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Evaluation of two-way interactive television for community college instruction: Development of an instrument and assessment of student attitudes

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Evaluation of two-way interactive television for community college instruction: Development of an instrument and assessment of student attitudes

by

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GENERAL INTRODUCTION

> "What has not been fully comprehended in recent time is that distance education ... is in a transitional phase moving toward the increased adoption of, and reliance on, fully interactive communications technology." (Garrison, 1990, p. 13).

Background

The field of distance education is rapidly changing with the proliferation of new technologies. One of the most recent technologies is two-way interactive video instruction offered over fiber optic networks. In the last few years the state of Iowa invested in the construction of a statewide fiber optic network, the Iowa Communications Network (ICN), connecting universities, community colleges, and public schools. With the aid of a federal grant, provided through the Star Schools program, 103 two-way interactive video classrooms were connected to the system and became operational in October, 1993.

The Star Schools grant was provided to the Iowa Distance Education Alliance, an entity formed through the collaborative efforts of the state universities, the Area Education Agencies, the community colleges, Iowa Public Television, the Iowa Department of Education, and public school districts. Evaluation of the project was included as a key component of the grant. The evaluation plan included assessment of the effectiveness of the state's fiber optic network in providing instruction through measuring attitudes of both instructors and students taking classes via the ICN. The assessment of student and instructor attitudes was part of the formative and summative evaluation of the project, providing both information for use in refining the system and a measure of satisfaction with the system.

Instruments that could be used statewide with a variety of student groups were needed. Following a review of instruments currently available, the evaluation team decided to develop instruments for use in Iowa. Instructor and student instruments were developed and used to survey both community college and secondary courses taught over the ICN during 1994. Survey development and data collection were funded in part by the U. S. Department of Education Star Schools grant #R203 B 20001-93. Research and evaluation procedures for the project were reviewed and approved by the Iowa State University Human Subjects Committee.

This dissertation reports on the development of the student evaluation instrument used by the Iowa Distance Education Alliance and on results from a survey of community college students using the instrument during summer 1994. Because of the rapid growth in the use in interactive video technology for instructional delivery and because of the demonstration nature of the Iowa project, it is important to assure the publication of the instrument and of initial evaluation results from Iowa. Therefore, rather than a traditional format, this dissertation includes two articles to be submitted for publication. The two articles will be submitted to the American Journal of Distance Education, one of the most widely read distance education journals in the United States.

Dissertation Organization

The dissertation is organized in four sections: (1) a review of the literature related to distance education in general and more specifically to the evaluation of distance education as a method of instruction; (2) an article describing the

development of a student evaluation instrument to be used in evaluation of interactive video instruction and an analysis of the instrument's usefulness; (3) an article describing the results of a study of community college students taking classes via the ICN, and (4) a general summary. The appendices include a copy of the student survey instrument; a list of those involved in developing the survey; copies of student comments in response to open-ended questions on the survey; and copies of the human subjects approval forms.

DISTANCE EDUCATION LITERATURE REVIEW

> "Technology and distance education are inextricably linked." (Garrison, 1985, p. 235).

The boundaries between distance and traditional education are becoming blurred with the advent of recent technologies. Originally, distance education was correspondence-based, but in the last twenty or so years, it has become more telecommunications-based (Garrison & Shale, 1987; Barker, Frisbie, & Patrick, 1989). Keegan (1980) notes that there is current emphasis on video and computer based distance education, especially in the United States and typically in higher education programs. With each new technology, shifts are occurring in the concept of distance instruction, particularly in terms of assumptions about interaction and independence (Garrison, 1985; Garrison & Shale, 1987; Barker, Frisbie, & Patrick, 1989).

In the following pages, definitions of distance education from several authors will be reviewed and factors contributing to the increased demand for distance education will be listed. Evaluation models in distance education will be discussed and attitude assessment instruments used in evaluation of distance education programs will be presented. A brief review of studies related to distance education students also is included. These studies look at student motivation, persistence, achievement, and satisfaction, as well as compare distance education with traditional classroom instruction.

History and Definition of Distance Education

> "...the distinguishing feature of distance education is that it is a means of extending access to education to those who might otherwise be excluded from an educational experience." (Garrison & Shale, 1987, p. 10).

What is Distance Education?

> "The essence of distance education is communication, and ultimately, learning... ." (Draper, 1987, p. 65).

Several definitions of distance education have been proposed in the literature. Keegan (1980) reviewed and summarized various definitions, including those of Holmberg, Peters, and Moore. Holmberg focuses on two elements: (1) separation of teacher and learner and (2) the planning of an educational organization. Moore includes three elements: (1) separation of teaching and learning, (2) use of technical media, and (3) the possibility of two-way communication. Peters introduces an industrialized model of distance education with six components: (1) separation of teacher and student, (2) influence of an educational organization, (3) use of technical media, (4) provision of two-way communication, (5) possibility of occasional seminars, and (6) participation in an industrial form of education. Keegan's definition of distance education, one of the best known in the field, resembles that of Peters, including:

- the quasi-permanent separation of teacher and learner,
- the influence of an educational organization,
- the use of technical media,
- the provision for two-way communication, and

- the quasi-permanent absence of a learning group (Keegan, 1980).

Garrison and Shale (1987) argue that these definitions do not reflect the reality of current technologies that provide for "real time" interaction and group-based learning. They provide their own definition of distance education which includes three criteria: (1) the majority of communication is non-contiguous, (2) it involves two-way communication between and among students and the teacher, and (3) it uses technology to mediate the communication.

As distance education moves to more reliance on technological innovations, so the definitions of distance education shift to reflect the change. Christopher Dede (1990; 1991) provides a definition for technology-mediated interactive learning which includes: (1) a technological medium is interposed between direct person-to-person interaction or provides a shared environment that shapes the process of interpersonal communication, (2) the technology provides tools and experiences that enhance the collective learning of those involved, and (3) the human participant's interaction is spontaneous.

Some authors, although not calling it a definition, describe distance education in other ways. Reed and Sork (1990) discuss five "commonalities" of distance education, including: (1) an adult clientele, (2) a temporal or spatial gap between the teacher and the learner mediated by instruction, (3) an institutional base, (4) increased access to learning opportunities by disenfranchised populations, and (5) greater individualization to provide opportunities that meet the unique needs of the learner.

Stone (1992) compares distance education and traditional instruction, identifying nine points where the two differ. In distance education, (1) students are more heterogeneous, (2) student records must be more accurate, (3) there are

more problems with student assessment, (4) special provisions must be made for student support services, (5) it is more capital intensive than traditional instruction, (6) development of courses is more complex and requires specialized staff, (7) there is a need for more organization, (8) problems in planning and scheduling are magnified, and (9) cost structures are more related to production costs.

Difficulties in defining distance education are complicated by the ever-changing nature of the field. Schlosser and Anderson (1993) conclude that no one theory or definition can fit the wide array of distance education practices, from correspondence, to television, to interactive video instruction. These authors suggest that as distance education incorporates new technologies and the media becomes more transparent, perhaps "good education theory and good distance education theory will be one and the same." (p. 14).

The Demand for Distance Education

> "For demographic, economic, political, and pedagogical reasons... distance learning is emerging as a vital strategy for American education in the 1990s" (Dede, 1990, p. 247).

Telecommunications involving cable, fiber-optics, microwave, slow scan, satellite, and microcomputers have expanded educational opportunities (Barker, Frisbie, & Patrick, 1989) and educational efforts involving these media will continue to increase for a variety of reasons. Christopher Dede (1990; 1991) describes some of these reasons. First, technological advances in fiber optics and other areas are driving the emergence of new technologies. Second, technologies are becoming more affordable. Third, demographic forces and the growing diversity of learners are creating a need for pooling instructional capabilities.

Distance education is seen as a method of dealing with problems in scale (not enough students in one location), rarity (educational opportunities not available locally), and style (learners with different cognitive and emotional needs). Fourth, economic forces are driving American companies to use more advanced information technologies, and, as a result, the role of workers will change. Fifth, political forces are demanding higher outcomes and more advanced courses for students. Sixth, education is seeing changes in pedagogical practices. Distance education is seen as a medium where there can be a wider range of student skills, a reliance on higher quality teachers, and greater opportunities for students than there are available in traditional classrooms (Dede, 1990; 1991).

Further factors are identified in the literature. Demands of adult students are leading to increases in the use of distance education. Although in recent years, secondary schools have become more involved in distance education activities to expand the curriculum and meet the needs of special populations, distance education has historically been primarily targeted to the adult population (Davis, 1983). Colleges and universities have seen enrollment growths in the nontraditional student population, those attending part-time and over age 22 (Jorgensen, 1986; Knapper, 1988). Obsolescence in job skills, special movements demanding equal opportunities, and business demands for training and retraining are fueling adult demands for education. These adult students, typically located at a distance from the institution, are demanding greater and easier access to instructional opportunities.

Another force driving the expansion of distance education, particularly at the K-12 level is the federal government. In 1987, Congress authorized an initiative to promote use of telecommunications in K-12 education called the

Star Schools Program Assistance Act. The program was aimed at improving instruction in mathematics, science, and foreign language, particularly in small or remote schools, through the use of satellite or other distance technologies. Initial funding was provided to multi-state public and private consortia offering satellite instruction to large numbers of K-12 students (Wilson, 1990; Simonson, 1994).

The Star Schools program also is pushing new technologies to the forefront of distance education through the funding of demonstration projects utilizing fiber optic voice, video, and data transmission. In 1992, the state of Iowa received a Star Schools grant to demonstrate the use of fiber-optic technology to provide live, two-way full-motion interactive instruction which allows greater levels of interactivity than previous forms of distance instruction (Simonson, 1994). The grant allowed the state to equip over 100 fully interactive video classrooms in community colleges, universities, and K-12 schools.

Iowa, with its focus on two-way fiber optic video instruction, illustrates the shift in distance education to group methods of instruction which allow "...sustained interaction among teacher and students..." (Garrison, 1990, p. 18), similar to the traditional classroom. As one author stated,

> What really changes the concept of distance education is the fact that we can electronically assemble a class of students who may interact not only with the teacher but with each other. The result is that distance education is no longer necessarily an independent and isolated form of learning but instead, begins to approach the interactive ideal of an educational experience. (Garrison, 1990, p. 15).

The new technologies in distance education are widening the communications channels between student and instructor, channels that were limited in earlier forms of distance instruction. More interactivity is now possible between and among participants in the distance learning environment. As Dede (1991) states, "The greater the interactivity of a medium, the more feedback can be communicated to motivate and individualize learning: having a friend teach you to ride a bike is more effective than is watching a videotape on the topic." (p. 147). But with the advantages of the new technologies also come new burdens for instructors and learners. Technological complications can disrupt communications, classroom management problems can disrupt learning, and a shortage of teachers trained in the mechanics and techniques of distance teaching can lead to ineffective instruction (Massoumian, 1989).

Research and Evaluation in Distance Education

> "Ultimately the value or purpose of research in an applied field is to improve the quality of practice of that discipline." (Merriam & Simpson, 1984, p. 6).

Studies in the field of distance education did not appear until after World War II and during the 1970s and 1980s most of the research done in the field came from large distance education universities, many of them outside the United States (Holmberg, 1987). Research needs in distance education vary. Saba and Twitchell (1988) call for more systems research to look at how parts of the distance education system affect one another and the system as a whole, how the system interacts with the social context, and what policies will move the system toward future goals. Morgan (1984) and Draper (1987) promote the use of

qualitative research in distance education, particularly focused on student learning and psychological aspects. Sparkes (1983) claims there is a need for research in the area of pedagogy and feedback theory as it relates to distance education. Hough (1984) and Hayes (1990) suggest studying distance education in the context of adult learner theories, while Coldeway (1988) claims there is a need for more research in the effects of technology on behavior as well as in the context of adult development. Another area that has attracted attention is the evaluation of distance education programs (Holmberg, 1987).

The Importance of Evaluation

> "Educational evaluation is the process of making judgments about the merit, value, or worth of educational programs." (Borg & Gall, 1989, p. 742).

Evaluation attempts to determine the quality or value of something and is done either (1) formatively to improve and to promote revision or (2) summatively to describe an outcome or assess overall effectiveness (Coldeway, 1988; Alaska University, 1990). Coldeway (1988) suggests that evaluation should be built into the distance education process and should focus particularly on components of the system that directly impact learners.

Evaluation can help distance educators understand the effects of this mode of instruction. Formative evaluation, in particular, can be used to assess program weaknesses and areas for improvement (Eiserman, 1987). Eiserman (1987) and Croft (1992) believe that until the field of distance learning matures, research and evaluation efforts should be focused on improving the practice rather than on testing hypotheses.

Issues important to be addressed in evaluation of distance education are satisfaction of students and perceptions of faculty (Tovar, 1989). Feedback from participants can help in redesigning the program (Jorgensen, 1986; Reed & Sork, 1990) and making instruction more effective (Alaska University, 1990). Lambert (1986) describes one of the benchmarks of quality distance learning as "happy graduates."

The purpose of evaluation is to determine what works and what doesn't, how well students are doing, and how the instruction can be improved; it helps in assessing efficiency, effectiveness, and outcomes as well as in assessing user satisfaction (Alaska University, 1990; Rumble, 1986). Evaluation also adds to the body of knowledge on distance delivered instruction (Alaska University, 1990). Biner (1993) and Biner, Dean and Mellinger (1994) suggest that distance education evaluation efforts should start with the assessment of student attitudes and opinions preceding assessment of learning outcomes, claiming that the study of learner satisfaction in distance learning programs has been neglected although it is an important criterion by which to judge the effectiveness and success of distance programs.

Evaluating Attitudes

> "As important as it is to determine the effectiveness (producing the desired effect; efficiency) of an innovation, we must invest as much energy in determining the 'affectiveness' (influencing the emotions) in order to assure maximum usage of our investments." (Wilson, 1990, p. 13).

Attitudes can be important outcomes of the educational process, predictors of academic success, and indicators of program effectiveness (Kifer, 1992).

Measurement of attitudes in distance education has received less emphasis than on measurement of achievement, even though attitudes can affect student learning and performance (Feasley, 1987). Attitudes have three dimensions (affective, cognitive, and behavioral intent) with the affective component as the core. Attitudes are related to behavior. (Kifer, 1992). Typical methods of measuring attitudes include interviews and questionnaires, both generally using the self-report method. Likert-scale rating is a well-known technique for measuring attitudes (Feasley, 1987; Kifer, 1992).

One theory of evaluation that focuses on attitude measurement and has been used in the field of distance education is that of Kirkpatrick (Biner, Dean, and Mellinger, 1994; Biner, 1993). The Kirkpatrick model, originating in the field of training and development, consists of four steps: (1) measurement of reactions, (2) assessment of learning, (3) measurement of changes in behavior, and (4) assessment of impact or results (Kirkpatrick, 1979). Reaction, the first component to be measured, is defined as how well a participant liked a particular program and is the same as measuring the feelings or attitudes of the participants.

Kirkpatrick (1979) argues that it is important to determine how people feel about the programs they attend because people must like a program in order to obtain the maximum benefits from it. The more favorable a participant's reactions, the more likely he/she is to pay attention and to learn. Biner (1993) indicates that negative reactions can undermine support for a program and negatively affect learning. By assessing attitudes, changes can be made in the program to address areas where there are negative reactions. Maintaining high learner satisfaction can result in lower attrition rates, greater numbers of

referrals, higher student motivation, greater commitment to the program, and better learning (Biner, Dean, & Mellinger, 1994).

Kirkpatrick (1979) claims that to evaluate a program effectively, one must begin with measuring in an organized way the reactions of people who participate. This assessment of attitudes must come before assessments of learning, changes in behavior, or the impact or results of the program. Kirkpatrick (1979) also provides some guidelines for developing instruments to measure the reactions or attitudes of participants: (1) determine the items or what is to be measured, (2) use a written comment sheet covering these items, (3) design the form so that reactions can be tabulated and quantified, (4) obtain honest reactions by making the forms anonymous, and (5) allow for additional comments.

Review of Attitude Instruments in Distance Education

> "In any type of instruction - conventional classroom or distance delivery - the emotional dimension is as important as the cognitive." (Dede, 1990, p. 253).

Assessment of attitudes in distance education has been done using a variety of instruments. Some of these instruments are described next. In general, this review focused on instruments with defined constructs or instruments used by federally funded Star Schools projects.

