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Teachers' Training in Distance Education and Their Willingness to Use the Technology After the Completion of Inservice Training

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Introduction

Education is changing. A paradigm shift has occurred within education as the world has moved from the industrial age to the information age (Reigeluth, 1994; Toffler, 1990). This shift has provided educators with technological innovations that have created new environments of teaching and learning; environments that no longer support the "assembly line" view of industrialized education. Reigeluth (1994) describes industrialized education as education which treats all students the same; all students are expected to do the same thing at the same time. This sameness forces students to be passive learners and passive members of their school community. Information age education can create environments that see the student as an active participant in the construction of new knowledge. Technology offers an empowering environment for meeting the needs of the students in this new age; an environment that offers a chance for active student-constructed learning and adventurous risk-taking teaching (Dede, 1990; Sheingold, 1990).

Distance education technology offers a robust opportunity for the creation of empowering environments. It is what Zuccermaglio (1993) describes as an "empty or open" rather than a "full" technology. Full technology is designed to transfer information from the machine to the learner, while empty technology offers the opportunity for metacognition and reflection on the learning activity. Distance education as "empty" technology can be used to develop transferable cognitive abilities, not simply more efficient recall of prescribed information. It maximizes communication rather than isolation (Garrison, 1993). Distance learning environments offer opportunities for local and long distance collaboration, increased communication between students and teachers, access to the larger global community, and access to "others'" views of the world (Sheingold, 1990). However, these opportunities will not occur spontaneously. Planning, training, and experience must be provided if the

potential of distance education is to be reached.

Teacher Training and Distance Education

Distance education cannot succeed with inadequately trained or uncommitted teachers. Staff development is critical for the implementation of new programs and teaching methods (Strudler, 1993). If teachers are to use this technology in their classrooms, their need for adequate inservice training programs must be met. Brown, Collins, and Duguid (1989) remind us it is quite possible to acquire a tool but to be unable to use it. For effective usage, many suggestions are provided in the literature concerning teachers' inservice training. Darling-Hammond (1993) posits that to create training programs which change the way people do things, a strong foundation must be built for professional development training and support. Strudler (1993) supports this idea and states:

Any training and staff development plan for technology must address the broader goal of empowering teachers and students to use information technology as tools throughout the curriculum. It is essential that staff development plans address the broader professional need of teachers (p. 8).

An understanding of the keys to successful inservice is essential if an innovation is to be implemented to its full potential.

Sustained interaction and staff development are crucial for any educational change. However, the more complex the change, the more interaction is required to assure implementation (Fullan, 1991). Within inservice training, teachers must be educated about the relationship between learning and technology, how to facilitate interactivity, and how to operate the technology (Corporation for Public Broadcasting, 1993; Dede, 1990). Support following training is

seen as necessary for effective staff development. Follow-up support assists teachers in transferring newly learned skills and practices into their active teaching repertoire (Joyce, 1990; Joyce & Showers, 1988). The Rand Change Agent Study found that even quality innovations could not succeed if teachers were inadequately trained (Berman & MacLaughlin, 1977). The quality of the teacher training remains the key to the successful implementation of any new innovation.

Distance Education in Iowa

Distance education using the Iowa Communications Network (ICN) is one form of technology that has been introduced recently in Iowa. The ICN is a statewide two-way full motion interactive fiber-optic telecommunications network with a point of presence (classroom) in each of Iowa's 99 counties. The ICN links colleges, universities and secondary schools throughout the state. This network is being used to offer new and additional courses to schools and students (IDEA, 1992).

During 1993, K-12 educators in Iowa were invited to attend workshops and institutes designed to introduce them to distance education via the ICN. The workshops focused on providing hands-on experience with interactive television technologies, while the institutes focused on curriculum reform with some attention to implementing reform practices in a distance education environment.

Iowa's vision of distance education is built around the concept of enhancing the quality of education through the use of telecommunications. The ICN combines the use of fiber optic networks, multimedia, and computers to mediate cognitive interactions with the environment. It offers the opportunity to present life contexts that change views of working, thinking, and learning. The technology is not seen as a replacement of the teacher but as a tool that mediates between the student, teacher, and the object of knowledge (Zuccermaglio, 1993). The appropriate use of distance education will encourage and challenge learners to construct their own meaning and to create knowledge. To reach this goal, teachers must be willing to use the technology. An understanding of the factors that contribute to teachers' willingness to use the innovation can be studied through the use of Rogers' (1983) Classical Diffusion Model.

