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ABSTRACT

The purpose of this descriptive study was to investigate the usefulness of an interactive communications network for agricultural education at the secondary level. The Iowa Communications Network (ICN) is a two-way full motion fiber optics telecommunications system capable of linking secondary agricultural departments throughout Iowa. The objectives of the study were to: (1) describe obstacles that may inhibit the use of the ICN as perceived by secondary agriculture teachers; (2) describe secondary agriculture teachers' attitude toward using the ICN for delivering agricultural instruction; (3) describe relationships between teachers' attitude, perceived obstacles, and selected variables; (4) identify priorities for collaboration among secondary agriculture programs in delivering instruction over the ICN; and (5) identify courses offered in secondary agriculture programs that are suitable or unsuitable for delivery via the ICN. Results show that overall, the 16 obstacles to using the ICN were perceived to be slightly significant. Teachers were most concerned with scheduling problems, but were also concerned that laboratory sessions and supervised agricultural experience programs could not be managed over the systems. Additionally, respondents were concerned with costs, lack of training, and incentives for using the system. Data suggests that teachers are undecided about using the ICN for teaching agriculture. The highest priority for collaboration among schools were in the areas of agricultural economics and horticulture. Teachers generally agreed that agricultural mechanics courses were not suited to ICN delivery, but agricultural economics courses were suitable. Data is illustrated in seven tables. (Contains 17 references.) (Author/MAS)

Title:

Teaching Through Fiber-Optics Telecommunications Technology: Possibilities and Priorities for Agriculture

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Introduction

> It is traditional to think of adult learners when distance education is mentioned. Indeed, the greatest percentage of distance students have been adults. That tradition is changing. With the implementation of well funded programs, such as the U. S. Federal government's Star Schools Program, the vast possibilities of distance learning are being increasingly offered to K-12 student populations (Schlosser & Anderson, 1993, p. 37).

Many states have or are installing technology which will enable all levels of education to utilize distance education (Moore & Thompson, 1990; School Tech News, 1986). This may be good news for secondary agricultural education programs. According to the National Research Council (1988), educators must create new ways to deliver agricultural education to a greater number of students. The Iowa Communications Network may provide a suitable mechanism for delivering agricultural instruction to a larger audience of youth and adults.

Will distance education technology be accepted by secondary educators in general and agric. . i educators specifically? Faculty resistance is often cited as a major barrier to the implementation of distance education technology (Dillon & Walsh, 1992). Currently, few secondary educators have knowledge related to distance education. And, faculty are seldom the subjects of research in distance education (Dillon et. al. 1992).

Negative teacher attitudes, additional workloads, lack of funding, reduced student interaction, lack of time, fear of job loss, fear of technology, and technical problems have all been identified as obstacles to the adoption of distance education technologies (Bruder, 1989; Dillon & Walsh. 1992; Hansford & Baker, 1990; Jackson & Bowen, 1993; Jurasek, 1993; Koontz, 1989; Swan & Brehmer, 1992). Teacher experience with technology seems to be key in overcoming such barriers, however. Several researchers (Dillon & Walsh, 1992; Jurasek, 1993; Koontz, 1989) have concluded that faculty with distance teaching experience generally have more positive attitudes toward technology mediated instruction.

The transfer of technology from researcher to end user is a complex process and may be useful to researchers in understanding some teachers' initial resistance to distance education technology. Five distinct phases have been identified that take place in the adoption process. These phases are awareness, interest, evaluation, trial, and adoption (Lionberger & Gwin, 1982; Rollins, 1993). At the awareness stage, the teachers have heard about or read about the technology, while at the interest stage they want to know more about the technology and how it works. The evaluation stage involves the teacher's "mental" decision to try, or not to try the technology. In the trial stage, use of the technology starts slowly and increases as the teacher begins to appreciate the technology. Once convinced of the usefulness of the technology, the teacher enters the adoption phase and implements the technology.