Survey using Kirkpatrick model. Biner (1993) used the Kirkpatrick model of evaluation as a basis for developing an attitude assessment instrument for use in telecourses offered at the university level. The steps used in creating

the instrument included (1) generating items related to course satisfaction, (2) defining underlying constructs, (3) determining the content validity of items, and (4) writing and pre-testing the instrument. The instrument developed consisted of Likert-items and open-ended questions. A group of subject matter experts with telecommunications experience used the Q-sort method to provide some evidence of validity and reliability for the constructs developed by Biner. The constructs covered in the instrument included: (1) instruction/instructor aspects, (2) technological aspects, and (3) course management/coordination aspects.

The Telecourse Evaluation Questionnaire. Using the instrument developed by Biner (1993) as a starting point, Biner, Dean, and Mellinger (1994) developed the Telecourse Evaluation Questionnaire (TEQ). The instrument was given to 127 graduate students and 74 undergraduate students in a one-way video, two-way audio television course. Factor rotation analysis revealed seven factors: (1) instructor/instruction, (2) technology, (3) course management, (4) at-site personnel, (5) promptness of material delivery, (6) support services, and (7) out-of-class communication with the instructor. A second factor analysis was conducted following collection of the survey from an additional 105 graduate and 72 undergraduate students; findings showed that one set of data accurately predicted the other. Cronbach inter-item consistency estimates for the factors ranged from .51 to .94.

A survey to assess program components. Harrison, Saba, Seeman, Molise, Behm, and Williams (1991) used a four step process to develop a

questionnaire to assess the components of a one-way video, two-way audio distance education program with worksite participants. First, the literature was reviewed, consistent aspects were identified, and a panel of experts was asked to review the literature-based components. Items found in the literature were related to instruction (pacing, use of study groups, materials, feedback, instructional style, and relevance of coursework), management (structure, communications, resources, staff interactions, registration, policies, and leadership), and logistics (quality of audio and video, on time delivery of materials, quality of feedback, and instructional environment).

Second, students, instructors, managers, and clients (businesses) were asked to comment on the components through interviews of a randomly selected sample. Interview responses were used to create sub-components using the critical incident technique. Four major components were identified from the interviews including: (1) instruction, (2) management, (3) telecommuting, and (4) support. Sub-components also were identified and included: student/ instructor interaction, student/peer support, logistics, and delivery system under the instruction category; staff responsiveness, technology, planning, and communications under the management category; costs, unique features, and content under telecommuting; and management support and client support under the support heading.

Third, an effectiveness rating scale was developed and the 566 items generated in phase two were categorized using qualitative techniques. Three content experts then were asked to classify the items and achieved a second round agreement level of 86%. The items were grouped into four dimensions

(management, instruction, telecommuting, and support) and an 89 item instrument was developed using Likert scales.

Fourth, the survey was field tested on 98 students at 14 distance learning sites (86% response rate). Cronbach coefficient alpha levels were determined and ranged from .65 to .90.

The Distance Education Student Progress Inventory. Kember, Lai, Murphy, Siaw, and Yuen (1991; 1992) developed an instrument named the Distance Education Student Progress inventory (DESP) based on Tinto's model of retention. The inventory has four scales with 17 subscales that were determined using a factor analysis of responses from 1,060 students enrolled in four college-level distance education courses. The scales are: (1) approach to learning, (2) motivation, (3) language ability, and (4) integration of study demands. Interviews with 32 randomly selected students were used to establish the validity of the scales. The instrument uses a five-point Likert scale. A path analysis including the four factors and background characteristics found that the model could explain 80 percent of the variance in course persistence among a group of college-level distance education students in Hong Kong. The students were taking correspondence courses with tutorials. Reliabilities for the factors (Cronbach alpha) ranged from .55 to .68.

An instrument to assess interactivity. Baynton (1992) developed an instrument to assess the interactive aspects of distance education. The instrument contains 28 Likert items and several open-ended questions and was reviewed by a panel of experts and pre-tested with a group of adult learners. The

instrument was given to two groups of teleconference students (580 in one group and 189 in the other) with an overall response rate of 56 percent. Factor analysis resulted in six factors: (1) student competency, (2) teacher support, (3) choice, (4) time flexibility, (5) value orientation, and (6) access to resources. Three major factors accounted for most of the variance (student competency, teacher support, and choice). The author reported a Cronbach reliability for the instrument of .81. Open-ended responses indicated that other factors should be included in the model such as level of academic support, emotional and psychological support, and predispositional and environmental variables.

The Eastern Iowa Community College Survey. Eastern Iowa Community College developed a student evaluation instrument for their Televised Interactive Education (TIE) system (Kabat, 1991; Kabat & Friedel, 1990). In 1989, the college received a grant from the First in the Nation in Education (FINE) Foundation to develop and pilot a model for assessing the effectiveness of two-way interactive learning systems for community college students. The model included six indices: (1) system use, (2) enrollments, (3) average grade per site, (4) student evaluations of the system, (5) evaluation of students who have withdrawn, and (6) instructor evaluations. The student evaluation survey uses Likert-scale items. Items were analyzed individually; no constructs were defined and no reliability information was provided.

University of Regina Survey. A Canadian survey (Keston & Burgess, 1984) used in a fiber-optic television class focused on four factors related to student success: (1) support systems including assistance to the instructor,

delivery of assignments and tests, and enrollment and registration procedures; (2) technical systems including quality of transmissions and technical difficulties; (3) student achievement and perceptions of the value of the course; and (4) the quality of interactions between instructors and students, particularly for off-campus students. No reliability estimates were provided.

Other student evaluation instruments. Other student evaluation instruments have been developed through several projects funded by the federal Star Schools program. The four initial recipients of funding were multistate partnerships including Technical Education Research Centers (TERC), Satellite Educational Research Centers (SERC), TI-IN United Star Network, and Midlands Consortium (Wilson, 1990). Student evaluation instruments developed by the Midlands Consortium focus on items related to instruction (Speth & Poggio, 1989; University of Mississippi, 1991). The TI-IN student questionnaire includes items asking why students took the course, attitudes toward the materials, test turnaround time, use of hand-sets, access to technology at home, ratings of the facilitator and teacher, and whether the course met expectations (TI-IN, 1990). Items are analyzed individually for both the Midlands and TI-IN surveys. No reliability information is provided.

Summary of assessment instruments reviewed. Among the survey instruments with constructs defined, several areas of focus appear consistently. Table 1 presents a list of these areas and an indication of the instruments that measure each construct or one similar in nature. The constructs that appear most consistently deal with the areas of instruction, technology, management,

and support. Peer interaction was only specified in two of the instruments , although the issue of interaction in the classroom appears consistently in the literature. Site personnel, material delivery and communication were areas addressed in one of the instruments. It could be argued that these areas are too specific and are part of a broader construct, such as management, coordination, or support. Perception of value indicates a construct designed to assess satisfaction. Learning style, student competency, and student external factors are not appropriate constructs for evaluating the effectiveness of a system, since they are not factors an institution can control.

Table 1. Areas of emphasis found in survey instruments.

	Instrument					
Area	**A**	**B**	**C**	**D**	**E**	**F**
Instructor/Instruction	X	X	X		X	X
Technology/Technical Aspects	X	X	X			X
Management/Program Coordination	X	X	X		X	X
Support		X	X		X	X
Site Personnel		X				
Material Delivery		X				
Communication		X				
Learning Style				X	X	
Student Competency					X	
Student External Factors				X	X	
Peer Interaction			X			X
Perceptions of Value						X

Students and Distance Education: A Review of the Findings

> "Before one can suggest a cure for a problem, it is necessary to first determine if there is, indeed, a problem." (Schlosser & Anderson, 1993, p. 17).

Most of the studies in distance education are recent and have been published within the last ten years. In reviewing the literature, it seems clear that the focus of studies related to distance education students has generally been in one of five areas: (1) looking at the motivations of students taking distance education courses and describing the population; (2) determining factors that affect student persistence in distance education courses; (3) assessing factors related to success and achievement in distance education programs; (4) measuring attitudes of students toward the program and determining program effectiveness in terms of student satisfaction; and (5) comparing distance education to traditional instruction.

Motivation for Participation in Distance Education

Several studies have looked at why students choose to take distance education courses and what types of students typically enroll. Some of these studies are discussed below.

Motivation studies. Evaluation of an Annenberg/Corporation for Public Broadcasting (CPB) project (Dirr, 1986) found that over two-thirds of students taking televised courses were female and 77 percent were older than traditional college students. The major reason for choosing a television course was

convenience. Students were generally satisfied with the courses and would recommend them for other students to take. Effectiveness of the courses was not studied.

Another Annenberg/CPB study (Hezel & Dirr, 1990) looked at constraints to enrolling in television courses by conducting interviews with 100 students in four institutions. For eight of ten students, time was the primary constraint. Other barriers included work and family responsibilities and distance from campus. Distance students valued communication with the instructor highly, but indicated that interaction with other students was less important.

An evaluation of TVOntario (Kuplowska, 1987) found that participants in the televised courses were likely to be highly educated, employed females between the ages of 31 and 50. Motivations for participation included job related, personal interest, and convenience. The majority said they learned a lot, had their expectations met, and were interested in taking more courses via television.

Undergraduate and graduate students at the University of Calgary involved in an audio teleconferencing class were surveyed to assess the strengths and weaknesses of the delivery method. Of the 1,059 students surveyed, 522 responded. Most were female and taking the course for career related reasons (Garrison, 1990).

A study by May (1993) looked at distance education and adult female learners. Based on interview data, the author concluded that less interaction occurred and that the women preferred solitary study. However, research on women outside the field of distance education (Gilligan 1982; Belenky, Clinchy,

Goldberger, & Tarule, 1986) would indicate that women have a higher need for interaction.

A study by Wilson (1990) reported the results of a survey of 75 high school seniors (93% Black) taking Advanced Placement (AP) courses at three high schools. About 80 percent reported taking the courses to see what college courses would be like. Nearly all (92%) were glad they took the course although many felt the instructor did not make the subject interesting (45%) or stimulating (47%).

Motivation findings summarized. In summary, it appears that college level distance education courses appeal to older, female students who enroll for convenience and personal or career related reasons. High school students enrolled in distance education courses tend to be high achievers taking advanced courses who want to experience what a college-course would be like.

Achievement within the Distance Environment

Achievement is an area where many studies have been conducted with students in various distance learning environments. These studies, some of which are summarized below, have generally indicated that distance students perform at a level equal to students in traditional classrooms.

Achievement studies. A study of 446 Open University students (James, 1984) found that students under age 30 and in the 30-40 age group had higher scores on end of the year exams than students over 40. However, there was no difference in the final course assessment.

Bernt and Bugbee (1993) studied 300 adult students in distance learning programs and also found age to be a significant variable in achievement. This study found that older students preferred more self-directed learning which was more problem oriented and less curriculum oriented, had lower expectations of academic success, and needed more feedback and contact. The authors conclude that attitudes may contribute more to achievement in older students.

A study of community college students in telecourses (Dille & Mezack, 1991) found that internally oriented students were more likely to achieve higher grades. Those who were oriented towards inanimate objects rather than people, those who had more credit hours, and older students also performed better. Previous experience with telecourses was not a significant predictor of success, although the authors expected it to be.

Whittington (1987) reports that a review of the literature shows no differences in academic performance between remote and origination site students. A study by Ritchie and Newby (1989) found that students in a distance class with no instructor present had higher levels of achievement than students in the studio class with the instructor present. However, this study involved only 26 undergraduate students.

Studies of a community college interactive television system (Kabat, 1991; Kabat & Friedel, 1990) found no significant difference in grades between origination and remote site students. Keston and Burgess (1984) also found no difference in grades among origination and remote site students in an interactive fiber-optic television course.

Another study comparing origination and remote site students in two courses (Treagust, Waldrip, & Horley, 1993) found that remote site students were

more tolerant of the limitations of the technology and saw greater potential for the medium, although students at both sites believed the method reduced interactivity. There were no differences in grades between the two sites, but there was a relationship between the failure of interactive television instructors to be prepared and the learning success of students.

Cookson (1989) reports that studies related to academic performance identify level of education and high school GPA as the most significant predictors of achievement. One study reported that grades were enhanced by the quality of the presentation, variety of media, and planned student-centered support. In an evaluation of a TI-IN teacher development institute, factors related to higher student grades were positive evaluations of the facilitator, high motivation levels, and few technical problems.

Achievement findings summarized. Overall, it appears that age and level of education may have an impact on achievement in distance education courses. Other student-related factors that may impact achievement include motivation orientation and locus of control. Factors external to the student that have been found to affect achievement include the quality of the presentation, the effectiveness of the teacher or facilitator, and technical problems. In general, presence of a student at a remote or origination site appears to have no impact on achievement, although there were some differences in perceptions of the program.

Persistence in the Distance Education Program

Coggins (1988) suggests that student persistence and satisfaction have not been studied as extensively as student achievement, although with drop-out rates of 30 to 80 percent for distance education programs, these two areas need to be researched. Coggins (1988) indicates that age, gender, number of years out of school, and level of formal education are related to persistence and that preferred learning style is related to both persistence and satisfaction. Other authors have also suggested a relationship between retention or success in a distance education program and psychological factors or learning styles (Atman, 1988; Ehrman, 1990).

Persistence studies. In a post-hoc study using a stratified random sample of 210 students (response rate of 78%) previously associated with the University of Wisconsin Extended Degree Program, Coggins (1988) found those intending to complete a program and those having higher levels of education were more likely to persist. Use of the Canfield Learning Style Inventory found differences in five subscales: (1) inanimate objects, (2) people, (3) expectancy of an 'A', (4) expectancy of a 'C', and (5) overall expectancy. Those who persisted scored higher on inanimate objects, expectancy of an 'A', and overall expectancy and lower than those who dropped out of the program on people and expectancy of a 'C'. The study also indicated that drop-outs had a higher preference for interaction with instructors and other students.

Some researchers have sought to apply Tinto's model of retention to distance education programs (Kember, Murphy, Siaw, & Yuen, 1991; Kember, Lai, Murphy, Siaw & Yuen, 1992; Sweet, 1986). One study (Sweet, 1986) surveyed 356

adult students in a distance education program and applied Tinto's model directly. The author found that student-faculty interactions were especially important in distance education, and that direct telephone contact between the faculty member and the student significantly influenced student commitment and persistence. However, the author concluded that the Tinto model offered only a partial explanation for dropout behavior.

Two articles (Kember et al., 1991; Kember et. al, 1992) report the results of a study using a modified version of the Tinto model of retention. The study found entry level characteristics of adult students were not good predictors of persistence; external attribution and academic incompatibility led to greater drop-out behavior.

Dille and Mezack (1991) conducted a study of community college students in telecourses to look at retention. They surveyed 188 adult students, predominantly female and Caucasian, using a demographic questionnaire, Rotter's Internal-External Locus of Control Scale (RIELC) and Kolb's Learning Style Inventory. Using analysis of variance and regression techniques, the authors found that internally oriented students were more likely to persist. Other variables associated with success in the telecourses included lower concrete learning style scores (those with high scores tend to be people oriented and miss personal interaction), higher GPA (indicating stronger academic skills), more academic credit hours (those with more credit hours may have better study habits and more confidence), and age (older students performed better).

Cookson (1989) reviewed the research on distance learners and found that outcomes research generally fell into three areas (retention, student profiles, and institutional factors) with outcomes generally defined as persistence, academic

achievement, course satisfaction, and intent to enroll in other courses. Cookson concluded that withdrawal studies generally found external variables not related to the institution as the primary explanatory factors in student persistence. The author (Cookson, 1988) reported the findings of several persistence studies. One qualitative study found persistence related to the program; drop-outs indicated dissatisfaction with the teaching/learning method, study materials, and turn around time. A second study found perceptions of the program accounted for 20 percent of the variance in persistence. Another study found that course satisfaction accounted for 28 percent of the variance in course completion.

Persistence findings summarized. To summarize, many of the factors related to persistence were the same factors found to be related to achievement: age, level of education, an orientation toward inanimate objects rather than people, and an internal locus of control. Not surprisingly, achievement (GPA) was also related to persistence. Other factors related to persistence appear to be level of teacher-student interaction and student satisfaction with the program.

Satisfaction with the Distance Education Program

Satisfaction with distance education has also been studied in a variety of distance education contexts. Although most studies have found that students are satisfied, some differences have been found between types of students and some suggestions have been provided for improving distance delivered instruction.

Televised instruction. Chute, Balthazar, and Poston (1988) reviewed five years of research conducted by the National Teletraining Center (NTC) and found high levels of student satisfaction with, but still some resistance to, televised training. The studies found that students attributed their ability to learn successfully in telecourses to effort, ability, attitude, quality of materials, the instructor, and the instructional design. Suggestions for improving the telecourse experience were to focus attention on instructional elements, social needs, and innovation-adoption aspects.

