OPPORTUNITIES AND OBSTACLES FOR DISTANCE EDUCATION IN AGRICULTURAL EDUCATION

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Abstract

A nationwide study using delphi techniques was conducted to develop consensus andprovide focus and direction for future research activities concerning the adoption of electronic communication, information, and imaging technologies for instructional use in agricultural education settings. A panel of 61 distance education experts were identified The four objectives were to identify the: I)positive effects of electronic technologies designed to facilitate communication, information gathering/retrieval, and imaging for instruction; 2) major obstacles that must be overcome in their adoption; 3) most promising technologies at the secondly level; 4) mostpromising technologies at the post-secondary level. Panelists suggested 21 ways these technologies improve instruction; responses clustered around: 1) increased availability of educational opportunities; 2) improved informational resources; 3) more effective instructional materials; 4)more convenient delivery methods. Panelists achieved consensus on 13 obstacles, which clustered around: 1) time constraints; 2) lack of a formalized faculty reward system; 3) lack of technical support; 4) equipment costs; 5) inadequately designed facilities. There was little difference between technologies identified as being most promising for the secondary and post-secondary levels. In general, panelists identified technologies clustered around four systems areas: I) distributed information; 2) computer-based information; 3) computer-assisted telecommunications; 4) graphical image production and display.

Introduction and Theoretical Framework

We live in a time of change. Gelatt (1993) said "Change itself **has** changed: It has become so rapid, so complex, so turbulent, and so unpredictable that is now called 'white water change"' (p. 10). The currents of change move so swiftly that they destroy what was considered the norm in the past, and by doing so, create a flood of new opportunities. Education, and more specifically, agricultural education, is not immune to the effects of change.

The development and use of communications technologies and instructional systems currently taking place are certain to bring about change in education. Wilkinson and Sherman (199 1) stated that technology to deliver and receive educational programs over distance has become more accessible and acceptable. Moore and Thompson (1990) pointed out that many states are in the process of installing telecommunications technology to allow distance education to occur in all levels of education, cradle to grave. Looking to the future, Pessanelli (1993) speculated that technologies will allow learning to take place virtually everywhere. Recently, President Bill Clinton and Vice-President Al Gore (1993) expressed the commitment of their administration to have every school in the nation connected to the "information superhighway."

A vast number of technologies have a place in distance education strategies. While video-based technology is currently the primary method of instructional delivery, a variety of others are used as well (Wilkinson & Sherman, 1991). Many desktop computer-based delivery systems show great promise. Documents, pictures, videos, sounds, and multimedia presentations can be accessed through computer networks such as the World Wide Web

(Hill, 1993). Salvador (1994) described how "pen computing," where an electronic pen is used with a LCD screen pad, is being used in a middle school to connect students to an instructor and to one another. The Virtual Online University, as reported by Marklien (1995), will connect faculty from universities around the world to more than 3500 students.

Despite these developments, challenges persist. Faculty and administrators consider these changes in educational delivery systems to be threatening (Beaudoin, 1990). Such concerns focus on poor attitudes toward distance education, suspicion of the nontraditional, and required changes in instructional methods (Dillon, 1989). Miller and King (1994) were able to identify 16 obstacles that exist in delivering distance education to secondary agricultural education programs.

However, Moore (1993) encouraged educators to look beyond these challenges and consider the vast opportunities distance education technologies and methodologies facilitate.

The opportunities for agricultural educators are numerous. Agricultural educators will be able to deliver programs to broader audiences, including learners of all ages and from diverse backgrounds. It will be possible to design and research distance education methodologies and assist colleagues in other areas of agriculture to enhance their teaching capabilities. Promise exists for partnerships and collaborative efforts with agricultural extension services and agribusinesses as never before. However, for these opportunities to develop from promise to reality, there is need to explore this evolving methodology of distance education, determine specific benefits it offers to the profession and obstacles it presents, and clarify a vision for the future.

Purpose and Objectives

The purpose of this study was to develop a consensus document to provide focus and direction for future research activities concerning the adoption of electronic communication, information, and imaging technologies for instructional use in agricultural education settings. The specific objectives were to identity the:

1. positive effects of electronic technologies designed to facilitate communication, information gathering/retrieval, and imaging will have upon the instructional process.

2. major obstacles that must be overcome in the adoption of these technologies.

3. technologies that hold the most promise for instruction at the secondary level.