Rate of movement from one stage of the adoption process to the next can vary widely, and research indicates that speed of adoption cannot be increased by skipping stages (Lionberger & Gwin, 1982). Other considerations related to the rate of adoption include teachers' willingness to change, individual differences, ability to understand the technology, and available funding.

Distance education technologies may be able to help facilitate the modernization and improvement of secondary agricultural education programs. But, several questions must be answered before this can occur. What are the attitudes of teachers toward delivering instruction via interactive communications networks, and what obstacles might inhibit their use of such systems? Also, what priorities should be established for collaboration among existing agriculture programs and for course offerings to schools without agriculture programs?

Purpose and Objectives

The purpose of this descriptive study was to investigate the usefulness of an interactive communications network for agricultural education at the secondary level. The Iowa Communications Network (ICN) is a 2-way full motion fiber optics telecommunications system capable of linking secondary agricultural education departments throughout Iowa. The objectives of the study were to:

1. Describe obstacles that may inhibit use of the ICN as perceived by secondary agriculture teachers.
2. Describe secondary agriculture teachers' attitude toward using the ICN for delivering agricultural instruction.
3. Describe relationships between teachers' attitude, perceived obstacles, and selected variables.
4. Identify priorities for collaboration among secondary agriculture programs in delivering instruction over the ICN.
5. Identify courses offered in secondary agriculture programs that are suitable or unsuitable for delivery via the ICN.

Procedures

The population for the study consisted of all secondary teachers of agricultural education in Iowa (N=216). Based on Krejcie and Morgan's (1970) formula for a 5% margin of error, a random sample of 140 teachers was selected to participate in the study.

The questionnaire utilized in the study consisted of 4 parts including the attitude toward the ICN scale, obstacles that may inhibit use of the ICN scale, questions related to collaboration and potential course offerings, and selected demographic questions. Content and face validity were established by a panel of experts in agricultural education.

Obstacles that may inhibit the use of the ICN by secondary agriculture teachers were identified by interviewing persons responsible for administering different aspects of the ICN, agriculture teachers not included in the sample, and from an instrument used by Swan (1992) for a similar purpose in North Dakota. Response categories for the Likert-type scale ranged from insignificant (1) to significant (6). The Cronbach's alpha reliability coefficient for the obstacles scale was .82.

Teachers' attitude toward the ICN was measured with a 28 item Likert-type scale, with five response categories ranging from strongly disagree (1) to strongly agree (5). The attitudinal instrument was tested for suitability and reliability with a group of 10 teachers not included in the sample. The Cronbach's alpha reliability estimate was .93.

The questionnaire, along with a cover letter and a stamped return envelope, was sent to all secondary agriculture teachers included in the sample. After 10 days, a second mailing was sent to all nonrespondents. Ten days after the second mailing, a reminder letter was sent to all nonrespondents stressing the importance of their participation. Approximately 10 days following the third mailing, telephone calls were made to the nonrespondents. One hundred and two teachers completed and returned the questionnaire for a response rate of 73%. Nonresponse error was controlled by comparing early to late respondents (Miller & Smith, 1983). No significant differences were found between early and late respondents.

Analysis of Data

All data were analyzed with the SPSS/PC+ personal computer program. Appropriate statistics for description (frequencies, percents, means, standard deviations, pearson correlations, and point biserial correlations) were used. The alpha level was set a priori at .05, and Davis' (1971) descriptors were used to interpret all correlation coefficients.

Results

The agricultural educators who participated in the study ranged in age from 23 to 64 years. The mean age of respondents was 36.94 with a standard deviation of 9.50. In regard to gender, 90.2% (92) of the teachers were male.

Teachers were asked to report their highest level of education. Bachelors degrees were held by 71% (66) percent of the respondents, 26.9% (25) of the teachers held masters degrees, and 2.2% (2) held doctoral degrees. Teachers were also asked to indicate the number of years they had taught agricultural education, and whether on not they had tenure. Years of experience ranged from one to 35 with a mean of 12.44 and a standard deviation of 8.51. Approximately three-quarters (77) of the teachers had tenure in their current positions.