James (1984) found students in the over 40 group were more satisfied than the younger students with distance education programs at the Open University. The author concludes that the age of students is important in distance education programs, impacting both affective and cognitive dimensions of behavior, with more influence on the affective.

Teleconferencing. Students in teleconferencing classes at the University of Calgary indicated that they were satisfied with the sound quality and the support received in the use of the equipment. Most were willing to take the course despite any technological inconveniences and would recommend it to others. A majority (62%) said interaction with the instructor was essential and most (90%) liked interacting with other students at the site, although ten percent indicated that on-site interactions were distracting. Students also indicated that there were difficulties with getting materials on time (Garrison, 1990).

Heinzen and Alberico (1990) used a retrospective pre-post design to survey 360 professional nurses, engineers, and supervisors on the use of teleconferences for instruction. The instrument used five-point Likert scales. Respondents

indicated that teleconferencing was an effective motivational tool that sustained interest, that it was successful as a method of training for developing skills, and it was an effective tool for communication. Participant responses suggested, however, that they thought the experience would be more interactive than it was.

Satellite instruction. While most studies in distance education focuses on adult students, satellite instruction is one area where much of the recent literature focuses on secondary students and teachers. This may be attributed to the federal Star Schools project which has expanded the use of satellite delivery to high schools across the country. Several studies reported in the literature look at students taking courses offered by TI-IN and the Midlands Consortium, two of the original recipients of Star Schools funding.

TI-IN. In 1987, a study looked at acceptance of TI-IN by participants and attempted to evaluate the overall effectiveness of the program using mailed surveys and telephone interviews (Barker, 1987). Although student-teacher interaction was rated as very good to excellent, students still preferred traditional instruction. Aspects students liked most included the variety of classes, the personality of the teacher, and the fact that the instruction was interesting. Aspects students liked least included too much homework, communication difficulties with the instructor, the impersonality of the medium, and poorly prepared teachers. Recommendations to improve the program included improving audio quality, using bigger TV screens, keeping the equipment repaired, and getting better teachers.

TI-IN also evaluated teachers taking satellite courses for college credit (Barker & Platten, 1988) and found that most felt it was somewhat harder than traditional instruction, few initiated telephone contact with the instructors, and most thought the lesson objectives were well presented, the picture was clear, the instructors voice was easy to understand, and assignments were promptly returned. What students liked most about taking a satellite course was the convenience of taking a course close to home. Weaknesses of the program included call in procedures that were too slow, limited opportunities for class discussion, and limited interactions with the instructor and students at other sites. Evaluations of four TI-IN teacher development institutes (Bryan, Davenport, Hyde, & Elliott-Taylor, 1989) used observation and interview techniques rather than surveys because of the limited number of students enrolled. Results showed participants were satisfied with the experience.

Later evaluations of TI-IN programs used personal observations from site visits; interviews with administrators, facilitators, and students; questionnaires from teachers, administrators, facilitators, and students; and custom-designed information-acquisition tests of students to collect information (Bryant, Maxwell, Scott, Madsen, Rockwell, & Love, 1990). Students reported learning as much as in traditional classes and were satisfied with both teacher and site facilitator performance.

Students recommended improvement in: (1) integration of the hand-set, (2) course descriptions and syllabi, (3) communication with the schools and between teachers and facilitators, (4) efficiency of technical assistance, (5) distribution of promotional materials, (6) reducing scheduling conflicts and starting on time, (7) phone communications, (8) resolving differences in grading

scales, (9) facilitator training, and (10) transfer of materials. Respondents also suggested implementing organized meetings to discuss problems and solutions (Bryant et al., 1990).

The TI-IN report concludes that to create an optimum distance education experience, there is a need for organized facilitators, prepared instructors, administrator support, motivated students, coordination of schedules, suitable classrooms, teacher/student interaction, good production quality, use of ancillary materials, hands-on involvement, attention to pacing, and prompt turn around of homework and tests. Equipment failure was also deemed to be extremely disruptive to the learning process (Bryant et al., 1990).

Midlands Consortium. One article reports on the evaluation of a program associated with the Midlands consortium. The study (Martin, 1988) of Oklahoma schools indicated that 61 percent of the principals believed the satellite programming had significantly improved educational opportunities for students; 39 percent believed it had improved staff development opportunities. Nearly half (48%) reported a decrease in use since the first year and few (28%) kept written documentation of use of the downlink. Difficulties reported included a need for more than one classroom available, lack of information on course availability, and lack of teacher guides.

Virginia Satellite Network. Two articles also report on evaluations of the Virginia Satellite Educational Network. The network uses satellites to deliver middle and high school instruction and inservice training to small, rural schools. Site visits were conducted at 13 randomly chosen middle and high schools where superintendents, teachers, staff, and students were interviewed and classes were observed. The researchers found that on-task and

off-task interactions among students was usual, younger students needed more supervision, and that the quality of the facilitator was the most important variable in determining the success of the local instruction (Moore, Burton, & Dodl, 1991).

A later study of the Virginia system found that strengths of the program included the quality of instruction, the academic success of the students, variety in courses, and positive perceptions of students. Suggested areas for improvement included the training of facilitators, monitoring of classes, communication between instructors and facilitators, administrative support, and course information (Gibson, 1992).

Interactive television. Although experience with live, interactive instructional television spans about 20 years (Whittington, 1987), most of the research and evaluation studies of the medium have been conducted in the last ten years. Keston and Burgess (1984) used observations, analysis of video tapes, interviews and questionnaire data in a study of graduate students in a fiber-optic class. Questionnaire response rates were 33 percent for off-campus students and 62 percent for on campus students.

Observations found a lower level of interaction between instructor and student for off-campus students and found that the level of interaction among students at the off-campus site increased as the amount of interaction with the instructor decreased. Technical problems topped the list of concerns for students. Student interviews with off-campus students indicated that poor turn around time for materials, lack of access to labs, inability to contact the instructor, the poor quality of the picture, and use of instructional aids that were difficult to read

(for example, illegible writing on the blackboard) also were problems. Questionnaire data revealed that instructor techniques (use of variety, interaction, eye contact, instructional aids, and prompt return of materials) affected perceptions of the instructor and that the most successful experiences from the students' point of view were those when the instructor was perceived as a "good" instructor.

A study at the University of New England (Baker & Hansford, 1990) used Likert-scale and open-ended items to survey 38 on-campus students, 17 off-campus students, and 23 staff members using interactive television for instruction. Students were located in either a large lecture hall or a small conference room. One finding was that ratings were more positive for students attending class in the small conference room. Students particularly liked the opportunity to experience experts and to see students from other locations. Suggestions were made for (1) improving instructional aids (legibility of blackboard and instructor's writing), (2) improving sound (using more microphones, different microphones, and providing student orientation to using microphones), (3) using a larger screen or monitor, and (4) paying increased attention to instructor deficiencies as the media tends to amplify these. Off-campus students also indicated a need for more interaction and advanced notification.

Another study (Oaks, 1986) looked at the opinions of students and faculty involved in interactive television classes over a microwave system. The evaluation focused on three areas: system effectiveness, instructor effectiveness, and program strengths and weaknesses. Ratings indicated that the system was generally effective with minor technical problems. Students felt the video and

audio were clear, they could hear other students, microphones worked well, and materials were received on time. Many students, however, felt ill at ease, did not feel part of the class, and considered the medium impersonal. In rating the effectiveness of instructors, students felt the instructors provided opportunities to ask questions, the course was well organized, and they were able to reach the instructor when necessary. Negative aspects included not being able to read handwriting and the limitation of class discussions. Students who had taken distance education courses previously had higher ratings compared to students who had not taken a distance class before. Suggestions for change included (1) removing barriers that inhibit interaction, (2) using cameras that allow off-campus students to be seen close-up, (3) faculty control of camera switching, (4) better audio control at the remote sites, and (4) improved course coordination and resolution of scheduling problems.

A survey of library science and health education students enrolled in compressed video classes (Jones, 1992) found that students (1) thought the classes were well organized, (2) had positive attitudes toward the teachers and distance education, (3) were satisfied with the room coordinators, and (4) thought they learned as much as in a traditional class. Ratings were lower on items related to the technology. A moderate number indicated problems with using the microphones.

Kabat (1991) and Kabat and Friedel (1990) report that community college students taking interactive television courses (both at origination and remote sites) were satisfied with the organization of the class, ability to reach the instructor, encouragement to participate, an environment conducive to learning, ease of use of the microphones, adequacy of the TV monitors, sound quality, and

interaction with the instructor. Both remote and origination site students also indicated that they were learning as much as in a traditional class and that they would take another distance class. There were some areas where there were significant differences between remote and origination site students, with the remote site student ratings consistently lower. These areas included adequacy of visual aids, instructor awareness of remote site students, and adequacy of turn around time for assignments and tests. A five year evaluation of a Wisconsin interactive television program (Morehouse, 1987) found no differences in levels of interaction or student attitudes between origination and remote sites.

A study by Silvernail and Johnson (1992) examined the relationship between student perceptions of interactive television and instructor evaluations. The survey of 93 graduate students found a relationship between satisfaction and the amount of student involvement, but no relationship with instructor ratings. Fulford and Zhang (1993) also found a correlation between perceptions of interaction and satisfaction with instruction. Their research focused on 233 K-6 teachers taking interactive television courses in five locations in Hawaii and assessed personal interaction (individual involvement in the class), overall interaction (involvement of other members of the class) and satisfaction (the value and quality of instruction) using six-point semantic differential scales. They found that learner satisfaction could be attributed more to overall interactivity than to individual interactivity and that perceptions of classroom interaction declined with increased exposure to the medium.

Satisfaction findings summarized. In reviewing the attitude studies it appears that several perceptions were consistently found to be related to

satisfaction, regardless of the medium, whether it be print-based or interactive television using fiber-optics. These were perceptions about the amount of interaction in the class between students and instructor and among students in the class; the promptness of materials transferred between student and instructor; and the quality of the instructor and the instruction received.

Two factors related to satisfaction with telecommunications-based instruction were (1) technical support and training in use of the equipment and (2) the quality of the technology, i.e. the audio and video quality. In addition, there were several areas that were consistently related to satisfaction when discussing satellite instruction and other interactive television environments such as microwave, compressed video, and fiber optics. These areas included (1) quality of the local facilitator, (2) administrative support at the local level, (3) scheduling coordination, and (4) access to adequate information. In addition, it appears that students located at remote sites are less satisfied compared to students at origination sites where the instructor is generally present.

Comparisons with Traditional Courses

In Linking for Learning it states, "In most instances, distance learning appears to be as effective as on-site, face-to-face instruction in the classroom. (U.S. Congress, 1989, p. 9). Much of the research in the area appears to bear this out.

Comparison studies. Whittington (1987) reviewed over 100 published and unpublished documents on the effectiveness of televised instruction and found that for telecourses, satellite courses, and interactive television, there were no differences in the amount of learning, student achievement, or in GPAs

between on-campus students and students participating in telecommunications based courses. Whittington concluded that students in television classes achieve as well as students in traditional classes and that effective instructional design and pedagogical techniques are the most important factors in student achievement, regardless of the medium used. Other researchers concur with this finding.

After reviewing five years of research on teletraining conducted by AT&T, Chute, Balthazar, and Poston (1988) concluded that teletraining students learned as well or better than students in face-to-face courses. Results from five years of evaluation of Minnesota's technology demonstration project found no significant differences between interactive television and traditional instruction in nearly 1,000 grades analyzed (Morehouse, 1987). Student performance was also compared by McCleary and Egan (1989) using essay and objective examinations with no differences found between distance and on-campus students. McCleary and Egan (1989) also found no differences between the two groups in the amount of material covered or the level of difficulty of the class, and no differences in ratings of teacher effectiveness.

A study using pre and post achievement and attitude measures compared high school students involved in TI-IN science courses via satellite and a control group and did find a difference in achievement with the satellite students scoring higher. No differences were found in the attitudes of the two groups. There are other studies reporting differences between conventional and television instruction in areas other than achievement.

One study (Egan, Welch, Page, & Sebastian, 1992) compared teacher education and graduate students in a traditional classroom (N=154) with

students taking courses over a microwave system (N=93) and those taking videotape courses (N=267) on ten variables. Among the ten variables, students with traditional instruction had higher rating on six when compared to microwave instruction and on eight when compared to videotaped instruction. Traditional courses had higher ratings on organization of course content, clarity of course content, relevance of course objectives, integration of text and assignments, value of visual materials, and value of text screens compared to the other two modes of instruction and also higher ratings on adequacy of the presenter and holding student interest when compared to videotaped courses. The two areas where no differences were reported were amount of material covered and level of difficulty. Comparison of microwave and videotaped courses showed only one difference; the value of visual materials was rated higher in the microwave course.

A study by Ritchie and Newby (1989) also found students in traditional courses had significantly higher ratings than students in distance courses in several areas. The traditional students rated the instruction as more enjoyable, perceived greater opportunities to ask questions, had greater levels of involvement in the instructional process, and felt more comfortable. The authors concluded that interaction had an effect on attitudes, with the most positive perceptions reported by those who also had more interaction.

Wilkes and Burnham (1991) compared 156 students in the Utah State Electronic Distance Education (EDE) system to 185 extension program students taking off-campus courses with an instructor present (face-to-face). They found that level of involvement was highly correlated with satisfaction in the EDE setting. Comparison of the two groups showed that the face-to-face students had

significantly higher scores on satisfaction, involvement, and material environment than the EDE students. Kember, Lai, Murphy, Show, and Yuen (1992) compared different formats of distance education and also found that satisfaction levels increased as perceptions of involvement and interaction increased.

Comparison findings summarized. Overall, the evidence suggests that there are no differences in achievement between students taught in a traditional classroom and those in distance classrooms, whether achievement is measured by GPA, grades, exams, amount of material covered, or difficulty of the class. However, the preponderance of the evidence suggests that there are differences between the two instructional modes in other areas. In general, traditional classes were found to have higher levels of interaction and involvement, higher perception ratings on items related to the instruction (adequacy of the presenter, relevance of the material, quality of visual materials, etc.), and higher levels of satisfaction. As Schlosser and Anderson (1993) concluded, "In spite of the fact that students perform as well in a distance education environment as in a traditional classroom, and appreciate the flexibility and convenience offered by distance education, students prefer the traditional classroom." (p.28).

Summary of the Literature Review

The literature reveals that technology is changing the practice of distance education. Distance education is moving toward more interactive environments. No longer is the isolated individual taking a correspondence

course the essence of distance education. Groups of students, using new technologies, can now interact in "real time" not only with the instructor, but also with other students. This trend is expected to grow as demands for distance education increase, particularly among adult populations.

As the technology changes and new distance education programs evolve, there is a need for evaluation. Evaluation of this mode of instruction can provide insights for improving practice in the field of distance education. One component of evaluation is the assessment of student attitudes. Several instruments have been developed for use in assessing student attitudes. Most of the instruments with constructs defined have been developed for college-level audiences; instruments for K-12 audiences developed by several federally funded programs have no constructs defined.

The constructs that appear in the literature frequently incorporate assessment of student attitudes toward the instruction or the instructor; toward the technology or the technical aspects of the program; toward management of the program or coordination functions; and toward support structures. These factors appear to contribute to student satisfaction with the distance education experience. Interactivity with other students is another area that is referred to in the literature as a key component affecting satisfaction with the new technologies.

Studies of distance education students have focused on their motivation for participation in distance learning activities, factors that affect their persistence and achievement in distance education programs, and their satisfaction with the experience. The literature suggests that adult students enroll for personal or career-related reasons and prefer the convenience of distance instruction.

Although there appear to be no differences in achievement levels between remote and origination site students or between students taught via distance instruction versus traditional classroom instruction, there are differences in achievement based on other factors such as age, level of education, motivation, and locus of control. Persistence appears also to be related to these variables as well as to the level of interaction in the classroom and satisfaction with the program.

Studies of student satisfaction suggest that the level of interaction in the class, course management issues such as material transfer between sites, and the quality of instruction are related to perceptions of satisfaction regardless of the instructional medium. Two other factors related to satisfaction in telecommunications-based environments were technical support and the quality of the technology. Additionally, in two-way interactive environments, local facilitation and support, scheduling coordination and access to information appear related to satisfaction levels. The literature would also suggest that remote site students are less satisfied than students at sites where the instructor is present and that students receiving traditional instruction are more satisfied than those receiving distance instruction.