4. technologies that hold the most promise for instruction at the post-secondary level.

Methods and Procedures

The conceptual model for this study was taken from Buriak and Shinn (1989) who used a Delphi approach involving expert opinion leaders to identify a research agenda for agricultural education. The Delphi method was selected for its ability to identify, and even create consensus among expert opinion leaders (Stackman, 1974). While decisions should be based upon a developed knowledge base, if one is unavailable, the opinions of experts are an acceptable alternative (Helmer, 1966). Buriak and Shinn (1989) suggested a Delphi model in which the study progresses in separate phases, "each phase moving closer to satisfying the objectives" (p.14). The phases of this research project are described below.

Phase I: Identification of the Panel

The Delphi method is heavily reliant upon the proper selection of an expert panel (Dalkey, 1969; Stackman, 1974). In order to identify an appropriate panel of experts, 37 names were purposely selected by an advisory committee from appropriate sampling frames. These frames included the Directory of Teacher Educators in Agriculture (Shelhamer, 1993) and the Agricultural Educators Directory (Henry, 1993). Experts were selected on the basis of recognized involvement with programs of agricultural education utilizing these technologies. A request was sent to each of these people on March 3 1, 1994. They were asked to identify expert opinion leaders to serve on a Delphi panel to examine how the new electronic communication, information, and imaging technologies will be used to improve instruction in the years ahead. They were also informed that panel members would be asked to identify the decisive obstacles that must be overcome in the process of adopting these technologies and the consequential instructional benefits derived following their adoption.

These 37 individuals nominated 61 members to serve on the Delphi panel. Only two panel members were duplicated during the identification process, indicating that there is not a consensus among opinion leaders as to expertise in this field. All 61 identified panelists were therefore invited to participate and informed of the commitment required to complete the study.

Of the 61 panelists invited to participate and mailed the first round instrument, 50 accepted and returned the instrument. Of these, 35 were university faculty members and 15 represented industry, state teacher supervisors, and secondary teachers of agriculture and technology courses. University faculty were primarily from departments of agricultural education, although agricultural extension, communications, and technology departments were represented as well. Forty-two of these 50 panelists completed the second round, and 38 completed the third. According to studies completed by the Rand Corporation, questions of process reliability when using the Delphi method are satisfactorily answered by a panel size larger than 13 (Dalkey, 1969).

Phase Two: Collection of Opinion

In the first round, panelists were asked to offer their response to four open-ended questions. These questions reflected the specific objectives of the study, and remained unchanged throughout the study.

Phase Three: Determining the Value of Opinion

In the second round, panelists were asked to review their own and the other panel members' responses and assign a value rating based upon the level of agreement with the item. To identify those items on which panelists held the strongest positions, a seven-point Likert scale was employed with items ranging from a 1 for "Strongly Disagree" to a 7 for "Strongly Agree." Items 3 and 5 allowed panelists to "Somewhat Agree" or "Somewhat Disagree" with a statement. Space was provided at the end of each section for panelists to suggest new ideas. Panelists were also encouraged to further refine existing statements by adding comments and suggestions.

Phase Four: Working Toward Consensus

Based upon the suggestions and comments from the second round, new items and parenthetical clarifications to several existing items were added in the creation of the third round instrument. Frequency distributions were used to refine further Round II responses. A 66% consensus level was established for this phase a priori. Only those statements on which 66% of the panel members selected "Somewhat Agree" (rating of 5), "Agree" (rating of 6) or "Strongly Agree" (rating of 7) were retained for the third round. In the third round, panelists were asked to re-evaluate items given the summary data from Round II responses as a guide to a new rating. Each panelist again indicated his/her level of agreement with the items, using the seven-point Likert scale.

Phase Five: Analyzing the Data

Descriptive statistics were used to summarize the data collected. Means and frequency distributions and percentages were calculated for each statement on the third round instrument. The fact that only small changes in the frequencies of retained items were found between the second and third rounds indicated that a consensus had been reached and the Delphi process could conclude.

Findings

Improving Instruction

Panelists suggested 21 ways in which these technologies will improve instruction (see Table 1). Their responses tended to cluster around four areas: 1) an increase in the availability of educational opportunities for students, 2) improved informational resources for faculty and students, 3) more effective instructional materials, and 4) more convenient delivery methods for instructors.

