing	4.47
Frequency of Instructor's Visit to Remote Site	4.34
Whether the Course is a Required Course or Not	4.27
Family Support	4.22
Family Obligations	4.14
Attitude of Student's Community towards Education	4.05
Seating Arrangement at Remote Sites	3.94
Physical Design of Remote Sites	3.94
Whether the Course is an Optional Credit Course or Not	3.92
Physical Design of Teleconferencing Space	3.91
Whether the Course is High Demand or Low Demand	3.90
Whether the Course is Non-Credit Course/Leisure	3.87
Value of Distance Education in Merit/Promotion	3.66
Recreation and Avocation as a Goal of Education	3.52
Dual Mode/Single Mode	3.50
Student's Employment Status	3.46
Student's Personal Interest	3.29
Goal of Education: Motor Skills Development	3.26
Student's Age	3.09
Instructor's Interest	3.03
Demographics of the Student's Community	2.91
Instructor's Family Background	2.89
Distance from Sponsoring Institution	2.81
Student's Socio-Economic Status	2.77
Employment Level in the Student's Community	2.75
Size of Student's Community	2.56
Student's Gender	1.77
Instructor's Gender	1.66

Table I reports the mean ranking of each of the 79 items resulting from the 87 Q-Sorts. The range of the mean rankings was from 7.83 to 1.60 on the 9 point scale (9 = most important to 1 = least important). Of the four items whose mean rankings were equal or greater than 7.0, three—aptitude for teaching, verbal skills, and knowledge of the curriculum—relate to instructor characteristics and one—quality of sound—is a technological characteristic. Of the top 10 items in the table, five are instructor charac-

teristics and four student characteristics. It is interesting to note the high ranking given to the instructor aptitude for teaching, 7.83, and verbal skills, 7.63, particularly when contrasted to instructor's academic background, 5.08, and overall size of class, 5.46. Given the rhetoric that surrounds the issue of class size and academic qualifications in post-secondary institutions, particularly universities, it is interesting to note the relatively neutral ranking given to both of these factors. It is an interesting speculation as to whether these factors would remain as low if some variation of the instrument, used in this study, was prepared for and administered to instructors in traditional classroom settings in the post-secondary sector.

Among the student characteristics, the student's motivation, 6.74 and ability to interact, 6.62 were rated most highly. It might logically be expected that these two factors would emerge as being strongly rated given the traditional assumption that non-traditional learners are strongly motivated and that the strength of audio-teleconferencing rests in its interactive capability. The student's academic background received a mean ranking close to the mid-point of the scale, 5.07, almost identical to that given the instructor's academic background and, once again, it is interesting to speculate on the importance that might be attached to this factor in a traditional setting.

Of the factors deemed to be relatively less important as others, the most striking were student gender and instructor gender, which received the lowest mean rankings of all items, 1.77 and 1.66 respectively. Of the items whose mean rankings were less than 3.0 only one other student characteristic was included, that of socio-economic status, and one other instructor characteristic, the family background, was included. The other characteristics related to elements of the student's home community, such as size and employment level.

Of the factors grouped around the middle point on the scale, that is 5.0, there were a number that initially might have been predicted to be rated comparatively more important than they were by the instructors. Thus, in addition to those previously noted, the experience of the instructor with audio-teleconferencing received a mean ranking of only 5.94. Similarly, the degree of experience of the student with distance education was rated comparatively low at 4.80. Given the mediated form of instruction and the necessary reliance on the technology, it is surprising to observe the relative lack of importance attached to these factors. The degree of isolation of students and the element of off-air interaction received low rankings of 5.36. Given the recognition of the difficulty isolated students face in studying, when they do not have the opportunity for the informal "off-air" interactions that a group of students at a remote site have, it is somewhat surprising that instructors would not see these factors as being more important in influencing instructional strategies. In addition, the comparative

lack of importance attached to student values, 5.76, and student's attitudes, 6.07, suggest that the instructional system may be somewhat impersonal.

The cluster analysis of the Q-Sort data revealed two distinct clusters of instructors of 29 and 58 instructors respectively. Table II provides the characterizing elements of the two clusters, that is, those variables on which the cluster as a whole ranks significantly higher and indicates how the clusters differ from each other. T-Tests were conducted on each of the 79 variables. Table III contains the mean rankings for each cluster on those variables that yielded significant t-values.