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EVALUATING STUDENT ATTITUDES IN AN INTERACTIVE TELEVISION CLASSROOM: DEVELOPMENT OF AN INSTRUMENT

A paper to be submitted to the American Journal of Distance Education

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Introduction

> "Advances in telecommunications technologies have created an increasing interest in distance education in educational settings including K-12, colleges and universities, the professions, and business and industry" (Dillon & Walsh, 1992, 5).

Distance education is a rapidly expanding form of educational delivery. Although the majority of distance education programs around the world are print based, there is an emphasis in the United States on video and computer based methods of distance education (Keegan, 1980, 1988). And while there is considerable research in the area of distance education, most of it addresses print-based or earlier forms of telecommunications based environments. Little research is evident relating to two-way interactive video based instruction over fiber optic networks.

The Background

Iowa has recently invested in a state-wide, two-way, full-motion, interactive fiber optic telecommunications network, the Iowa Communications Network (ICN). Construction of the ICN was completed in October, 1993, connecting 103 classrooms across the state and linking community colleges,

universities, and local schools. In 1992, the federal Star Schools Program approved an $8 million grant to the state through the Iowa Distance Education Alliance (IDEA) to demonstrate the use of this fiber-optic system for K-12 instruction (Simonson, 1994). One of the goals of the project is to support research and evaluation in the area of distance education, particularly as it relates to the ICN.

The ICN is an innovative method of delivering instruction. In only a few areas of the state have students had previous experience with interactive instruction using microwave transmissions, and in nearly all of those areas, video transmission has been one-way. Iowa is a leader in the use of two-way interactive fiber optic technology for instructional delivery (Simonson, 1994). It is important that the effectiveness of this mode of delivery be assessed so that improvements can be made and others implementing this form of technology can learn from Iowa's experience.

The Theory

An important component in the evaluation plan of the IDEA project is to evaluate the effectiveness of the ICN for instruction. Kirkpatrick (1979) proposes a method for evaluating the effectiveness of educational programs which includes a four step process measuring (1) participants' reactions, (2) learning, (3) changes in behaviors, and (4) the overall impact of the program on desired results. Kirkpatrick defines reaction as how well participants like a particular program. He argues that it is important to determine how people feel about a program because in order to obtain maximum educational benefits, people must like the program. The more favorable the reaction, the more likely participants

are to pay attention and to learn (Biner, 1993; Kirkpatrick, 1979). While positive reactions can not guarantee learning, negative reactions can negatively affect learning and support for a program (Biner, 1993).

Measurement of reaction is the first step in evaluating a program's effectiveness. Biner, Dean, and Mellinger (1994) contend that "distance learner satisfaction is an inherently important criterion by which to judge the effectiveness or success of a tele-education course, a criterion that is arguably as important as distance learner performance." (p. 61). They argue that high learner satisfaction results in lower attrition rates, greater referrals, higher levels of motivation, greater commitment and belief in the importance of the program, and better learning. Measuring the effectiveness of a distance education program should begin then with evaluation of the reactions of participants in the program.

The Purpose

The purpose of this article is to describe the development of an attitude assessment instrument for use in the evaluation of two-way interactive technology for classroom instruction. The instrument was developed as part of the Iowa Star Schools project.

By assessing participant reactions to key elements of the ICN instructional method, it can be determined which components are working well and which components could be improved. If participants are having difficulties with the equipment, improvements can be made. If instruction is perceived negatively or participants have difficulties with interacting in a distance environment, instructors can be provided with further training to assist them in learning

techniques shown to be effective in distance teaching. Orientation sessions for students could also be developed to assist them in feeling more comfortable participating in a distance classroom. Course management is another area where participant reaction could guide improvements in the process. Improving satisfaction with ICN delivery should result in higher student motivation, fewer drop-outs, greater enrollment in distance education courses, and better learning.

Developing an Instrument

As part of the IDEA project, a survey instrument was developed to assess the attitudes of both community college and secondary students involved in ICN courses. Support for development of the instrument and for its use in surveying students was provided in part by a U. S. Department of Education Star Schools grant (#R203 B 20001-93). Kirkpatrick (1979) recommends those developing reaction measures should: (1) determine what they want to find out, (2) use a written instrument covering the items to be measured, (3) design the form to be tabulated and quantified, (4) make the forms anonymous, and (5) allow for additional comments.

Selecting and Reviewing the Items

The IDEA evaluation team followed these recommendations and developed a written instrument containing 25 Likert-items, six demographic items, and two open-ended questions on a computer scan sheet. A five step process was used in developing the instrument. The steps included:

Step 1: Reviewing the literature related to student satisfaction in distance education courses.

Step 2: Defining constructs contributing to satisfaction with interactive television instruction.

Step 3: Generating items to measure the constructs.

Step 4: Presenting the items to an advisory committee charged with reviewing and providing feedback on IDEA research and evaluation activities.

Step 5: Constructing the instrument.

The following describes in greater detail the process used for the initial survey development.

Step 1. A number of journal articles relating to assessment of student attitudes in broadcast television courses, satellite courses, and interactive television courses were reviewed (Barker, 1987; Barker & Platten, 1988; Bernt & Bugbee, 1993; Biner, 1993; Christopher, 1982; Davis, 1984; Egan, Welch, Page & Sebastian, 1992; Eiserman & Williams, 1987; Hezekiah, 1986; Kabat, 1991; Kabat & Friedel, 1990; Kember, Lai, Murphy, Show, & Yuen, 1992; Kruh, 1983; Martin & Rainey, 1993; McCleary & Egan, 1989; Pryor, 1985; Ritchie & Newby, 1989; Robinson, 1985; Shaeffer & Roel, 1985; Silvernail & Johnson, 1992; Smeltzer, 1986; Treagust, Waldrip, & Horley, 1993; Vanderhaar, 1986; Whittington, 1987). In addition, instruments developed by Eastern Iowa Community College, the University of Mississippi, the University of Alabama, the Midlands Consortium, and the TI-IN program for use in evaluating distance education programs were reviewed.

The IDEA evaluation team determined that the instruments reviewed in the literature were not appropriate for a secondary school audience using two-

way interactive fiber optic technology for several reasons. First, reading levels appeared to be targeted for college-level students which may have created difficulty for secondary students. Second, items were included that were not appropriate for a secondary audience, such as items related to cost-effectiveness, fee payments, degree programs, and value to employers. Third, most instruments were designed for audiences receiving one-way video and often one-way audio (satellite and broadcast television) and therefore included items related to telephone feedback systems, tape recordings, and packaged instructions that did not pertain to the Iowa system. Fourth, questions related to two-way interactivity were not included in many instruments.

In addition, the evaluation team received a strong message from both project management and from the advisory panel that the survey instrument should not include items that could be construed as assessing instructor performance. Because of collective bargaining and contract language, it was deemed important that the IDEA not be perceived as evaluating teachers. The instruments were reviewed by the Iowa teachers' union.

The Iowa project needed an instrument that could be used at both secondary and community college levels for both average and high ability students, one appropriate for a two-way fully interactive environment, and one that was not evaluating instructor performance, but rather the effectiveness of the delivery method. It was determined by the evaluation team that a new instrument should be developed.

Steps 2 and 3. Several constructs appeared consistent in the literature and appeared to be applicable for both K-12 and community college level

students in a two-way interactive television environment. These constructs were selected for measurement. The constructs selected were: (1) technical aspects, (2) membership, (3) instruction, (4) course management, and (5) overall course satisfaction.

The constructs were defined in the following manner. Technical aspects included items that related to the adequacy of the equipment in the interactive television classroom. Membership was defined as a sense of being part of a class and is evidenced by involvement and participation in the class and a feeling of belonging. The instruction construct was designed to measure the attitude of the student about the instruction received in the class and about the learning environment. Course management was defined as the students' attitude toward logistical procedures and the provision of resources to students. Overall course satisfaction was to reflect the students' attitude toward the interactive distance education experience.

A list of items was generated to measure these constructs. These items were reviewed and refined over a period of two months. Assistance with assuring an appropriate reading level for the student questions was provided by teacher education faculty members at Iowa State University and the University of Northern Iowa. A comparison of reading levels indicates that the instrument created for the Iowa Star Schools project is more appropriate for surveying students in grades 7-12 than other instruments found in the literature. The Flesch grade level score for the IDEA instrument was 8.3, compared to grade level scores of 10.2, 11.7, 13.4, and 13.8 for the other instruments.

Steps 4 and 5. The IDEA project includes a Research and Evaluation Advisory Panel. One role of this panel is to review and provide input for evaluation instruments used in the project. Members of the advisory panel include representatives from the state's public universities, community colleges, Area Education Agencies, and the First in the Nation in Education (FINE) Foundation, as well as a research and evaluation specialist and a classroom teacher. Items were deleted, revised, or added based on the recommendations of this group. The surveys were then constructed and re-submitted to this group for approval. Following further revisions and final approval, the surveys were printed on computerized scan sheets and distributed to the regional coordinators. In the Iowa project, each of the state's fifteen community college regions has a person assigned to coordinate Star Schools activities in the region. These persons are referred to as regional coordinators.

Surveying the Students

IDEA regional coordinators were contacted in June 1994 and asked to survey all community college courses taught over the ICN during the summer session of 1994. Only eight of the community colleges were offering summer courses over the ICN. In seven of the community colleges, all summer ICN courses were surveyed. The eighth community college has been involved in interactive television instruction for over ten years and was offering thirteen courses. Four of those courses were randomly chosen to be surveyed. The researcher felt that including all thirteen might skew the research results as both students and instructors were more likely to have been involved in previous

interactive television courses. Of the 31 courses being taught over the ICN, permission was granted by the community colleges to survey 22, or 71 percent.

Return rates. Regional coordinators were responsible for distributing surveys to the course instructors, collecting the surveys from the instructors, and mailing the completed forms to the IDEA evaluation team. Eighteen of the 22 courses returned surveys for a response rate of 82 percent. These eighteen courses represent 58 percent of the courses being taught over the ICN by community colleges during summer session 1994. Table 1 indicates the number of ICN courses conducted in each region, the number surveyed, and the number returning surveys.

Table 1: Survey return rates by community college.

Community College	Courses Offered	Surveyed	Returned
Community College A	7	7	7
Community College B	13	4	4
Community College C	1	1	0
Community College D	4	4	3
Community College E	2	2	0
Community College F	1	1	1
Community College G	2	2	2
Community College H	1	1	1
TOTAL	**31**	**22**	**18**

Course descriptions. The courses reflected a variety of content areas including mathematics, science, literacy, vocational education, business, art, and social sciences. The number of students enrolled in each course varied from seven to 46. Return rates were generally high although return rates in the

individual courses varied considerably. Among the eighteen courses, eight had return rates of over 75 percent, five had return rates between 51 and 75 percent, four had return rates of 40 to 50 percent, and one had a return rate of under 40 percent. Return rates by course are listed in Table 2.

Table 2: Individual course return rates.

Course	Enrolled	Returned	Percent
A1 (math)	9	8	89%
A2 (math)	14	13	93%
A3 (business)	14	13	93%
A4 (business)	17	12	71%
A5 (business)	16	9	56%
A6 (business)	9	7	78%
A7 (business)	16	14	88%
B8 (vocational)	14	9	64%
B9 (math)	27	11	41%
B10 (science)	31	22	71%
B11 (literacy)	20	17	85%
D12 (business)	27	13	48%
D13 vocational)	46	19	41%
D14 (science)	15	9	60%
F15 (literacy)	14	13	93%
G16 (art)	14	2	14%
G17 (business)	7	3	43%
H18 (history)	19	16	84%
TOTAL	**326**	**210**	**64%**

Respondent description. Of the 210 community college students responding to the survey, 37 percent were male and 63 percent were female. Most respondents were Caucasian (85%) with about five percent Black American, four percent Asian/Pacific Islander, four percent Native American, one percent Hispanic, and one percent other. Sixty-two percent were under age 25, and 38

percent over 25. Approximately one-third were freshman students (31.1%) and another third (35.4%) were sophomores. Eighteen percent indicated they were juniors or seniors, while the remainder classified themselves as other. Sixty-one percent were taking their first interactive television course, 27 percent their second, and the remainder had taken three or more television courses. About half of the students were taking the course at a remote site (51%) and the other half (49%) at the origination site where the instructor was present.

Testing the Instrument

Validity is defined as the ability of the instrument to measure that which it purports to measure. Face validity for the instrument was supported by the stringent review of the Research and Advisory Panel. Support for the constructs was established by conducting a confirmatory factor analysis.

Reliability is defied as the internal consistency or stability of the instrument and there are several methods of estimating reliability. Reliability of an instrument is expressed as a coefficient between 0.00 and 1.00, with 1.00 indicating perfect reliability. This coefficient indicates the extent to which the instrument is free of error variance, or the possibility that differences arise from chance (Borg & Gall, 1989).

Split-half correlation is the most common method of determining the internal consistency of an instrument. This method calculates reliability through an analysis of individual test items using a single test administration and is considered by many to be the most satisfactory method of determining reliability in the area of education (Borg & Gall, 1989). The Cronbach Coefficient

Alpha is the form that is most appropriate for use when items have multiple response possibilities.

Factor analysis results. A confirmatory factor analysis using the Statistical Package for the Social Sciences (SPSS) provided support for the five constructs identified in the literature and reflected in the survey. Maximum likelihood estimates were used and missing data were deleted on a pairwise basis. Both varimax and oblimin rotations were used with consistent results obtained for both. Factor loadings are reported in Table 3.

In all cases, the factor loading reported is the highest loading for that item. Only four items loaded in an unexpected manner. Two of those items ("technical problems interfere with my learning" and "the fact that I am on TV inhibits my class participation") failed to load on any factor with a factor loading greater than .30. The other two items, ("remote site students receive materials in a timely manner" and "I have had no problem getting access to the classroom") loaded on the instruction and technical factors, respectively, rather than on the course management factor as predicted. These four items were analyzed as single items and dropped from the constructs. Only one other item ("it is easy to use the microphone) loaded at a level higher than .30 on more than one factor on the two rotations, however, in both cases the item loaded higher on the predicted factor (oblimin = .50 technical and .34 membership; varimax = .47 technical and .41 membership). These items were included in the technical aspects construct.

Table 3: Factor loadings for items in each construct.

Factor and Items	Varimax	Oblimin
Factor 1: Instruction		
The class is well organized.	.68	.72
The instructor pays attention to remote students.	.67	.67
The classroom is free of distractions.	.55	.52
I pay as much attention as I would in a regular class.	.53	.50
The instructor is available to answer my questions.	.52	.44
It is easy to pay attention to the instructor on the TV.	.50	.47
Factor 2: Membership		
I feel encouraged to become involved in class discussions and activities.	.74	.73
I feel the instructor is speaking directly to me.	.65	.64
I feel the students at the other site are part of my class.	.57	.52
I feel like I am part of the class.	.55	.45
Factor 3: Technical Aspects		
It is easy to see the TV monitor.	.83	.89
It is easy to use the microphone.	.47	.50
It is easy to hear comments made by students at the other site.	.36	.32
Graphics and other visuals are easy to read on the monitors.	.36	.33
Factor 4: Course Management		
Enrollment and registration procedures meet my needs.	.82	.82
It is easy to get information about ITV classes.	.54	.56
I have adequate access to the resources I need.	.48	.47
Factor 5: Course Satisfaction		
I would take another ITV class.	.79	.78
I would tell my friends to take an ITV class.	.73	.72
Overall, I am satisfied with my ITV class.	.62	.56
I am learning as much in the ITV class as I would in a regular class.	.44	.38
Single Items		
Technical problems interfere with my learning in the TV classroom.		
The fact that I am "on TV" inhibits my class participation.		
Remote site students receive class materials in a timely manner.		
I have had no problems in getting access to the classroom during the scheduled class time.		

Reliability results. Following the factor analysis, additional analysis was conducted to determine the reliability of the constructs. When subscale scores or constructs are used as the unit of analysis, the reliability of the subscale needs to be estimated (Suen & Stevens, 1993). Cronbach alpha is designed to estimate the reliability of the composite score from the responses to a number of items.

SPSS procedures were used to determine Cronbach alpha coefficients for each of the five constructs. Standardized Cronbach Coefficient Alpha estimates indicate that the constructs are reliable, with coefficients ranging from .64 to .91. Table 4 shows the Cronbach Alpha reliability estimate for each construct.

Table 4: Reliability estimates for the survey constructs.