Obstacles

Panelists achieved consensus on 13 obstacles to be overcome in the process of adopting these technologies (see Table 2). These obstacles tended to cluster around five areas: 1) lack of time, 2) lack of a formalized reward system for faculty, 3) lack of technical support, 4) cost of the equipment, and 5) lack of properly designed facilities.

Table 1. Suggested Ways Technology Will Improve Instruction

Statement	Percentage "Agree" or "Strongly Agree"
They will provide teachers with additional teaching aids to reach and meet the needs of the diverse learning styles of students.	100.0
Teachers will have greater access to information resources.	100.0
Students will be able to take courses at many institutions.	91.9
A wider range of visual materials will be utilized.	89.2
Students' access to instruction will be enhanced.	86.5
Experts of all kinds will be more available for both students and teachers.	86.5
Textbooks will be available on CD ROM.	86.5
Teachers will communicate with their colleagues more.	83.8
Experts of all kinds will be more available, and more utilized, by both students and teachers.	83.8
They will reinforce learning by providing students with relevant and timely experiences.	78.6
Instruction will become more individualized.	77.6
Teachers will collaborate over distance on curriculum and research.	75.8
They will increase the opportunities for business/education partnerships.	75.7
Feedback to learners will be quicker and more specific.	73.0
Experts of all kinds will be more utilized, by both students and teachers.	73.0
Direct communications with content experts will be utilized instructionally.	73.0
Multimedia will be more effective in the instruction of abstract concepts.	73.0
Travel time for both students and instructors will be reduced.	70.3
Students will be able to choose courses based upon quality, regardless of the relative geographical location of student and instructor.	70.3
Realistic simulations and or virtual experiences will be utilized instructionally.	70.3
Course materials will be more easily updated.	67.6

Promising Technologies

There was little difference between the technologies identified by the panelists as being most promising for the secondary and post-secondary levels. They achieved consensus on 13 statements for secondary programs (see Table 3), and 19 for post-secondary (see Table 4). In general, the panelists identified technologies that tended to cluster around four areas: 1) distributed information systems, 2) computer-based information systems, 3) computer-assisted telecommunications systems, and 4) graphical image production and display systems.

Panelists agreed that there would be great variation in the adoption of these technologies by state, as well as by individual institutions within states. They reserved only one technology for the secondary level, namely interactive video, while identifying several technologies solely for the post-secondary level. These included: 1) electronic advising will become an important and accepted avenue for students; 2) on-line database searches; 3) satellite delivery of audio visual materials, and 4) multimedia authoring systems. All were described as promising technologies for the post-secondary level.

Areas of Disagreement

Stackman, (1974) suggests that important information is often found through the delphi process in those item on which opinion leaders cannot reach consensus. Some items eliminated in the second and third rounds of this study were notable (see Table 5). Panelists did not achieve consensus on many items. The statements they disagreed on clustered around three areas, namely, teaching methodology or pedagogy, the technology adoption process, and educational administration.

Table 2. Obstacles to Overcome in the Process of Adopting Distance Education Technologies

Statement	Percentage "Agree" or "Strongly Agree"
Educator apathy; most teachers are not using the technologies available now.	89.2
A lack of commitment by educators to spend the time to master the use of these technologies.	86.5
The level of preparation necessary for the instructor to utilize the technologies consistently.	83.8
The lack of administratively provided time, like professional development leave, to learn to use the technologies.	81.1
The lack of a reward system that encourages staff memebers to utilize the technologies.	78.4
Resistance to change by educators	78.4
The lack of administratively provided time, not leave, just time during the day to attend workshops.	73.0
A lack of support services to maintain hardware.	73.0
Low awareness level of administrators and legislators.	73.0
A lack of coordinated effort in securing these technologies.	73.0
Lack of access to state-of-the-art hardware.	73.0
A lack of facilities designed to utilize the new technologies.	70.3
The cost of the hardware.	67.6

Table 3. Promising Technologies for Secondary Programs in Agricultural Education

Statement	Percentage "Agree" or "Strongly Agree"
Interactive computer software programs.	94.6
Presentation software.	94.6
Interactive multimedia CD ROM-based computer programs.	86.5
Electronic mail used to communicate among teachers.	86.5
Computers in all classrooms.	86.5
LCD Panels and projectors to display information.	83.8
Computer graphics programs for landscaping and design (CAD).	81.1
Video tapes.	81.1
Interactive Video.	78.4
Electronic mail used for students to communicate with other students.	78.4
Multimedia delivered over a network, (e.g. MOSAIC).	78.4
Computer-assisted telecommunications and data transmission using the Internet.	75.7
Two-way interactive television.	75.7