Classical Diffusion Model

Diffusion of innovations is a multidisciplinary theory of planned social change that has brought about the spread of new ideas or new technologies throughout a social system. Rogers (1983) defined diffusion as "the process by which an innovation is communicated through certain channels, over time, among members of a social system" (p. 5). In-

novations are adopted at different rates depending on how they are perceived by adopters. There are five characteristics of innovations that influence that decision: relative advantage, compatibility, complexity, trialability, and observability. Rogers (1983) notes that relative advantage is the degree to which an adopter perceives an innovation as an advantage. The greater the perceived advantage, the faster the innovation will be adopted. The compatibility of an innovation with the existing culture and its ability to meet felt needs will also influence its rate of adoption. Innovations seen as compatible with the existing values of a social system will be adopted faster than those that are not perceived as being compatible. The complexity of the innovation is another characteristic that influences the rate of adoption. If an innovation is perceived as being complex to use or understand, it will not be adopted as quickly. Trialability is the opportunity for trying out the new innovation to see if it meets the adopters' needs. Perceived trialability of an innovation is positively related to its rate of adoption. Observability is the degree to which the results of an innovation are observable to others. The greater the degree to which these results can be seen, the higher the rate of adoption (Rogers, 1983).

Diffusion is defined as a particular type of communication in which one person offers information to others about a new idea. The communication channel is the method by which the message is conveyed. Interpersonal channels involve face to face exchange and are more effective in the adoption process. Most adopters make their decision to adopt based on an interpersonal subjective evaluation rather than a scientific evaluation. Thus the use of these channels will influence the process of adoption (Rogers, 1983).

Rogers proposes a five-stage model of the adoption process consisting of knowledge, persuasion, decision, implementation, and confirmation. This study was not conducted to see if the stages of the innovation-decision-process exist. The researchers are using the constructs of knowledge, persuasion, and decision to understand the symbolic adoption of the Iowa Communications Network. Knowledge is defined as an individual's exposure to the innovation's existence and understanding of its functions. Persuasion is the individual's formation of a favorable attitude toward the innovation. Decision is the individual's engagement in activities that lead to a choice to adopt or reject the innovation (Rogers, 1983).

Few studies have looked at inservice training from a diffusion of innovation point of view. Moore and Thompson (1990) posit that it is important to "review the extent and quality of teacher preparation and in-service training in distance education" if we are to understand the process of change (p. 37). Many factors contribute to a teacher's decision to adopt an innovation.

The Study

This study will focus on teacher inservice training and its relationship to willingness to use an innovation such as distance education. The study will provide information for follow-up training activities and insight into the process of adoption as a whole.

The main objectives of this study were:

1. Identification of the factors that contribute to teachers' willingness to teach over the ICN after completion of distance education inservice training.
2. Examination of the relationship between teacher attendance in either the workshop or the institute or attendance in both, and willingness to teach over the ICN.
3. Examination of the relationship between participants' decision to attend the workshop and/or the institute and the participants' knowledge about distance education, their attitude toward distance education, and their willingness to teach over the ICN.

Methodology

Subjects

The subjects of this study were participants in 16 inservice workshops and five curriculum institutes in the Spring, Summer, and Fall of 1993. There were 475 teachers and administrators surveyed. Of the 280 survey respondents, 210 were K-12 teachers. These teachers were the focus of this study.

Instrument

The instrument was developed after examination of other diffusion of innovation and technology instruments (Carr, 1990; Derr, 1991). It was piloted for readability in two graduate technology courses.

The instrument consisted of demographic questions and questions about perceptions of distance education in relation to knowledge, attitude (persuasion), willingness to adopt (decision), and communication channels. Additionally, questions were asked concerning each teacher's personal use of the ICN and factors that would increase the probability of their use of the ICN.