The teachers were asked if their school was currently connected to the ICN. They were also asked if they had ever taught or taken a class via the ICN. At the time of the survey, 22.5% (22) of the schools represented by the agriculture teachers were connected to the ICN. None of the teachers had taught using this technology. Nine teachers (9.1%) indicated that they had taken at least one course via the ICN.

The teachers responded to sixteen statements representing obstacles which might inhibit their use of the ICN. A Likert-type scale with response categories ranging from insignificant (1) to significant (6) was utilized. Table 1 shows that forty-eight percent (49) of the teachers provided a mean score in the range of 4.51 to 5.50 (moderately significant). Approximately 39% (38) of the teachers reported mean scores in the range of 3.51-4.50 (slightly significant). Means scores in the range of 1.51-3.50 (moderately or slightly insignificant) were reported by less than eight percent (8) of the teachers. The overall mean score for the 16 obstacles was 4.49 (slightly significant), with a standard deviation of .63.

Table 1
Overall Mean Scores for Obstacles that May Inhibit Use of the Iowa Communications Network by Agriculture Teachers

Mean	f	%	Cum %
1.51-2.50	1	1.0	1.0
2.51-3.50	7	6.8	7.8
3.51-4.50	38	39.3	47.1
4.51-5.50	49	48.0	95.1
5.51-6.00	5	4.9	100.0
Total	102	100.0	100.0

Mean 4.49 Std. Dev. .63

Note: Based on Scale: 1 = insignificant; 2 = moderately insignificant; 3 = slightly insignificant; 4 = slightly significant; 5 = moderately significant; 6 = significant

Table 2 shows the percentage of teachers who selected slightly significant, moderately significant, or significant for each of the sixteen obstacles. School and class scheduling problems were considered most significant by the agricultural educators. Lack of local support staff, the inability to have lab sessions, and materials distribution were each considered slightly significant, moderately significant, or significant by 87.3% of the teachers. Costs, lack of training, and preparation time were considered slightly significant to significant obstacles by 80-85% of the agriculture teachers. Obstacles receiving the lowest frequencies in the slightly significant, moderately significant, or significant categories were lack of student interest and negative attitudes of teachers towards the ICN.

Table 2
Percentage of Teachers Who Selected Slightly Significant, Moderately Significant, or Significant for Each Obstacle

Obstacle		%
1.	Coordination of schedules between schools.	94.1
2.	The ICN could create scheduling problems.	88.2
3.	Laboratory sessions cannot be taught via the ICN.	87.3
4.	Distributing materials between sites.	87.3
5.	Lack of local support staff.	87.3
6.	Supervised agricultural experiences cannot be managed via the ICN.	86.3
7.	Costs associated with using the ICN.	85.3
8.	Lack of training.	83.3
9.	Preparation time needed by teachers.	82.4
10.	Fear that the ICN would reduce the number of agriculture programs.	78.4
11.	Agriculture teachers are to busy to teach via the ICN.	77.5
12.	Lack of incentives for teaching via the ICN.	77.5
13.	Administrators do not understand teachers' needs when teaching via the ICN.	77.5
14.	Difficulty in establishing cooperative relationships among schools.	68.6
15.	Negative attitude of teachers towards the ICN.	61.8
16.	Lack of student interest.	58.8

On a five-point Likert-type scale, teachers were asked to respond to 28 statements related to their attitude toward the use of the ICN to teach agriculture. Table 3 shows that 62.7% (64) of the teachers provided a mean score in the range of 2.51 to 3.50 (undecided). An additional 32% (33) of the agriculture teachers provided a mean score in the range of 3.51-4.50 (agree). The remaining 4.9% (5) of the teachers provided mean scores between 1.51 and 2.50 (disagree). The overall mean score for the 28 attitudinal statements was 3.26 (undecided) with a standard deviation of .47.