Construct	Reliability estimate (Cronbach alpha)
Instruction	.84
Membership	.87
Technical Aspects	.79
Course Management	.64
Course Satisfaction	.91

Conclusion

The instrument appears to measure what it intended to measure and items loaded on the intended constructs. The review of the panel members supports the validity of the items and of the instrument. Reliability estimates are generally high, ranging from .64 to .91, however, several recommendations are made here for improving the value of the instrument.

Recommendations

Several recommendations can be made based on the results of this study. First, since the instrument was developed for use at both the secondary and community college levels, factor analysis and reliability estimates should be used to determine the stability of the constructs across populations. Use with populations outside of Iowa is also recommended to determine the generalizability of results across geographic regions.

Second, revisions may be needed to account for the two items that failed to load as predicted on the course management factor. These two items, access to the classroom and receipt of class materials in a timely manner, were conceptualized by the instrument developers to be related to course management. It is possible that from the students' perspective, management of interactive television courses consists of several components: (1) site management by local facilitators which might include opening doors and turning on equipment, (2) institutional management issues which might include enrollment and registration procedures and assuring that students have access to institutional resources, and (3) instructor controlled management issues which might include getting class materials to the remote sites in a timely manner and quick turn around time for student papers and tests.

Third, instrument revisions may be needed for the two items that failed to load on any factor with a loading higher than .30. Interestingly, these two items were the only negatively worded items on the survey. The researcher tested whether recoding the items to make them positive would affect the factor analysis results; it did not. These items may need to be dropped from the survey, or the items may need to be reworded.

Fourth, the researcher recommends the use of the attitude assessment instrument in conjunction with other measures to determine the overall impact of interactive television instruction. Kirkpatrick's levels of evaluation could be used as a model. Other measures would include assessment of gains in knowledge, changes in student behavior, and outcome measures such as retention and academic success.

Usefulness of the Instrument

Based on initial results, it appears that the instrument developed for use in the Iowa Star Schools project is a reliable tool for measuring student attitudes in interactive television courses. The constructs identified through the confirmatory factor analysis appear consistent with the literature. The use of computerized scan sheets and a limited number of items provide for time-efficient data analysis as well as limiting the amount of instructional time needed for students to complete the instrument. This instrument appears to have useful applications in conducting formative evaluations of instructional programs utilizing two-way interactive telecommunications technology.

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EVALUATION OF INTERACTIVE TELEVISION INSTRUCTION: ASSESSING ATTITUDES OF COMMUNITY COLLEGE STUDENTS

A paper to be submitted to the American Journal of Distance Education

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> "The question is not if there will be more distance learning in tomorrow's education. The question is do we in higher education intend to move into the future to respond to the demand for distance delivered educational experiences. (Jorgensen, 1986, p. 9)

Recent innovations in technology have blurred the boundaries between distance and traditional education (Garrison and Shale, 1987). Cable, satellites, computer courses, and fiber-optics have expanded distance education opportunities, and although distance education has its historical foundations in correspondence study, today, distance education more typically refers to simultaneous delivery of instruction using telecommunications technologies that allow live audio and/or video interactions. The focus has shifted from individualized instruction to small group interaction (Barker, Frisbie, & Patrick, 1989).

Studies in the field of distance education began appearing after World War II and focused primarily on large distance education universities. While there have been a number of studies related to student achievement and course and materials development, evaluation of distance education programs has recently attracted more attention (Holmberg, 1987). Evaluation typically focuses on the need to improve (formative) or to describe an outcome (summative) and should be built into the distance education process and published as part of the distance education literature (Coldeway, 1988). Draper (1987) also indicates that

evaluation is a necessary component of any distance education program, and that it should include ways to assess attitudes of participants about their learning experience.

Assessing Learner Satisfaction

Evaluating the effectiveness of televised instruction has focused on grades but has neglected learner satisfaction (Biner, Dean, Mellinger, 1994). Biner, Dean, and Mellinger (1994) contend that learner satisfaction is an important criterion for judging the success of televised instruction and that outcomes of high learner satisfaction include lower attrition, more referrals, higher student motivation, and better learning. Assessment of student satisfaction is important in identifying problem areas and modifying the program (Biner, et. al., 1994). According to Kifer (1992), attitudes are important predictors of academic success and indicators of program effectiveness. Of the three dimensions of attitude (affective, cognitive, and behavioral intent), Kifer contends that the affective dimension is the core component.

A Model

Biner (1993), in a discussion on the assessment of university telecourses, says that negative reactions can "both undermine support for the program and detrimentally affect learning." (p. 62). He recommends that evaluation efforts should begin with assessing student attitudes and opinions. Biner presents the Kirkpatrick model of evaluation as a framework for evaluating telecourses. Kirkpatrick (1979) recommends that a good evaluation begin with organized

measurements of reactions and feelings of those participating in the learning situation. He argues that people must like a program in order to obtain maximum benefits. The more positive the attitude, the more likely participants are to pay attention and to learn.

Previous Findings

Some studies can be found in the literature related to student satisfaction with distance education courses. Most of the studies in the area of satisfaction involve satellite-based delivery systems or televised courses.

Effect of classroom interaction. Wilkes and Burnham (1991) found a relationship between satisfaction and involvement and found that on-site students rated both areas significantly higher than distant students. These authors conclude that instructors have substantial influence on the amount of student involvement in the classroom and that instructor training may improve ratings. Dillon and Walsh (1992) found that instructor immediacy behaviors (feedback in class, expressive vocal quality, inviting student contact, etc.) were associated with student satisfaction in distance education courses.

Silvernail and Johnson (1992) and Ritchie and Newby (1989) found a significant correlation between student ratings of the effectiveness of a television class and ratings of student involvement in the class. The latter found that classes where the instructor was not physically present had significantly lower ratings on involvement and overall satisfaction than either the traditional class or the television class with the instructor present in the room.

It could be argued that students in television classes where the instructor is physically present (origination) are likely to have a learning experience more similar to that of a traditional classroom than to that of their remote counterparts. Egan, Welch, Page, and Sebastian (1992) have found in their research that students consistently rate conventional instruction higher than distance instruction. However, Jurasek (1993) found that students at remote sites had significantly more positive attitudes than students at origination sites.

Another factor likely to impact the effectiveness of distance education is the number of sites involved. Multiple sites can severely curtail the amount of interactivity possible in the classroom (U.S. Congress, 1989).

Effect of student experience. Fulford and Zhang (1993) found interaction was a critical predictor of learner satisfaction in distance education and that perceptions of interaction declined with experience in an interactive television classroom. The authors hypothesized that the effectiveness of interactive television for instruction may decrease as student experience with the system increases. However, Dille and Mezack (1991) found that lack of experience or previous experience with telecourses was not a significant predictor of success in telecourses, although they expected it to be.

Effect of age and gender. Several studies have indicated there may be differences in perceptions of distance education based on the age and gender of the student, although the direction of the difference varies. Dille and Mezack (1991) found older students performed better in telecourses. Bernt and Bugbee (1993) found that attitudes contributed more to achievement for older students.

James (1984) found that younger students performed better than older students in a distance learning environment. James (1984) concluded that age of students in a distance learning system impacts both affective and cognitive dimensions, with more influence on the affective. Coggins (1988) suggests that both age and gender are predictors of persistence and satisfaction with distance learning. Ross and Powell (1990) found that women were more successful in distance education courses than men and that they made more calls to the instructor and made better use of support structures.

The Need

As technological innovations change the nature of distance education, educators need to assess the attitudes and opinions of students participating in the new learning environments. Assessing attitudes is the first step in determining the effectiveness of the program and is essential in providing information needed to revise and improve the program (Martin and Rainey, 1993; Sachs, 1993).

Background and Instrument Development

In 1992, the state of Iowa, through the Iowa Distance Education Alliance (IDEA), received an $8 million grant from the U.S. Department of Education's Star Schools program to demonstrate a two-way, full-motion, interactive fiber-optic telecommunications-based instructional delivery system. The Iowa Communications Network (ICN) is a fiber-optic network with a point-of-presence in each county of the state. Approximately 103 classrooms with two-

way fully interactive audio and video became operational in October, 1993, partially as a result of the Star Schools project.

As part of the IDEA project, an instrument was developed by the project evaluation team to assess student attitudes about their experience in these interactive television classrooms. The instrument requested demographic information, ratings on a series of four-point Likert-scale items, and responses to two open-ended questions. Data were collected across the state at both the K-12 and community college level. Support for development of the instrument and for data collection were provided in part by the U.S. Department of Education Star Schools grant (#R203 B 20001-93). This article will report the results of the analysis of community college student responses.

The Likert-items on the survey were grouped to form constructs based on a review of the literature. Confirmatory factor analysis and Cronbach alpha levels (Table 1) provide support for the constructs created from the Likert items and indicate that the instrument is a reliable measure. These constructs will form the basis of analysis presented in this article.

Technical aspects relates to the adequacy of the equipment. Membership is defined as a sense of being involved and a part of the class. Instruction looks at the learning environment. Course management focuses on logistical procedures and the provision of resources to students. Course satisfaction reflects the students' overall attitude toward the interactive distance education experience.

Table 1: Reliability estimates for the survey constructs.

Construct	Reliability estimate (Cronbach alpha)
Instruction	.84
Membership	.87
Technical Aspects	.79
Course Management	.64
Course Satisfaction	.91

Description of the Sample Population

In the Iowa Distance Education Alliance (IDEA), Iowa's Star Schools project, each of the state's fifteen community college regions has a person assigned to coordinate Star Schools activities in the region. These persons are referred to as regional coordinators. Regional coordinators are responsible for the collection of data from students and instructors using the Iowa Communications Network (ICN) for instruction.

Survey Return Rates

IDEA regional coordinators were contacted in June 1994 and asked to survey all community college courses taught over the ICN during the summer session of 1994. Eight of the community colleges were offering summer courses over the ICN; seven agreed to survey all their courses. Only four of thirteen courses from the eighth community college were surveyed as this region was different from the other regions in the level of previous experience with

interactive television instruction. Of the 31 courses being taught over the ICN, 22 (71 percent) were surveyed. Eighteen of the 22 courses returned surveys for a response rate of 82 percent. These eighteen courses represent 58 percent of the courses being taught over the ICN by community colleges during summer session 1994. Table 2 indicates the number of ICN courses conducted in each region, the number surveyed, and the number returning surveys.

Table 2: Survey return rates by community college

Community College	Courses Offered	Surveyed	Returned
Community College A	7	7	7
Community College B	13	4	4
Community College C	1	1	0
Community College D	4	4	3
Community College E	2	2	0
Community College F	1	1	1
Community College G	2	2	2
Community College H	1	1	1
TOTAL	**31**	**22**	**18**

The courses reflected a variety of content areas including mathematics, science, literacy, vocational education, business, art, and social sciences. The number of students enrolled in each course varied from seven to 46. Individual course return rates were generally high with eight having a return rate of over 75 percent, five between 51 and 75 percent, four between 40 and 50 percent, and only one with a return rate of under 40 percent.

Description of Respondents

Two-hundred and ten community college students responded to the survey. They were:

- 37 percent male and 63 percent female;
- 85% Caucasian, 5% Black American, 4% Asian/Pacific Islander, 4% Native American, 1% Hispanic, and 1% other;
- 62% under age 25 and 38% over 25;
- 31% freshman students, 35% sophomores, and 35% other;
- 61% were taking their first interactive television course, 27% their second, and the remainder had taken three or more television courses;
- 51% were at a remote site and 49% at an origination site.

Findings

Data collected from the community college students were analyzed in five ways. First, the frequency data indicated the level of satisfaction for each item. Second, the overall mean scores for the constructs allowed some determination of the strengths and weaknesses of the program. Third, t-test comparisons of the constructs investigated potential differences in ratings based on age, gender, experience of the students with distance education, location at an origination or remote site, and the number of sites involved. Fourth, regression analysis provided information about the most important predictors of student satisfaction. Fifth, analysis of the open-ended responses provided further information concerning student attitudes and opinions.

Individual Items

In evaluating the 25 Likert-scale items on the survey, it appears that, in general, the community college students were satisfied with their experience in the distance learning classroom. In assessing areas for improvement, a level of 25 percent dissatisfaction was set by the researcher; items where one-fourth or more of the students responded negatively were deemed areas in need of improvement. For 19 of the items, over three-quarters of the students indicated that they were satisfied. Over 75 percent agreed that:

- they have had no problem getting access to the classroom (97%);
- it was easy to see the TV monitor (94%);
- the instructor paid attention to remote site students (93%);
- enrollment and registration procedures were adequate (93%);
- they felt part of the class (90%);
- overall they were satisfied with the course (88%);
- the instructor was available to answer questions (88%);
- the class was well organized (88%);
- they would take another interactive television class (87%);
- it was easy to use the microphone (85%)
- they have adequate access to resources such as the library (84%);
- they would tell their friends to take an interactive television class (82%);
- they felt the instructor was speaking to them (82%);
- It was easy to pay attention (82%);
- it was easy to hear comments (81%);
- they were learning as much as in a regular class (78%);
- it was easy to read graphics and other visuals on the monitors (78%);

- they felt encouraged to become involved in class discussions (77%);
- and they paid as much attention as in a regular class (76%).

There were six areas that student ratings indicate improvement may be needed. Over one-quarter of the students felt that:

- technical problems interfered with their learning (42%);
- remote site students did not receive materials in a timely manner (35%);
- being "on TV" inhibited their class participation (29%);
- students at the other site(s) were not part of the class (27%);
- there were distractions in the classroom that interfered with learning (26%);
- and it was not easy to get information about television classes (25%).

However, a breakdown of responses by origination (where the instructor was present) and remote site students shows that remote site students were less satisfied in several areas. Over 25 percent of the remote site students responded negatively on eleven of the 25 items, while only three items met this criterion for origination site students. Origination site students indicated that:

- technical problems interfered with their learning (48%);
- remote site students did not receive materials in a timely manner (29%);
- and being "on TV" inhibited their class participation (26%).

The eleven areas where remote site students were not satisfied and the percent indicating the area as a problem are listed below. The remote site students felt that:

- they did not receive materials in a timely manner (41%);
- technical problems interfered with their learning (38%);
- they did not pay as much attention as in a regular class (37%);

- being "on TV" inhibited their class participation (33%);
- there were distractions in the classroom that interfered with learning (33%);
- students at the other site(s) were not part of the class (32%);
- they were not encouraged to become involved in class discussions (28%);
- they were not learning as much as in a regular class (26%);
- the instructor was not speaking to them (25%);
- it was not easy to hear comments (25%);
- and it was not easy to get information about television classes (25%).

On most items, the percent of students responding positively was lower for remote site students compared to origination site students. Table 3 shows the percent of students agreeing with each statement in the two groups.

Construct Comparisons

The four-point Likert scale items on the survey were grouped into five constructs and mean scores were calculated. As can be seen in Table 4, students appear to be very satisfied with their distance education experience (mean=3.23), technical quality in the classroom appears to be adequate (mean=3.21), and the students are satisfied with the quality of the instruction they receive (mean=3.17). Overall, the students personally feel a sense of class membership (mean=3.12). The area in most apparent need of improvement is course management (mean=2.93).

Table 3: Percent of students indicating agree or strongly agree for each item by origination and remote sites.

Construct and Items	Origination %	Remote %
Construct 1: Instruction		
The class is well organized.	91	86
The instructor pays attention to remote students.	94	91
The classroom is free of distractions.	81	67
I pay as much attention as I would in a regular class.	89	63
The instructor is available to answer my questions.	91	85
It is easy to pay attention to the instructor on the TV.	81	82
Construct 2: Membership		
I feel encouraged to become involved in class discussions.	80	72
I feel the instructor is speaking directly to me.	90	75
I feel the students at the other site are part of my class.	77	68
I feel like I am part of the class.	92	88
Construct 3: Technical Aspects		
It is easy to see the TV monitor.	92	85
It is easy to use the microphone.	78	91
It is easy to hear comments made by students at other site.	87	75
Graphics and other visuals are easy to read on the monitors.	79	76
Construct 4: Course Management		
Enrollment and registration procedures meet my needs.	95	91
It is easy to get information about ITV classes.	75	75
I have adequate access to the resources I need.	86	82
Construct 5: Course Satisfaction		
I would take another ITV class.	86	87
I would tell my friends to take an ITV class.	84	80
Overall, I am satisfied with my ITV class.	94	82
I am learning as much in the ITV class as I would in a regular class.	81	74
Single Items		
Technical problems interfere with my learning.	48	38
The fact that I am "on TV" inhibits participation.	26	33
Remote site students receive materials in a timely manner.	71	59
I have no problems getting access to the classroom.	95	98

Scale: 1=strongly disagree; 2=disagree; 3=agree; 4=strongly agree

Table 4: Construct scores

Construct and Items	Mean Score
Construct 1: Instruction	*3.17*
Construct 2: Membership	*3.12*
Construct 3: Technical Aspects	*3.21*
Construct 4: Course Management	*2.93*
Construct 5: Course Satisfaction	*3.23*

Scale: 1=strongly disagree; 2=disagree; 3=agree; 4=strongly agree

T-test Analysis

The constructs were compared using the Statistical Package for the Social Sciences (SPSS). Pooled t-tests were conducted to determine if there were differences in the construct scores on the basis of gender, age, previous student experience with distance education, student location at an origination or remote site, and the use of multiple sites. A significance level of .05 was set.