The demographic variables included in the survey were gender, age, area of instruction, highest degree, teaching experience, and level of experience in using distance education. Participants' perceptions about their knowledge, attitude, and willingness to adopt distance education were measured by using a five-point strongly disagree/strongly

agree scale. Knowledge was measured by asking participants to respond to the following question: "I believe I am knowledgeable about teaching at a distance." Attitudes towards teaching at a distance were measured by asking respondents to respond to this item: "I believe I have a favorable attitude towards teaching at a distance." The same construct was measured indirectly using Rogers' (1983) taxonomy of the perceived characteristics of the innovation. These include relative advantage, complexity, compatibility, trialability and observability. The coefficient alpha reliability for the attitude scale was .88. Finally, willingness to teach over the ICN was measured with this item: "I am willing to teach over the ICN."

Procedures and Data Analysis

The instrument was mailed to distance education workshop and institute participants after inservice completion and was followed by a reminder postcard. A return rate of 61 percent was obtained. Results were analyzed using the statistical package for Social Sciences (SPSS). Statistics computed were descriptive statistics, stepwise regression, and one-way analysis of variance (ANOVA).

Results

Demographic Characteristics

Demographic characteristics of responding teachers are presented in Table 1. One hundred twelve were female (53%) and 98 (47%) were male. More than two-thirds of the teachers were older than age 40. One hundred forty-two (68%) teachers had more than 15 years of teaching experience. Most teachers (70%) had no experience or little experience using distance education technologies. Seventy-one (34%) teachers attended only the inservice workshops, 53 (26%) teachers attended only the curriculum institutes, and 83 (40%) attended both.

Predicting Factors of Willingness to Use the ICN

Stepwise regression (at the .05 level) was used to identify the predictors of teachers' willingness to teach over the ICN (Borg & Gall, 1989). The independent variables used for this analysis were: (1) knowledge about distance education, (2) general attitude score, (3) sex, (4) age, (5) communication with other teachers, and (6) the school being connected to the ICN. Favorable attitude towards distance education was the primary predictor variable for all three groups (workshop participants, institute participants, and those who attended both). In addition to attitude, teachers' positive conversation with others about distance education predicted curriculum institute teachers' willingness to teach over the ICN.

Table 1. *Characteristics of workshop/institute participants*

	N	Percent
Gender		
Females	112	53
Males	98	47
Attended		
Inservice workshop	71	34
Curriculum institute	53	26
Both	83	40
Age		
40 and less	61	29
Greater than 40	148	71
Area		
Foreign Language	29	14
Literacy	23	11
Math	62	30
Science	35	17
Vocational Education	27	13
Elementary	8	4
Other	20	10
Teaching experience (years)		
15 and less	67	32
Greater than 15	142	68
Level of experience using distance education		
No experience	60	29
Very little	85	41
Some	58	28
Quite a bit	4	2
Extensive	2	1

Inservice Attendance

One-way ANOVA (at the .05 level) and Scheffe post hoc procedures (.05 level) were used to identify whether there were significant differences between teachers attending singularly the workshop or institute or attendance at both in their perceptions of knowledge, attitude, and willingness to teach over the ICN (Table 2).

The results showed a significant difference between those who attended the workshop or curriculum institute and those who attended both the workshop and the curriculum institute ($F=8.92, P<.001$) in their knowledge about distance education. Using the Scheffe range test at the .05 level, there was a difference between those attending both the workshop and the institute and those attending only the institute in their perception of their knowledge about distance education. The knowledge score for those who attended both the workshop and the institute was higher than for those who attended only the institute.

In terms of attitudes toward distance education, the results showed no significant difference between the three groups ($F=2.02, P=.136$). Teachers' attitude scores were similar in the three groups.

The results showed a significant difference between the three groups in their willingness to use distance education ($F=4.74, P<.001$). Scheffe analysis showed a difference between those who attended both the workshop and the institute and those who attended either the workshop or the institute. Those who attended both the inservices showed more willingness to teach over the ICN than those who attended only one inservice.

Table 2. *ANOVA results of teachers' perception of their knowledge about, attitude toward, and willingness to use distance education by their attendance at workshops and institutes*

	N	Mean	SD	F-Ratio	Probability	Scheffe
Knowledge						
Workshop (W)	72	3.72	0.94	8.09	0.001	B>I
Institute (I)	53	3.38	0.88			
Both (B)	83	3.94	0.82			
Attitude						
Workshop	72	4.00	0.90	2.02	0.136	None
Institute	53	3.85	0.84			
Both	83	4.12	0.57			
Willingness						
Workshop	72	3.76	0.85	4.74	0.001	B>I B>W
Institute	53	3.74	0.84			
Both	83	4.08	0.63			

Reason for Attending

Respondents were asked what most influenced their decision to attend the inservice(s). Their answers were classified into three categories: personal interest, administrative request, or other reasons. A one-way ANOVA was used to determine if there were significant differences between the three groups in relation to knowledge, attitude and willingness to teach over the ICN (Table 3).