Table 3
Overall Mean Scores for Agriculture Teachers' Attitude Toward Using the Iowa Communications Network to Teach Agriculture

Mean	f	%	Cum %
1.51-2.50	5	4.9	4.9
2.51-3.50	64	62.7	67.6
3.51-4.50	33	32.4	100.0
Total	102	100.0	100.0

Mean 3.26 Std. Dev. .47
Note: Based on Scale: 1 = strongly disagree; 2= disagree; 3= undecided; 4= agree; 5=strongly agree

Pearson correlations and point bisenal correlations were used to describe relationships between obstacles that may inhibit the use of the ICN and selected variables (Table 4). The associations ranged in magnitude from negligible to moderate. Teachers who provided higher scores on the obstacles scale tended

to have less positive attitudes towards the ICN, were less likely to be located in a school connected to the ICN, and were younger. The association between years of teaching experience and perceived significance of the obstacles was negligible.

Table 4
Summary of Relationships Between Obstacles That May Inhibit Use of the ICN and Selected Variables

Variable	Association
Attitude toward ICN	-.36*
School connected to ICN	-.13
Years of teaching experience	-.08
Age	-.16

* p = >.05

Table 5 shows the associations between attitude toward using the ICN for delivering agricultural instruction and selected variables. The associations ranged in magnitude from negligible to low. Female agriculture teachers tended to have more positive attitudes towards using the ICN to teach agriculture. The association between years of teaching experience, connection to the ICN, and age were negligible.

Table 5
Summary of Relationships Between Attitude Toward the ICN and Selected Variables

Variable	Association
School connected to ICN	.06
Years of teaching experience	-.07
Gender	.21*
Age	.01

* p = >.05

Agriculture teachers were asked to list units of instruction that they would like to receive from other agriculture programs through the ICN. A total of 275 units of instruction were listed by the 102 agriculture teachers participating in the study. Units of instruction were placed into 12 content-related categories by the researchers. Table 6 shows that units related to agricultural economics (25.8%) were listed most frequently as priority units for reception. Horticulture, floriculture, and landscaping units (13.8%) were the second most frequently cited units followed by animal sciences (11.2%), agronomy (9.5%), aquaculture (9.5%), agricultural mechanics (8.3%), and biotechnology (5.5%). Categories representing less than 5% of the total number of units included natural resources and the environment, careers in agriculture, computers, and leadership, FFA and SAE. Approximately 6% of the units were grouped into a miscellaneous category and included such units as forestry, food technology, international agriculture, and agricultural journalism.

Agriculture teachers were also asked to list units of instruction that they would be willing to teach via the ICN. A total of 164 units of instruction were listed by the 102 agriculture teachers who participated in the study. Table 6 shows that units related to animal sciences (25.6%) were listed most frequently as priority units for delivery. The second most frequently cited category was agricultural economics (23.2%) and was followed by agronomy (11.6%), horticulture, floriculture, and landscaping (8.5%), agricultural mechanics (7.3%), and leadership, FFA, and SAE (5.5%). Categories representing less than 5% of the total number of units included natural resources and the environment, computers, careers in agriculture, biotechnology, aquaculture, and the miscellaneous category.

Due to the nature of the instruction in secondary agriculture programs, it could be hypothesized that only select course offerings are suitable for delivery via the ICN. Agriculture teachers who participated in the study were asked to list titles of courses (semester or year-long) that could be delivered via the ICN to schools without an agriculture teacher. A total of 210 course titles were listed by the agriculture teachers. The researchers collapsed the course titles into nine categories which are presented in Table 7. Course titles related to agricultural economics (35.2%) were listed most often as courses that were suitable for delivery via ICN. The second most frequently cited category of course titles was agronomy (19.5%) and was followed by animal sciences (18.6%), horticulture, floriculture, and landscaping (5.7%), and natural resources and the environment (5.2%). Categories representing less than 5% of the course titles included agricultural mechanics, leadership, FFA, and SAE, and aquaculture. Approximately 11% of the course titles were grouped into a miscellaneous category and included such titles as agricultural communications, Iowa agriculture, agricultural issues, and agricultural chemicals.