Gender comparisons. There appear to be differences in ratings of membership and instruction between males and females. In both cases, males had significantly higher ratings. Males appeared to feel more involved in and part of the class (membership) and to rate the instructor and the instructional environment more positively (instruction). There appears to be no difference in ratings on the other three constructs (Table 5).

Table 5: Comparison of construct ratings by gender

Construct	N	Mean	SD	T-value	Probability
Membership				***2.05***	***.042***
Males	75	3.07	0.56		
Females	130	2.89	0.59		
Instruction				***2.35***	***.020***
Males	75	3.19	0.55		
Females	130	3.00	0.54		
Technical Aspects				***1.37***	***.171***
Males	75	3.18	0.56		
Females	130	3.08	0.52		
Course Management[a]				**-0.06**	**.951**
Males	72	2.98	0.65		
Females	127	2.99	0.47		
Satisfaction				***1.62***	***.106***
Males	75	3.16	0.66		
Females	130	3.01	0.61		

[a] Separate t-test used due to unequal variance of samples.

Age comparisons. The respondents were divided into two groups based on their age, those age 25 and under and those over age 25 (Table 6). Comparison of construct scores between these two groups indicate that there are differences in perceptions of membership based on age. Those over age 25 had significantly higher scores on the membership construct than did those aged 25 or under, indicating that they felt a greater sense of involvement in the class. No other constructs were found to be significantly different.

Student experience in distance education. Previous experience with distance education classes appeared to make no difference in perceptions of students (Table 7). None of the construct scores were significantly different.

Table 6: Comparison of construct ratings by age

Construct	N	Mean	SD	T-value	Probability
Membership				*-2.65*	*.009*
≤ 25	128	2.88	0.61		
> 25	78	3.10	0.53		
Instruction				*-1.42*	*.157*
≤ 25	128	3.03	0.57		
>25	78	3.14	0.52		
Technical Aspects				*1.10*	*.271*
≤ 25	128	3.15	0.51		
> 25	78	3.07	0.57		
Course Management				*-0.29*	*.774*
≤ 25	126	2.98	0.57		
> 25	74	3.00	0.51		
Satisfaction				*-0.62*	*.534*
≤ 25	128	3.05	0.62		
> 25	78	3.11	0.65		

Table 7: Comparison of construct ratings by student experience

Construct	N	Mean	SD	T-value	Probability
Membership				*-0.37*	*.711*
First distance course	109	2.94	0.59		
Previous experience	90	2.97	0.60		
Instruction				*1.60*	*.112*
First distance course	109	3.13	0.56		
Previous experience	90	3.00	0.54		
Technical Aspects				*-0.40*	*.689*
First distance course	109	3.10	0.53		
Previous experience	90	3.13	0.55		
Course Management				*-0.18*	*.854*
First distance course	106	2.97	0.56		
Previous experience	87	2.99	0.55		
Satisfaction				*0.34*	*.734*
First distance course	109	3.10	0.61		
Previous experience	90	3.07	0.65		

Location of the student. Location of the student at the origination site (where the teacher was physically present) or the remote site appears to make a difference in ratings of instruction. Students at the origination site had significantly higher ratings of instruction than students at remote sites (Table 8) indicating a more positive perception of the instructor and the instructional environment.

Table 8: Comparison of construct ratings by student location

Construct	N	Mean	SD	T-value	Probability
Membership				***1.76***	***.080***
Origination site	98	3.03	0.54		
Remote site	103	2.88	0.63		
Instruction				***1.97***	***.050***
Origination site	98	3.15	0.52		
Remote site	103	2.99	0.58		
Technical Aspects[a]				***0.33***	***.738***
Origination site	98	3.13	0.60		
Remote site	103	3.10	0.47		
Course Management				***0.47***	***.637***
Origination site	94	3.01	0.57		
Remote site	101	2.97	0.52		
Satisfaction				***1.14***	***.257***
Origination site	98	3.12	0.60		
Remote site	103	3.02	0.67		

[a] Separate t-test used due to unequal variance of samples.

Number of sites. The number of sites connected for the classes varied. Some community college classes had only two sites connected while others had up to eight sites connected. A comparison of those with two sites versus those with more than two sites shows no significant difference in student ratings (Table 9).

Table 9: Comparison of construct ratings by number of sites

Construct	N	Mean	SD	T-value	Probability
Membership				***0.23***	***.819***
Two sites	105	2.97	0.64		
More than two sites	102	2.95	0.54		
Instruction[a]				***-0.55***	***.584***
Two sites	105	3.05	0.61		
More than two sites	102	3.10	0.48		
Technical Aspects				***0.59***	***.555***
Two sites	105	3.14	0.55		
More than two sites	102	3.09	0.52		
Course Management				***1.66***	***.099***
Two sites	103	3.05	0.55		
More than two sites	98	2.92	0.54		
Satisfaction				***0.00***	***.997***
Two sites	105	3.07	0.65		
More than two sites	102	3.07	0.61		

[a] Separate t-test used due to unequal variance of samples.

Regression Analysis

Analysis of the data was conducted using stepwise regression to determine the constructs most likely to predict student satisfaction. Both the satisfaction construct and the individual item related to overall satisfaction were used as dependent variables in different sets of analyses. The prediction equation remained the same regardless of which of these dependent variables was used.

In looking at the entire sample of community college students using the construct of satisfaction as the dependent variable, the first variable entered in the equation was instruction, accounting for 46 percent of the variance. Adding the variables of membership, course management, and technical aspects increased the variance prediction to 55 percent.

However, looking at the entire sample tended to mask some differences between the variables most likely to predict satisfaction for remote students versus origination site students. When the two groups were separated and stepwise regression analysis was conducted on each subset, results were slightly different. Although instruction was the first variable entered in the equations for both groups, other variables entered were different.

For remote site students, instruction accounted for 49 percent of the variance and when course management was added, 57 percent of the variance could be accounted for. For origination site students, instruction could account for only 40 percent of the variance. Adding membership increased that number to 50 percent and adding technical aspects raised the percent of variance accounted for to 53 percent. The regression analysis results can be seen in Table 10.

Table 10: Stepwise regression findings for sample satisfaction

Variables entered	Probability	Total R^2
All Community College Students		
Instruction	.0000	.46
Membership	.0000	.52
Course Management	.0019	.54
Technical Aspects	.0299	.55
Origination Site Students		
Instruction	.0000	.40
Membership	.0000	.50
Technical Aspects	.0230	.53
Remote Site Students		
Instruction	.0000	.49
Course Management	.0000	.57

Comment Analysis

As part of the survey evaluating the effectiveness of the ICN for instruction, students were asked to respond to two open-ended questions. One question asked them to describe what they liked best about taking an interactive television class while the second asked them to provide suggestions for improvement. One hundred and ten students responded to the open-ended questions among the 210 surveys returned. The student comments were categorized (Table 11).

Positive comments. As can be seen from the previous table, the students appear to enjoy the ability to meet others in remote locations that the interactive television classes provide. One student commented, "You get a chance to talk with people from many different areas," while another liked "being able to meet people from other sites on TV." Not only did the students appreciate meeting other students, they also liked the opportunity to hear different views. "It gives you a chance to relate with people in other sites and you get a better variety of students with different questions and answers," was one of the comments. Another said, "I like the interaction with other students I would normally never get to meet and hear different viewpoints."

The excitement of experiencing a new technology was apparent in several comments as students said, "we learn to use new technology," "it was a new experience," it was "nice to be exposed to fiber optics," it was a "unique experience," and it is "exciting to be part of the future." One student indicated, "I like being a part of a new way to higher education." Students also appreciated their instructors and expressed it with such comments as "the instructor is fun,"

Table 10: Summary of student comments

Comment category	N [a]
What students liked best	
Interaction with students at other sites	37
Experiencing new technology/new learning experience	27
Classes offered closer to home (no travel)	25
The instructor	14
Smaller class size and more relaxed atmosphere	12
Liked the equipment/better capability for visuals	10
Increased access to learning opportunities	9
Classes offered at convenient times	4
Learned a lot	6
No instructor in the class	4
Jut like a regular class	4
Meets the needs of special populations	2
Saves money	2
Better than correspondence course	1
Suggestions for improvement	
Improved microphones	25
Improved camera capabilities	19
Improved transportation of materials	18
Increase participation/interaction	13
Decrease technical problems	12
More one-on-one communication with the instructor	11
Make visuals easier to read	7
Fewer class distractions/better student behavior	7
Have teacher visit remote sites	7
Keep system on at the end of class/don't cut off instructor	6
Get rid of program/do not take one	4
Better access to resources (i.e., library)	3
More classes available	3
Keep room warmer	3
Changes to help students stay attentive	2
Meet remote students face-to-face	2
Improve ability to do labs	1
Improve ability to tape classes	1
Better access to the ICN room	1
Better instructor	1

[a] Numbers reflect multiple responses from 110 of 210 students

"the instructor is very interactive," and "the instructor is more interactive with the students."

The convenience provided by interactive television classes was another plus for the students. "Its closer to my home (1 mile instead of 50 miles) and I'm more available for my daughter," said one student. Another student commented that "It allows me to take courses offered in a location too far away to travel to," while a third replied that "It helps people who can't drive to the original site to take a certain class." One response summed it up by saying, "Its close to home and easier to take classes."

The students also appeared to like the smaller class sizes. Students commented that they liked, "the smallness," the "smaller class size in a room," the "relaxed atmosphere," and the fact that "there are not many people at my site." One student stated that "There are only four people in my class and we are still able to have it!"

Other aspects identified as positive but mentioned less frequently included the ability of the ICN to provide clear visuals, the ease of use of the equipment, increased access to learning opportunities and classes, and the ability to meet the needs of special populations such as prison inmates. Others liked the fact that there was no instructor in the class, that it saved money, and that it was better than a correspondence course. Several commented that it was "just like a regular class," while others just said that they enjoyed it and "learned a lot."

Suggestions for change. Although the students appeared to be satisfied with the interactive television experience, there were still several aspects that they recommended for improvement through their written comments.

Improving the technical capabilities of the microphones and cameras topped the list. One student said, "I would like a system installed where the instructor could hear the students talking without the use of microphones." Another said, "I can't hear when speaking and so often find that the instructor was talking about something else and never even heard my comment." A third student recommended a "better sophisticated, different type of microphone system for students." A fourth recommended "microphones that you didn't have to press a button for all the time." A fifth suggested "voice activated microphones," and a sixth identified a need to "have more automation-minded microphones." Not only did the students recommend different microphones, they also suggested a need for student training in use of the microphones with such comments as "Students at the other site don't always use their microphones so we don't know what they are saying," and " You need to develop in students less fear of using the microphone."

Cameras also needed improvements according to the students. They indicated that the classrooms "need cameras that are not fixed," "need switchable student cameras," "need a zoom lens on the remote site to see the other class better," "need swivel cameras and hidden cameras," and "need control of the cameras at the remote sites."

Transporting materials between sites and technical difficulties also caused problems for the students. Students wondered "If things could be returned more quickly," and recommended improving the "speed of material exchange." Students said they needed to "receive homework and tests back faster," and "need to get work back faster." They recommended a "better system of getting materials to remote site students," and "more effective material transport

between sites." One went so far as to recommend that "I think instructors should use overnight express and return papers to remote sites via those overnight special services."

Although not specific, many students indicated that technical difficulties interfered with their learning saying "too many technical difficulties with the system slow down class," "technical problems robbed us of some class time," "technical problems caused class to be canceled," and there were "way, way too many technical difficulties." Other students recommended "eliminating technical problems," and "debugging the electrical systems."

The students also felt that the level of participation and interaction could be improved. Some indicated that "the remote site doesn't seem to participate as much as they should," and suggested "a little more interaction between the classrooms." Some suggested ways to improve the interaction with "more class discussion," and "better interaction with the other class through group projects."

Other areas for improvement that were mentioned less frequently included making visuals easier to read (comments primarily dealing with illegible writing and difficulty reading the blackboard), having the instructor visit the remote sites, better access to resources such as the library, providing some time at the end of the class period for additional discussion with the instructor and to be sure that the instructor is not cut off, more classes provided on the system, better access to the room, and a chance to meet remote students face-to-face. Some students indicated that the room was too cold, it was difficult to conduct labs in the ICN classroom, it was sometimes hard to pay attention to the TV monitor, and that sometimes there is a need to tape record classes. Several

students commented on poor student behavior in the classroom which created distractions for others and some suggested the need for a class monitor.

Conclusions and Recommendations

Overall, students appear satisfied with the distance learning experience. In summarizing the individual items, students felt the equipment was adequate and easy to use; they felt the instructor attended to students and involved them in the class; and they would take another distance course and recommend the courses to their friends. Students liked the opportunity to interact with students at other sites and remote students appreciated the opportunity to take classes without the inconvenience of traveling. Students had positive perceptions of the instructors and the technology.

It appears that students still felt technical problems interfered with learning in the distance classroom, materials were not always delivered in a timely manner, it was not easy to get information about interactive television classes, classroom behaviors were sometimes distracting, "being on TV" inhibited participation for some, and although students personally felt a strong sense of class membership, that sense of membership did not always extend to the remote classroom. Remote site students also felt that they were not paying as much attention as they would in a regular class and, in some cases, that they were not learning as much. The comments of the students would seem to reflect these same concerns. In addition, the comments provide suggestions for improving the audio (microphone) and video (camera) components of the

classroom. Course management is the lowest rated among the constructs, suggesting a need for improvement in this area.

In comparing groups on the constructs, males appeared to feel more involved in the class (membership) and had a more positive view of the instructor and the learning environment (instruction); older students (over age 25) felt more involved in the class; and students at the origination site had more positive perceptions of the instructor and the learning environment. Whether or not the student had previous experience with distance education and whether there were two sites connected or multiple sites connected appeared to make no difference in ratings for any of the constructs. There also were no differences between any of the groups on technical aspects (ease of use and adequacy of the equipment), course management (registration procedures and access to information and resources), and course satisfaction (willingness to take another course and refer friends).

It appears that the quality of instruction is the primary predictor of satisfaction for both remote and origination site students, although more so for remote site students. It also appears that while course management is an important variable in determining the satisfaction of remote site students, it is much less important for origination site students. The students' sense of class membership is a more important factor for students at the origination site.

The findings would support the literature in several areas. Females may have a higher need for interaction (Belenky, Clinchy, Goldberger, and Tarule, 1986; Gilligan, 1982), both with other students and with the instructor. The literature would suggest that distance education may limit interactivity in the classroom. In this study, females had significantly lower ratings than males on

both the instruction and membership constructs. The membership construct measures peer interactions while the instruction construct contains questions related to interactions with the instructor.

The literature would suggest that remote site students have less interaction with the instructor. Another concern is that lack of monitoring at the remote site leads to disruptive behavior on the part of the students. This study found that remote site students rated the instruction construct significantly lower than did origination site students, where the instructor was present in the classroom. Comments suggest a need for an on-site facilitator.

Distance education is more suited to older student orientations according to the literature. The literature indicates that interacting with other students is less important for older, nontraditional students (Hezel and Dirr, 1990; May, 1993). In this study, older students rated membership significantly higher than did younger students (under 25). This may be because they have a lower need for interaction with their peers and thus perceive the distance class environment as meeting their needs for membership.

This study found, as did Dille and Mezack (1991), that previous student experience with distance education appeared to make no difference in perceptions. Although the literature might suggest that increasing the number of sites used decreases the amount of interactivity, no differences were found in this study between student in classes with only two sites (one origination and one remote) and students in classes with multiple remote sites.