Table 4. Promising Technologies for Post-Secondary Programs in Agriculture

Statement	Percentage "Agree" or 'Strongly Agree"
On-Line database searches using Gopher, Veronica, After Dark, Lexus/Nexus.	97.3
Presentation software.	97.3
LCD Panels and projectors to display information.	94.6
Multimedia delivered over a network, like MOSAIC.	94.6
Computer-assisted telecommunications and data transmission using the Internet.	92.1
Interactive computer software programs.	91.9
Electronic mail used to communicate among Professors.	91.9
Interactive multimedia CD ROM-based computer programs.	91.6
Electronic mail used for students to communicate with other students within and between campuses.	89.2
Distance Learning at this level will vary greatly by state.	89.2
Distance Learning at this level will vary greatly by individual institution.	89.2
Two-way interactive television.	81.1
Some advising will be done electronically.	78.4
Satellite delivery of audio visual materials.	75.7
Computers in all classrooms.	75.7
Video tapes.	75.7
Computer graphics programs for landscaping and design (CAD).	71.1
Multimedia authoring systems.	71.1
Electronic advising will become an important and accepted avenue for students.	67.6

Table 5. Sample of Statements Not Retained by 66% of Panelists

Statement	Percentage "Agree" or "Strongly Agree"
Benefits not retained:	
Traditional educational "service areas" or "boundaries" will overlap, and competition between educational institutions will increase.	64.9”
The utilization of information will become more important than its memorization.	64.9”
Students will collaborate with others at distant sites in real time.	62.2”
The presentation of information will be greatly improved.	62.2”
These technologies will increase the equity of course offerings among educational institutions	60.6
Student interest will be increased.	60.5
Instruction will become highly specialized.	57.8”
They will increase the number of students served by an instructor.	55.3
It will fundamentally change the teacher/student roles in education, enabling student-centered education, with the teacher assuming the role of a coach.	50.0
The authenticity of instruction will be increased.	42.1
Education will become more economical.	26.4
Lesson preparation time will be reduced.	5.3
Obstacles not retained:	
Educators' fear of the technologies.	63.2
High cost of network connections.	62.2”
Lack of vision by administrators.	60.4
Resistance to change by administrators.	57.9
Increased cost to students for the ability to utilize these technologies.	55.3
The paradigm of the instructor as the expert, using teacher-directed learning.	52.6
Competition among universities for the same learners.	42.2
A lack of student training in the use of the technologies.	34.2
Student fear of the technologies.	5.2
Lack of student interest.	5.2

[a] These items were removed in Round III. All others were removed in Round II.

Conclusions

1. Electronic communication, information, and imaging technologies will improve how we teach in agricultural education settings. They will allow us to reach more students, more effectively, with better information.

2. Faculty and administrators considered the time required to become proficient in the use of these technologies to be an obstacle to their use. Other obstacles included a lack of commitment for the use of these technologies to improve instruction and a lack of support, both technical and instructional, to assist faculty in their adoption. A lack of funding and the cost associated with implementing these technologies were also cited.

3. This research supports Dillon's (1989) finding that a lack of incentives is a primary reason why faculty do not support or adopt distance education technologies and methodologies.

4. While no single technology was identified as being most promising for either secondary or post-secondary agricultural education, computer-based telecommunications technologies of all types emerged as a dominate group. Post-secondary agricultural education will likely focus upon networked applications such as e-mail and the World Wide Web. Secondary agricultural education programs will probably focus upon "stand alone" applications such as CD-ROM and other interactive software programs.

Recommendations

This study indicates that agricultural educators are knowledgeable and hold strong opinions about distance education and its related technologies. Therefore, agricultural educators should be included in the planning, development, and implementationofdistanceeducationprograms.

Due to the variety of technologies suggested, individual institutions should each develop and prioritize a list of distance education technologies.

Because of the frequency with which personnel outside the profession of agricultural education were suggested as resource persons, partnerships should be developed within and between institutions to plan for the use of these technologies.

Research should be conducted to identify specific rewards and incentives to motivate faculty to commit to and support the adoption of these technologies.

Adjustments of faculty assignments and modification of tenure and promotion systems should take place to encourage the adoption of these, more time-consuming, technologies and methodologies.

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