Table II
Characterizing Elements Resulting from Cluster Analysis

Cluster I

- Student's Experience with Distance Education
- Physical Design of Teleconferencing Space
- Administrative Policies Governing Teleconferencing
- Scheduling of Teleconferencing Classes
- Time Allocation for Teleconferencing
- Overall Class Size
- Instructor's Experience with Audio-Teleconferencing
- Physical Design of Remote Sites
- Quality of Sound
- Ease of Using Equipment by the Students
- State of Teleconferencing Equipment
- Group Size Per Site
- Instructor's Exposure to Orientation Programming

Cluster II

- Student's Values
- Instructor's Values
- Instructor's Personality
- Instructor's Attitude
- Instructor's Knowledge of the Structure of Curriculum
- Instructor's Aptitude for Teaching
- Goal of Education: Socialization
- Goal of Education: Personal Growth
- Goal of Education: Self-Learning
- Goal of Education: Knowledge
- Goal of Education: Problem Solving
- Instructor's Knowledge of Student's Motivation
- Goal of Education: Self-Expression
- Goal of Education: Creativity
- Instructor's Knowledge of Student's Background
- Goal of Education: Attitude Toward Learning

Table III
Mean Rankings for Cluster I and Cluster II Instructors
on Elements Yielding Significant t-values

Item	Mean Cluster I	Mean Cluster II	t-Value	Significance Level	DF
Student's Values	5.13	6.08	-2.47	0.01	83
Student's Experience with Distance Education	5.89	4.23	4.48	0.00	83
Ease of Use of Equipment by the Students	7.13	5.44	5.60	0.00	85
Instructor's Experience with Audio-teleconferencing	6.72	5.55	3.39	0.00	85
Instructor's Exposure to Orientation Programming	6.86	5.13	5.55	0.00	85
Instructor's Values	5.34	6.22	-2.54	0.01	84
Instructor's Aptitude for Teaching	7.48	8.01	-2.03	0.04	85
Instructor's Knowledge of the Structure of the Curriculum	6.75	7.58	-2.44	0.01	85
Instructor's Personality	5.64	6.27	-2.02	0.04	84
Instructor's Knowledge of Student's Background	4.51	5.19	-2.00	0.04	84
Instructor's Attitude	5.82	6.74	-2.88	0.00	85
Instructor's Knowledge of Student Motivation	5.79	6.39	-1.94	0.05	85
Physical Design of Teleconferencing Space	4.44	3.64	2.29	0.02	83
Administrative Policies Governing Tele-conferencing	4.96	4.21	2.08	0.04	83
Scheduling of Teleconferencing Classes	5.92	5.03	2.51	0.01	80
Time Allocation for Teleconferencing	6.68	5.65	3.55	0.00	85
Overall Size of Class	6.03	5.17	2.19	0.03	85
Physical Design of Remote Site	4.55	3.62	2.76	0.00	83
Quality of Sound	7.96	6.51	4.62	0.00	85
State of Teleconferencing Equipment	6.79	5.63	3.48	0.00	84
Group Size per Site	6.00	4.89	3.03	0.00	84
Goal of Education: Socialization	4.58	5.22	-2.01	0.04	85
Goal of Education: Personal Growth	4.65	5.91	-3.97	0.00	85
Goal of Education: Self-Learning	5.67	6.62	-2.68	0.00	82
Goal of Education: Knowledge	5.48	6.29	-2.33	0.02	84
Goal of Education: Problem-Solving	5.37	6.66	-3.90	0.00	84
Goal of Education: Self-Expression	4.93	5.89	-3.32	0.00	85
Goal of Education: Creativity	5.21	6.48	-3.73	0.00	84
Goal of Education: Attitude Toward Learning	5.44	6.36	-2.60	0.01	85

The characterizing elements of the two clusters reported in Table II reveal striking differences between the two clusters of instructors. An examination of variables on which Cluster I instructors rank significantly higher than Cluster II instructors reveals elements in the global instructional environment that relate directly to the media used in instruction and its administration (e.g., both instructor and student experience with audio-teleconferencing, the time allotted for the scheduling of teleconferencing sessions, the physical design of the teleconferencing space, and so forth). On the other hand, the variables on which instructors in Cluster II rank higher than those in Cluster I are more abstract and are not directly related to the practical aspects of the media of instruction (e.g., student and instructor values; goals of education, namely socialization, self-learning, and creativity; instructor's knowledge of student background; and so forth). If the data in Table I is examined in light of the data in Tables II and III, it can be noted that Clusters I and II differ in only four of the top ten ranked variables and three of the bottom ten ranked variables. Thus, both clusters see instructor verbal skills as being very important as well as the student's motivation and ability to interact, whereas neither cluster ranks instructor gender and student gender as being important.