Finally, the areas where students reported the most concerns are also the areas the literature identifies. Cookson (1989) used qualitative methods and found dissatisfaction with turn around time of materials as did Garrison (1990)

in a quantitative survey. Massoumian (1989) says that problems with the technology, such as poor audio or video or equipment malfunction, can disrupt the classroom, and Massoumian (1989) and Moore, Burton, and Dodl (1991) point out that remote sites without a teacher's presence can experience disciplinary problems. Finally, many articles point out the difficulty of maintaining interactions with the remote site students.

Based on the results of this study, several recommendations are made:

Institutions involved in distance education activities need to pay more attention to course management and support functions, particularly for remote site students.

- Transportation of materials between sites needs to be improved.
- Improvements in dissemination of information about course opportunities are needed.
- Adequate on-site facilitation is needed in remote classrooms.
- Access to resources such as library materials is needed for remote students.

Institutions using interactive technologies need to provide the best technical quality possible.

- Institutions should consider options in audio (microphones) and video (cameras) equipment configurations.
- Institutions need to resolve technical problems as quickly as possible and establish mechanisms to assist instructors in coping with technical difficulties.

Instructors involved in distance education activities need adequate training to allow them to be successful distance educators.

- Instructors need to be aware of differences among students in perceptions of interaction and the need for interaction.
- Instructors need to pay particular attention to involving remote site students in classroom activities and creating opportunities for remote and origination students to work together to enhance group membership.
- Instructors need to practice techniques, such as looking into the camera, that will help remote students feel the instructor is speaking to them.
- Cooperative relationships are needed with the on-site facilitators.
- Training is needed in creating and using appropriate visual aids.
- Instructors need to establish communication channels for students outside of class time.

Students need an orientation to interactive instruction.

- Students need instruction on using the microphones.
- Ground rules need to be established to promote a distraction-free environment.

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GENERAL SUMMARY

This study was conducted in an effort to evaluate the effectiveness of the Iowa Communications Network (ICN) for community college instruction. An instrument was developed and tested and data were gathered from community colleges across the state. The study includes a general literature review related to distance education, an article discussing the development of an assessment instrument and the testing of that instrument, and an article describing evaluation results based on survey responses from 210 community college students.

Summarizing the Literature and the Study Findings

As the literature review pointed out, distance education is growing, and changes in technology are changing the focus of distance education. Iowa is at the forefront of change as it implements use of a fiber optic network to deliver two-way, full motion, interactive television instruction which allows two way interaction between and among students and instructors both verbally and visually. Evaluation of the ICN and its use in education is important as Iowa demonstrates to the rest of the nation the use of fiber optic networks for interactive television instruction. One of the first areas to assess, based on an evaluation model developed by Kirkpatrick, is the satisfaction of those participating in the learning experience.

The literature documents several key areas for evaluation of student attitudes towards distance education: instruction, technology, management or

coordination, support, and level of interaction. Previous studies have shown that although achievement in distance education courses may be affected by age, level of education, motivation, and locus of control, there are generally no differences in achievement between students in traditional classes and those in distance delivered classes, or between distance students at remote sites and those at origination sites where a teacher is present.

Factors affecting persistence in distance education included the same variables found to affect achievement, plus the level of interaction in the class and the student's satisfaction with the distance learning experience. Satisfaction in distance learning environments utilizing telecommunications was found to be related to level of classroom interaction, course management, instruction, technical support and quality of technology, local facilitation, scheduling, and access to information. In addition, the literature provides evidence of differences in levels of satisfaction between remote and origination site students (remote students were generally less satisfied) and between distance education students and students in traditional classrooms (those in traditional classrooms were generally more satisfied).

The instrument developed through the Iowa Distance Education Alliance (IDEA), Iowa's Star Schools project, was found to be useful in assessing student attitudes towards instruction ICN classrooms. Factor analysis and reliability coefficients supported the validity of the constructs and indicated that the instrument reliably measured those constructs. Some revisions in the instrument may be necessary in the area of course management. Course management may be too broad an area. One suggestion is to break down the

construct into three smaller constructs, on-site facilitation, institutional management and coordination, and instructional management issues.

The evaluation data suggest that overall, community college students were satisfied with their courses taught over the ICN. This suggests that the ICN is an effective tool for serving the community college population.

Students were generally satisfied with the equipment, although they provided suggestions for improvements. They were generally satisfied with their instructors and the level of instruction they received, and they indicated that they would take another distance course and would recommend distance courses to their friends. The students liked the convenience provided by distance delivered courses and appreciated the opportunity to interact with students from other areas.

Remote site students appeared to be less satisfied with the experience than were origination site students. Course management was an important variable in predicting remote site student satisfaction, while membership was more important in predicting origination site student satisfaction. The quality of instruction was an important predictor of overall satisfaction for both groups.

Males held a more positive view of the instructor and the learning environment and males and older students felt more involved in the class. Previous experience with distance education and participation in a class with multiple sites had no effect on any of the measures.

Findings from the study support the findings reported in the literature. It appears that students involved in instructional activities over the ICN perceive many of the same benefits and many of the same barriers as students involved in other forms of telecommunicated instruction. Therefore, many of the

suggestions for improvement generated through the evaluation are applicable to other distance education environments. Recommendations for improvement include more emphasis on support management functions, increased attention to the level of interactivity in the distance classroom, training for instructors, and an orientation for students.

Limitations

Several limitations must be considered when reviewing the results of this study. First, as with all attitudinal research using Likert-scale instruments, one limitation is that student responses are self-reported. It must be assumed that students are responding truthfully when completing the survey.

Second, the sample size used for this research was constrained by limitations in the numbers of courses available for study. It also must be assumed that community college students enrolled in summer courses are representative of community college students taking courses during the academic year.

Third, data were gathered as part of a larger study of the effectiveness of the Iowa Communications Network (ICN). Responses of Iowans are not necessarily representative of responses of students from other geographic areas.

Fourth, the non-experimental and post-hoc nature of the study may limit the generalizability of the findings. The study did not allow for control of confounding variables and influences such as different subject areas and different instructors were not taken into account.

Fifth, the experimental nature of the new system and students' excitement over using the newest technology may have colored their responses. A "halo

effect" could have occurred. Students were also aware that they were participating in an evaluation of the system and this awareness could have affected their responses.

Sixth, some caution is recommended in the statistical interpretation of the data. Although the test-wise error rate for the t-tests was set at .05, this does not reflect the experiment-wise error rate. A total of five sets of comparisons were made on the set of student data. In order to hold the experiment-wise error rate to .05, an adjustment would need to be made (Bonferonni's adjustment) in the alpha level. By dividing the initial alpha level (.05) by the number of comparisons made (5), an alpha level of .01 is obtained. The tables above could be re-interpreted using this adjusted alpha level, which holds the experiment-wise error rate at .05.

In using a criteria of .01 alpha, it appears that age is the only variable in which there is a significant difference in the t-test analysis. This would be the most conservative interpretation. However, given the test-wise error rates of .05 reported above, it seems to the author that some consideration should be given to the possibility that differences do exist in the perceptions of different groups of students toward their distance education experience. It is possible, however, that because of the number of comparisons conducted, the differences found could be the result of chance.

Recommendations

The following recommendations are made for further study of the use of interactive television for instruction. First, evaluations of the satisfaction of audiences other than community college students should be conducted. This

would allow assessment of whether the system was more suitable for different levels of instruction.

Second, use of the instrument created for this study would allow a determination of the stability of the constructs across populations. Some revisions in the course management items and separation of that construct into three constructs might add to the usefulness of the instrument.

Third, other measures of system effectiveness should be incorporated into future studies. These measures might include learning, retention, enrollment growth, system use, cost effectiveness, and future academic success.

Fourth, qualitative studies could be conducted to aid in better understanding of the distance learning environment and the needs of students in these settings, particularly remote site students. Qualitative studies could utilize focus groups conducted over the ICN, observations conducted unobtrusively from another ICN site, or review of videotapes, all techniques that would use the system itself in conducting further research.

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APPENDIX A: ADVISORY PANEL

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Iowa Distance Education Alliance Research and Evaluation Advisory Panel

Advisory Panel Responsibilities

- **Provide advice about evaluation process and design.**
- **Review evaluation instruments and procedures.**
- **Provide recommendations for revisions in instruments and procedures.**
- **Review the results of evaluation activities.**
- **Provide advice in developing the research agenda.**
- **Assist in selecting research grant recipients.**
- **Provide advice on research activities and procedures.**
- **Review the results of research activities.**
- **Review research and evaluation publications.**

APPENDIX B: INSTRUMENTATION

Dear

Thank you so much for agreeing to help me in surveying the community college classes that are being held on the ICN this summer! I have put together packets of materials (enclosed) for you to provide to the instructors. Each packet includes: 1 letter to the instructor
1 instructor survey
1 cover sheet
20 student surveys
I was not sure how many students would be in each class. If you need more surveys for a particular class you can call me and I will send more surveys to you or you can take surveys out the packets for any class that may need fewer than 20.

I have indicated in the instructor letter that they are to return the packets to the person who provided them (I assume that will be you). However, you may wish to attach a memo for the instructor to let them know where to return the survey packets. Please send the completed surveys back to our office by mid-August if possible (the sooner, the better). I will provide reports of the survey results for your region in the fall.

If you have any questions, please call me at (515) 294-9464. Again, thank you for your assistance!

Sincerely,

Chris Sorensen
Evaluation Specialist

Dear Instructor,

We are pleased that you have chosen to use the Iowa Communications Network (ICN) for your class. As part of Iowa's federally funded Star Schools grant, we are collecting information about student and instructor perceptions of distance education and their class experience with the ICN. This information will be used in future planning. We appreciate your taking the time to complete the enclosed information and collecting surveys from your students.

Near the end of the course, distribute and collect the survey forms from the students. Students should not place their name anywhere on the survey. Answers are confidential. All data will be reported in aggregate form. Instructors are asked to fill out the instructor survey and the instructional use cover sheet. All student surveys, the instructor survey, and the cover sheet are to be returned to the person who provided you with this packet of information.

Again, thank you for your assistance in the Iowa Star Schools project. If you have any questions about these surveys or their administration, please call me at the Iowa State University Star Schools Office, (515) 294-6919.

Sincerely,

Chris Sorensen
Evaluation Specialist

Survey Procedures
for Instructor and Student Class Surveys

Step 1

The instructor using the ICN or other interactive television system receives a packet containing an instructor survey, a course cover sheet, and student surveys . Instruction is defined as teaching a complete course, teaching a partial course (more than one session but not a complete course), and supplementary activities used for instruction.

Step 2

The instructor is responsible for distributing and collecting student surveys and for completing the instructor survey and cover sheet at the completion of the course or activity. Some information requested on the cover sheet may not be appropriate for uses other than a complete course. Complete only those items that apply and use the back side of the form to describe the activity. Return the surveys (Students and Teacher), and the cover sheet to the person designated below.

Step 3

The person listed above is responsible for mailing the completed surveys (Student Surveys, Teacher Survey, and Cover Sheet) to Iowa State University.

Cover Sheet
Interactive Distance Education
Instructional Use

Institution Offering Course_____ Date _____

Origination Site _____

Remote Site(s) _____

_____

_____

Course Title _____

Time Offered _____ Enrollment _____

Subject Area _____ Level _____# Students at

Origination Site _____ # Students at Remote Site _____

Males _____ # Females _____

Ethnic Background of Students (#) Caucasian _____ Black American _____

Hispanic _____ Native American_____

Asian/Pacific Islander _____ Other _____

Course/Activity offered by (Check One)

Community College _____ Regent Institution _____

Private College _____ Other (Specify) _____

System Used (ICN, Microwave, Other) _____

If available, please list the average class grade at each site, for example, 3.25 (no individual grades).

Origination site _____ Remote Site(s) _____

_____

_____

Iowa Distance Education Alliance
Student Survey
For Students Taking Classes Over the ICN

Please darken the appropriate circle with a #2 pencil.

1. I am *1=male* *2=female*
2. My ethnic origin is *1=Caucasian* *2=Black American* *3=Asian/Pacific Islander* *4=Hispanic* *5=Native American* *6=Other*
3. My age is *1=under 18* *2=18-24* *3=25-34* *4=35-44* *5=45-54* *6=55 or over*
4. My college classification is

   1=freshman *2=sophomore* *3=junior*
   4=senior *5=graduate student* *6=other*

5. Number of distance education courses you have taken (including this one).
   If 10 or more, darken the '0'.
6. Are you taking this class at an origination or remote site?
   1=origination *2=remote*

Use the following scale to indicate your level of agreement with items 7 through 31.

1 = strongly disagree
2 = disagree
3 = agree
4 = strongly agree

7. It is easy to pay attention to the instructor on the TV monitor.
8. I feel encouraged to become involved in class discussions and activities.
9. I feel like I am a part of the class.
10. I am learning as much in the interactive television class as I would in a regular class.
11. I would tell my friends to take an interactive television class.
12. I would take another interactive television class.
13. Overall, I am satisfied with my interactive television class.
14. I feel the TV instructor is available to answer my questions.
15. The instructor pays attention to students at the remote site during class.
16. The class is well organized.
17. I feel the instructor is speaking directly to me.
18. I feel the students at the other site(s) are very much a part of my class.
19. It is easy to use the microphone.
20. It is easy to see the TV monitor.

OVER---------->

List two things you like best about taking an interactive television class.

List two things about the interactive television class that you would like to change or improve.

21. It is easy to hear comments made by students at the other site.
22. Graphics and other visuals are easy to read on the monitors.
23. Technical problems interfere with my learning in the TV classroom.
24. The fact that I am "on TV" inhibits my class participation.
25. I pay as much attention in the interactive TV class as I do in a regular
26. The classroom is free of distractions (e.g. people coming in and out, ta noise from other rooms).
27. It is easy to get information about interactive television classes that available.
28. Enrollment and registration procedures meet my needs.
29. I have adequate access to the resources I need for class, such as the lit
30. Remote site students receive class materials in a timely manner.
31. I have had no problem in getting access to the classroom during the scheduled class time (e.g., doors are unlocked).

Name of course

_____

Institution where you are taking this class

_____

Any other comments you would like to make

(Note: The survey is printed on computer readable scan sheets with wider margins than shown here prior to distribution.)

APPENDIX C: RESPONSES TO OPEN-ENDED QUESTIONS

Community College Surveys - Open Ended Comments

List two things you like best about taking an interactive television class.

1. (1) It is a form of new technology, and (2) I don't have to travel to go to class.
2. Close to home and teacher visitations.
3. (1) Closer to my home (1 mile instead of 50 miles), and (2) I'm more available for my daughter.
4. It is convenient, more than driving to campus.
5. Close to home and easier to take classes.
6. Small class.
7. It is close to home, 10 miles instead of 50 and I learn better in a small classroom.
8. (1) The chance to listen to other students, and (2) being on screen.
9. Not having to drive to the college for class.
10. A change from normal classes.
11. Broader opportunities for classes. Broader spectrum of people.
12. Just as informative as a regular class.
13. (1) Close to home. (2) Different type of education.
14. Close to home. Like ordinary class.
15. If it wasn't for the ICN, I wouldn't be taking college courses.
16. Easy to get to class, it is not a long drive. You get a chance to talk with people from many different areas.
17. Easy to listen and ask questions.
18. Class is available. It is easy to get information.
19. Use of new technology. Seeing people in other towns.
20. Availability and convenience.
21. You're more at ease to listen.
22. (1) It gives you a chance to relate with other people in other sites. (2) You get a better variety of students with different questions and answers.
23. Mush easier to learn via TV than usual correspondence courses. Feel like I'm a part of the class.
24. The instructor does a very good job of teaching in this method.
25. Instructor seems to take more interest in each person.
26. It is close to my home and not many people at my site.
27. (1) You get the class out of the way. (2) Easier to focus since you have no other classes.
28. It is only twice a week. Not a lot of bookwork homework assignments.
29. (1) Freedom of not always having instructor in the room. (2) More days and times available to take classes.
30. Close to home. Easy access.
31. Not having to drive out of town for class. Schedule times.
32. I feel I am part of society even though I am incarcerated.
33. Relaxed atmosphere. Availability - especially evenings and Saturdays.
34. Small classes.
35. Small groups.
36. Small groups.
37. Small groups.
38. Experience.
39. Experience.
40. When they do participate you get many more ideas floating about.