The results showed no statistical difference between teachers who joined the inservice for personal interest, administrative request, or for other reasons in their knowledge about distance education ($F=0.80$, $p=0.451$). This indicates that the reason for attending the inservice(s) did not affect their perception of knowledge gained.

The ANOVA results showed a statistical difference between the three groups in their attitude towards distance education ($F=4.56$, $p=0.012$). Using Scheffe, there was a difference between those teachers who attended the inservices for personal interest and those who attended because of administrative request. Those reporting personal interest showed a more favorable attitude toward distance education than those attending because of an administrative request.

A statistical difference between the three groups was identified in relation to willingness to use the ICN ($F=3.16$, $p=0.045$). Scheffe analysis, however, did not detect any differences between those teachers who attended for personal interest, administrative request, or attended for other reasons, although the mean score for teachers who attended for personal interest or other reasons was higher than those who attended because of an administrative request. Perhaps a more liberal test, such as Tukey, would detect such a difference.

Table 3. ANOVA results of teachers' perceptions of their knowledge about, attitude toward, and willingness to use distance education by their attendance at workshops and institutes

	N	Mean	SD	F-Ratio	Probability	Scheffe
Knowledge				0.80	0.451	None
Personal Interest (P)	117	3.75	0.83			
Administrative Request (A)	77	3.61	0.89			
Other (O)	12	3.83	0.72			
Attitude				4.56	0.012	P>A
Personal Interest	117	4.13	0.73			
Administrative Request	77	3.79	0.83			
Other	12	4.08	0.69			
Willingness				3.16	0.045	None
Personal Interest	117	3.96	0.79			
Administrative Request	77	3.71	0.78			
Other	12	4.17	0.58			

Discussion

Rogers presents a model of the innovation decision process. This study focused on three stages of that model (knowledge, persuasion and decision) in conjunction with the willingness to adopt a distance education technology. Inservice training in distance education serves as the major vehicle for transmitting information and skills to teachers. This study focused on factors that contribute to teachers' willingness to use the technology. The inservices provided teachers with knowledge that corresponds to the first stage of the model. According to Rogers (1983), the second stage of persuasion can be addressed through the study of attitudes. An innovation will have a greater chance of being accepted if individuals form positive attitudes toward the innovation. Inservice training provides an environment that can facilitate this process. This study identified that attitudes toward the innovation are the primary predictor of teachers' willingness to use distance education. Those teachers who formed positive attitudes toward distance education showed more willingness to use the technology.

Teachers who attended both inservices (workshop and institute) showed more knowledge and more willingness to use distance education than those who attended only one inservice. This implies that teachers need more than a "one shot workshop" to adopt new educational technologies (Huberman and Miles, 1984; Hurst, 1994; Stallings, 1989). Follow-up experiences are important to support the trainees as they move toward adoption.

Teachers who attended inservices because of personal interest showed a more favorable attitude toward the use of distance education and more willingness to use distance education. It must not be assumed that all teachers come to inservices with the same level of interest in learning about

the technology. Therefore, inservice coordinators should include a variety of experiences and viewpoints to address the beliefs and knowledge levels of the participants. In addition, time should be provided for input from the attendees to help tailor the inservices to their needs.

Education is in a state of change; change in curriculum, class structure, and staff development. Changes in teaching practices involve the development of new skills, behaviors, coordinated activities, and technologies (Fullan, 1987). One of the methods Iowa chose to address change in education was the creation of the ICN. This change can only occur if Iowa teachers are willing to use the technology. This study has identified that teachers' positive attitudes toward use of the ICN was a major contributor to the adoption decision. Additionally, follow-up activities and participant's personal interest influenced the decision.

In conclusion, several implications concerning distance education inservice construction can be drawn from this study. First, inservice developers should provide the opportunity for attendees to discuss their concerns, questions, and beliefs about the technology. Second, planned follow-up activities should be part of the staff development process. Finally, inservice developers should take into consideration the attendees' needs and reasons for attending to increase participants' willingness to use the technology.

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