Discussion and Future Directions

The study reported in this paper examined the perceptions by audio-teleconferencing instructors of factors in an audio-teleconferencing instructional environment. The instrument used in the study was a Q-Sort that required instructors to rank a number of variables in order of importance in considering teaching strategies.

The results from the group of instructors as a whole indicated that, in the main, instructor variables and, to an extent, student variables were ranked as being the most important factors in determining teaching strategies. However, it was noted that some factors that might have been expected to be ranked more highly tended to receive a relatively neutral ranking. Thus, in a traditional setting it might be expected that the verbal skills of students, their academic ability, and their values and attitudes might be deemed more important in determining teaching strategies. This might be interpreted as the technology filtering out or masking certain aspects of the instructor-student relationship. Although it is generally acknowledged that mediated instruction results in a reduction in the quality of interaction present in face-to-face communication, for example in audio-teleconferencing, there is a loss of feedback from non-verbal cues, it might also change the nature of the instructional transaction in more subtle ways.

One can conjecture that factors that might well produce a "halo" effect in a traditional setting are filtered out by the media and that students are seen to be more equal, with the result that audio-teleconferencing, although less personal, is a more democratic form of education. The fact that gender was ranked the least important factor by the instructors as a whole, could be interpreted as supporting this view. If indeed distance education is truly a less personalized form of education, it may well be that this is the most identifiable characteristic. Rather than describing it as part of a separate paradigm in which the over-arching concept is its non-contiguous mediated nature, it can be viewed in the same light as other less personalized main-stream forms of education, such as very large classes, which are often found in post-secondary institutions.

The cluster analysis of the data yielded two types of instructors that differed in the importance they attached to different variables. The first cluster of instructors ranked as more important a number of factors that related directly to the technology used in the instruction. The second cluster ranked as more important a number of factors that are typically associated with a more traditional mode of instruction. These results suggest that the first type of instructor is more sensitive to the nature of this form of mediated instruction and pays more attention to both the practical factors related to it and the skills required to use it effectively. On the other hand, despite involvement with a mode of distance education, the second type of instructor appears to be more firmly embedded in a traditional paradigm of instruction.

It is interesting to consider the two clusters of instructors identified in this study in light of a recent debate regarding the alleged paradigm shift in distance education between Holmberg (1990), on the one hand, and Garrison (1989) and Garrison and Shale (1990), on the other. Although there is some difficulty in connecting the points advanced by both sides, this is not unanticipated because they view distance education from different perspectives. Holmberg (1990) sees mediated communication as the basic characteristic of distance education and the "new" distance education with its technological enhancements as simply an evolution of the correspondence model that is still the predominant delivery technique (p. 53). Garrison and Shale (1990), however, see the new technologies, because of their ability to facilitate "a collaborative transactional approach" as producing a radical shift in the nature of distance education, such that it can be considered to be part of the mainstream educational field (p. 45). It is possible that the second type of instructor would identify more with the viewpoint of Garrison and Shale, focusing primarily on the educational nature of the interaction, rendering the delivery medium transparent to

some extent. The first type of instructor would identify more strongly with Holmberg's position, viewing the educational transaction via its mediated nature.

The data reported in this paper raise a number of questions that are to be the focus of further research. It has been suggested in this paper that audio-teleconferencing masks a number of factors in the instructional process, in addition to those normally acknowledged to be absent in mediated instruction. Thus, it would be informative to administer the existing Q-Sort instrument to teleconferencing students and a modified form of the instrument to instructors in a traditional instructional setting.

If, indeed, the typologies of instructors suggested in this paper are valid, then there are a number of practical questions that spring to mind. Do the two types of instructors use different instructional strategies? Do they require different kinds of training? Are the two types of instructor the result of different institutional backgrounds, academic preparation, or personalities? Do they indeed view distance education from different perspectives as discussed above? Further research will be directed to shedding light on these and other issues.

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