41. It takes away the distractions of a classroom. It takes away the inhibitions of speaking on a microphone.
42. Introduced to new people. New experience.
43. We get to meet new people. We get to talk on the cool microphone.
44. (1) It allows me to take courses offered in a location too far away to travel to. (2) Meet other students from other sites.
45. Instructor can not see if my eyes are open or not. Plenty of naps and breaks. Enjoyed extremely.
46. (1) Fits my scheduling needs. (2) Allows us to meet people from remote campuses.
47. Meet people not in your school.
48. I like the TV and we can see the teacher.
49. (1) Monitors make visual aids easier for professor to use. (2) Paying only one teacher must keep our prices down.
50. Gives more available course options. Less "structured."
51. When teacher is able to visit both classes.
52. (1) Take classes offered too far to travel to. (2) Meet other individuals.
53. The class was a lot of fun. The instructor did goofy stuff with the camera to keep us awake. I felt I could ask questions and give answers. We worked together here more than we might of if the professor had been directly available to us. Fun, informative class.
54. It is easier to see the screen than a board in a conventional room.
55. Didn't like or dislike anything in particular. It was just a regular class.
56. There are only four people in my class and we are still able to have it.
57. The instructor is very interactive.
58. I had no problems with this type of learning. It went pretty well overall.
59. (1) Get to know other people. (2) Learn to use new technology.
60. I enjoyed the class.
61. Convenient.
62. Convenient.
63. Because of ICN, I could take a class I needed when I needed it.
64. Hear other opinions.
65. (1) Using the new technology. (2) Getting to know the students from other site.
66. Nice to be exposed to fiber optics. "Meet" other people.
67. Being able to meet people from the other site over TV.
68. Have outside opinions. Wider variety of opinions (get more out of class).
69. Meeting people at out other campus. Different views from a different area.
70. I have never done it before - experience. Meeting people at the other campus.
71. (1) It was neat! (2) Different environment!
72. Bigger class. Different atmosphere.
73. (1) The chance to meet other students. (2) Change.
74. (1) Interaction with other students I would normally never get to meet. (2) Different view points.
75. (1) Get to use new technology. (2) Get to meet people from different places.
76. (1) Getting views of other people in different location of the state. (2) Being at the origination site.
77. I enjoyed the instructor.
78. Can leave early.
79. (1) You can be taught miles away. (2) It can open more and better opportunities for science.
80. I didn't like anything. However, it is difficult to distinguish whether it was the class or the fiber optics.
81. ?

82. The notes given in class are easy to read over the monitor. I feel that I get results equal to the effort I put into the class.
83. (1) Freedom (more of it). (2) Excited to be a part of the future.
84. It is very different. A new experience.
85. The smallness. The use of the TVs instead of overheads.
86. The monitors and the clearness of the video.
87. There are new faces. It helps people who can't drive to the original site to take a certain class.
88. More active information being discussed. Hear other students' comments.
89. It makes the class seem larger. The instructor has more interaction with other students.
90. Less time traveling. Saves money and expenses.
91. Seeing other people in different cities take the same class.
92. The instructor.
93. Smaller class size in a room.
94. Interesting.
95. Talk, learn.
96. (1) Learn things. (2) Relax.
97. You meet new people. You learn a lot.
98. (1) New technology. (2) Learn and meet new people.
99. The teacher is fun.
100. Communicating with kids I don't know and getting paid for it.
101. Students here helped one another out more since we could talk while class is going on.
102. I like that you can stay in your own area and don't have to drive to where the class is being given. I feel that I myself learn as much over the TV as I would if I were in a class with the teacher standing in front of me.
103. I was able to take the class in town and not have to drive.
104. I don't have to talk out loud in front of everyone.
105. (1) Meeting people from other areas, or at least seeing them. (2) More advantageous to see exactly what the professor is looking at.
106. It saved me from having to drive to the college four days a week. I am very glad the teacher is at my site for this particular class.
107. (1) It is a neat new experience. (2) Meet students that I never would have met. (3) I like being a part of a new way to higher education.
108. It is a new experience for me. We had the instructor here.
109. (1) Easy to see and hear the teacher and (2) also easier to see other students' works.
110. First experience with such technology

List two things about the interactive television class that you would like to change or improve.

1. I can not make out teacher's hand writing.
2. The teachers could write bigger and clearer to read.
3. More classes on the system. More sites offering the system.
4. I don't know.
5. I would like a system installed where the instructor could hear the students talking without the use of microphones. I feel this would cut down on talking of students during the class period.
6. Some teachers writing is hard to read on the overhead.
7. Sometimes problems with the system.
8. Having the teachers come to this center once or twice during the course.
9. I would not choose another television class.

10. Too many technical difficulties with the system slows down class.
11. Can't hear when speaking, so often find that instructor was talking about something else and never even heard my comment.
12. Reading/seeing things (visual aids) on monitor. Being available at all sites.
13. More teacher/student personal communication (one-on-one).
14. (1) A little harder to get in touch with the teacher. (2) Attention maybe a little harder to keep.
15. Homework back earlier.
16. I'd like more reference material available (library).
17. Graphics and other visuals. I don't feel I learn as much.
18. Leaving on at end of class to finish up if necessary - not turned off right away. Not canceled because of energy alert.
19. The time the teacher spends moving the camera.
20. If things could be returned more quickly.
21. Textbook does not explain things well. In a class such as this, the book can be very important. Many students will sign the attendance sheet and leave.
22. The shutting down process. Maybe after it is shut down, still be able to answer questions relating to the class.
23. Should be more time at the end of class for questions and answers.
24. Receiving homework and tests back sooner. Never get homework or tests back for 4 to 6 weeks at a time. Very frustrating!!! You never know where your grades are.
25. Getting graded assignments back faster.
26. It is hard to interrupt. I wish I could raise my hand. It is hard for me to argue back and forth.
27. (1) Interact with everyone in the site - not just certain centers. (2) Not all summer - should have the classes all week so we actually have a month of summer.
28. Doesn't always keep you involved. Hard to keep paying attention.
29. (1) I would very much like more resources available at the county sites. (2) Eliminate technical problems.
30. Need a good library. Need to get work back faster.
31. Have instructor visit sites more.
32. Instructors come to the prison to teach more.
33. Technical problems. Speed of material exchange.
34. Getting work back sooner.
35. Receiving your work sooner.
36. I think instructors should use overnight express and return papers to remote sites via those overnight special services.
37. (1) Getting work back earlier. (2) Interaction non-existent. Better if face-to-face.
38. Open microphone?
39. Better sophistication, different types of microphone system for students.
40. Remote site does not always seem to participate.
41. Remote site doesn't always seem to participate as much as they should. The teacher needs to be a different centers at times to give everyone the chance to be the remote class.
42. Timeliness of getting assignments back.
43. (1) See more of other classmates and (2) get all students interacting in discussions.
44. Classmates talk so much that it is hard to pay attention and hear. Technical problems cause classes to be canceled. This class needs a babysitter.
45. (1) Communications between student and teacher and (2) receiving of test grades and material between two sites.
46. The program needs refined, i.e. technical difficulties.

47. (1) Get rid of the program and (2) see line one. My advice to kids going into college is do not take an interactive course. It is bad for your brain.
48. Get an instructor that is more interactive and try to interact with both classes. I would not recommend anyone take a class like this.
49. The speed of receiving test results needs to be improved. Many students are disruptive and noisy.
50. (1) Would like to have an assistant at the remote site, "some people make too much noise!" and (2) I would like to be able to review our tests. Thank you for your concern.
51. Debugging the electrical systems. Zoom lens on remote site camera so we can see the other class better.
52. The attitude of the students who view from another location - lack of respect and goofing off.
53. Technical difficulties and more class discussion.
54. More classes offered. Different hours.
55. The technical problems. Nothing else.
56. At first it was hard to get used to the microphone. It is sometimes hard to read the monitor instead of a blackboard.
57. Make it so the instructor may move around and write on a board.
58. Teacher in different locations. Less interaction with teacher personally.
59. Could see all remote sites at the same time.
60. A bigger TV screen for front of room (like a 60 inch big screen).
61. It is difficult getting used to using the microphones.
62. (1) learn new things, and (2) study new things.
63. Longer lunch breaks and more movies.
64. Own monitor for remote sites.
65. Don't want to be on TV.
66. Noise and talking.
67. Teacher needs to write bigger and more clear. The room here is way too cold, its very uncomfortable. The class was mostly physics, and I thought it was a mixture of chemistry and biology along with physics.
68. Nothing I would like to change.
69. During lecture the TV system was fine. During labs it was sometimes difficult to understand what was going on and what we were supposed to do.
70. The room is very cold. I learn better when the teacher is in the same room as me.
71. Classroom too cold.
72. Hard to talk to professor on one-on-one basis without calling long distance.
73. Ability to focus in sharper on objects/experiments. ICN able to stay on until class is over. Sometimes goes off earlier.
74. (1) That the remote sites should be able to stay hooked up with us until the instructor is finished. Instead of a set shut off time. (2) Being able to tape classes that students miss or know they will not be attending.
75. I often forget to use the microphone since the instructor is in this room. It may be easier for us if you didn't have to push a button to use the microphones. Sometimes the volume levels are pretty high.
76. Materials need to be received much quicker. Microphones are hard to manage.
77. Swivel cameras and hidden cameras. Headset microphones. Make it so the camera doesn't add 10 pounds.
78. (1) Have one microphone in the classroom. (2) Camera could move around.
79. Camera that moves around. Different kind of blackboard.
80. (a) The mail is slow and (b) Limited board space - need a wider camera angle.
81. Have microphones that you don't have to push a button to talk (e.g. headset).

82. Swivel cameras or hidden cameras.
83. Difficult to get outside help if needed. If professor could visit more often.
84. Way, way too many technical difficulties. Students at other site don't always use their microphones so we don't know what they are saying.
85. I felt the instructor often acted as this was a high school classroom rather than a college one. I felt I deserved to be treated as an adult, not a high school student.
86. The microphone system.
87. (1) Camera could move and (2) one microphone for the whole room.
88. If I had had difficulty with this class, I think not being able to talk to the instructor in person would have been frustrating. In my opinion, though, he did his best to make himself available to us. Technical problems robbed us of some class time.
89. It would be nice to have more time to talk to teacher before and after class.
90. I wish we could see the students at the remote site better.
91. A little more interaction between classrooms.
92. Better system of getting materials to the remote site students.
93. (1) Make the teacher available to move and walk around the room. (2) Have it so you can talk without pressing a button.
94. People scared to use the microphone.
95. The mail.
96. Get rid of microphones and let the teacher walk around.
97. (1) Teacher able to walk around. (2) Have it set up so you don't have you press the button to talk every time.
98. Actually meeting the other students.
99. Need to develop a system to interact on an individual basis.
100. More interaction and more easier to hear them on microphones.
101. Better interaction with other class - group projects.
102. Be able to hear what they are saying without pressing microphones. See them close up.
103. (1) Communication. (2) Convenience.
104. Improvements on the microphones.
105. (1) Microphones that you didn't have to press a button for all of the time. (2) Get a day to meet the other students at the remote site.
106. Have a more automation-minded microphone. To have the teacher move around so he/she can interact more with class.
107. Nothing at all.
108. Make the remote high school rooms more easily accessible by placing them close to a door that is separate so as not to interrupt high school while college courses are being taught during the day.

APPENDIX D: HUMAN SUBJECTS APPROVAL

Information for Review of Research Involving Human Subjects
Iowa State University
(Please type and use the attached instructions for completing this form)

1. Title of Project: Iowa Distance Education Alliance/Teacher Education Alliance--Iowa's Star Schools Project

2. I agree to provide the proper surveillance of this project to insure that the rights and welfare of the human subjects are protected. I will report any adverse reactions to the committee. Additions to or changes in research procedures after the project has been approved will be submitted to the committee for review. I agree to request renewal of approval for any project continuing more than one year.

Typed Name of Principal Investigator	Date	Signature of Principal Investigator
Michael Simonson	9/27/93	Michael Simonson

Department	Campus Address	Campus Telephone
RISE	E005 Lagomarcino	4-7012

3. Signatures of other investigators

	Date	Relationship to Principal Investigator
Jan Sweeney	9/27/93	Coordinator of Evaluation
Mari Kemis	9/27/93	Research and Evaluation Specialist
Chris Sorensen	9/27/93	Evaluation Specialist

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4. Principal Investigator(s) (check all that apply)
☒ Faculty ☒ Staff ☐ Graduate Student ☐ Undergraduate Student

5. Project (check all that apply)
☒ Research/ Evaluation ☐ Thesis or dissertation ☐ Class project ☐ Independent Study (490, 590, Honors project)

6. Number of subjects (complete all that apply)
X # Adults, non-students ___ # ISU student X # minors under 14 ___ other (explain)
X # minors 14 - 17

7. Brief description of proposed research involving human subjects: (See instructions, Item 7. Use an additional page if needed.)

See attached

(Please do not send research, thesis, or dissertation proposals.)

8. Informed Consent:
☐ Signed informed consent will be obtained. (Attach a copy of your form.)
☒ Modified informed consent will be obtained. (See instructions, item 8.)
☐ Not applicable to this project.

9. Confidentiality of Data: Describe below the methods to be used to ensure the confidentiality of data obtained. (See instructions, item 9.)

The identifiers are used for matching data files only as data are collected and processed. Cofidentiality is maintained with names and identifiers kept at separate locations. All responses are aggregated and are reported most often as statewide data. No names will be used in reporting results from teachers and students back to schools; in fact, all results from classroom evaluations will be given only to teachers and not to administrators in the buildings.

10. What risks or discomfort will be part of the study? Will subjects in the research be placed at risk or incur discomfort? Describe any risks to the subjects and precautions that will be taken to minimize them. (The concept of risk goes beyond physical risk and includes risks to subjects' dignity and self-respect as well as psychological or emotional risk. See instructions, item 10.)

none

11. CHECK ALL of the following that apply to your research:

- ☐ A. Medical clearance necessary before subjects can participate
- ☐ B. Samples (Blood, tissue, etc.) from subjects
- ☐ C. Administration of substances (foods, drugs, etc.) to subjects
- ☐ D. Physical exercise or conditioning for subjects
- ☐ E. Deception of subjects
- ☒ F. Subjects under 14 years of age and/or ☒ Subjects 14 - 17 years of age
- ☐ G. Subjects in institutions (nursing homes, prisons, etc.)
- ☐ H. Research must be approved by another institution or agency (Attach letters of approval)

If you checked any of the items in 11, please complete the following in the space below (include any attachments):

Items A - D Describe the procedures and note the safety precautions being taken.

Item E Describe how subjects will be deceived; justify the deception; indicate the debriefing procedure, including the timing and information to be presented to subjects.

Item F For subjects under the age of 14, indicate how informed consent from parents or legally authorized representatives as well as from subjects will be obtained.

Items G & H Specify the agency or institution that must approve the project. If subjects in any outside agency or institution are involved, approval must be obtained prior to beginning the research, and the letter of approval should be filed.

K-12 students may be involved in distance education activities starting in Spring 1994 when the fiber optics network is operational to schools. If elementary and middle school students are receiving instruction over the network, evaluative information will be asked of them after parental consent is given. A simple form will be developed asking parents, etc. to allow participation in the evaluation. It is not expected that identifiers will be needed for this phase of evaluation. Teachers will be provided with materials explaning the evaluation and will be asked to provide this explanation to the students prior to the evaluation. The student's participation will indicate modified informed consent.

Checklist for Attachments and Time Schedule

The following are attached (please check):

12. [X] Letter or written statement to subjects indicating clearly:
    a) purpose of the research
    b) the use of any identifier codes (names, #'s), how they will be used, and when they will be removed (see Item 17)
    c) an estimate of time needed for participation in the research and the place
    d) if applicable, location of the research activity
    e) how you will ensure confidentiality
    f) in a longitudinal study, note when and how you will contact subjects later
    g) participation is voluntary; nonparticipation will not affect evaluations of the subject

13. [ ] Consent form (if applicable)

14. [ ] Letter of approval for research from cooperating organizations or institutions (if applicable)

15. [X] Data-gathering instruments

16. Anticipated dates for contact with subjects:

First Contact	Last Contact
1/1/93	unsure-project is funded through 9/94
Month / Day / Year	Month / Day / Year

17. If applicable: anticipated date that identifiers will be removed from completed survey instruments and/or audio or visual tapes will be erased:

    It is expected that identifiers would be removed from data files approximately one year from beginning participation, when follow-up activities are completed.

    Month / Day / Year

18. Signature of Departmental Executive Officer | Date | Department or Administrative Unit

    Michael Smith | 9/27/93 | R.I.S.E.

19. Decision of the University Human Subjects Review Committee:

    [X] Project Approved [ ] Project Not Approved [ ] No Action Required

    Patricia M. Keith | 10.22-93 | PMKeith

    Name of Committee Chairperson | Date | Signature of Committee Chairperson