Table 6
Categories of Priority Units of Instruction that Agriculture Teachers Desire to Receive or Would be Willing to Deliver via the ICN

Unit	Receive		Deliver	
	f	%	f	%
Agricultural Economics	71	25.8	38	23.2
Horticulture/Floriculture/Landscaping	38	13.8	14	8.5
Animal Sciences	31	11.2	42	25.6
Agronomy	26	9.5	19	11.6
Aquaculture	26	9.5	4	2.4
Agricultural Mechanics	23	8.3	12	7.3
Biotechnology	15	5.5	4	2.4
Natural Resources/Environment	13	4.7	6	3.7
Careers in Agriculture	6	2.2	4	2.4
Computers	5	1.8	5	3.1
Leadership/FFA/SAE	4	1.5	9	5.5
Miscellaneous	17	6.2	7	4.3
Total	275	100.0	164	100.0

Table 7
Categories of Priority Courses That Could be Offered via the ICN to Schools with no Agriculture Teacher

Course	Suitable		Not Suitable	
	f	%	f	%
Agricultural Economics	74	35.2	9	4.8
Agronomy	41	19.5	19	10.2
Animal Sciences	39	18.6	12	6.5
Horticulture/Floriculture/Landscaping	12	5.7	30	16.1
Natural Resources/Environment	11	5.2	5	2.7
Agricultural Mechanics	6	2.9	88	47.3
Leadership/FFA/SAE	3	1.4	8	4.3
Aquaculture	1	.5	5	2.7
Miscellaneous	23	11.0	10	5.4
Total	210	100.0	186	100.0

Agriculture teachers were also asked to list titles of courses (semester or year-long) that would be unsuitable for ICN delivery. A total of 186 course titles were listed by the agriculture teachers. Table 7 shows that agricultural mechanics courses (47.3%) were most frequently cited as not suitable for ICN delivery followed by horticulture, floriculture, and landscaping courses (16.1%), agronomy courses (10.2%), animal science courses (6.5%), and miscellaneous course titles (5.4%). Categories representing less than 5% of the course titles included agricultural economics, natural resources and the environment, leadership, FFA, and SAE, and aquaculture.

Conclusions and/or Recommendations

Overall, the 16 obstacles to using the ICN in secondary agriculture programs were perceived to be slightly significant. Teachers were most concerned with scheduling problems, but were also concerned that laboratory sessions and supervised agricultural experience programs could not be managed over the system. Additionally, the respondents were concerned with costs, lack of training, and incentives for using the system.

Perhaps scheduling, training, and incentives are less problematic than concerns related to supervised agricultural experiences and laboratory experiences. Can quality programs in agricultural education be delivered while sacrificing the application of learning provided through supervised agricultural experiences and laboratory experiences? Do agriculture teachers really have to sacrifice these components of an agriculture program? It was recommended that pilot or demonstration programs be developed that include laboratory and hands-on learning experiences within the interactive distance education delivery mechanism. The interactive and video components of distance education should be exploited to demonstrate viable alternatives to conventional methods of teaching agricultural education.

Data suggest that secondary agriculture teachers are undecided about using the ICN as a tool for teaching agriculture. If attitudes are a reflection of an individual's personal perspective and are strongly predictive of behavior (Na and Lee, 1993), what does this tell us about agriculture teachers' willingness to use this educational technology? Perhaps Lionberger et al.'s (1982) adoption process theory could explain the current situation. The ICN was connected to less than 25% of the schools represented in this study. This might indicate that most of the secondary agriculture teachers were at the early stages of the adoption process. Maybe the teachers' indecisiveness about using the ICN was related to their status in the adoption process. It was recommended that teacher educators provide secondary agriculture teachers with current information related to the ICN to increase awareness and stimulate interest. Also, secondary agricultural education teachers should be provided opportunities, both as a recipient and provider of distance education, to gain experience with ICN technology. Studies in technology have shown that teacher attitudes become more positive as a result of experience with technology (Na, S. & Lee, M., 1993; Rollins, 1993).

The highest priority for collaborative efforts among schools with agriculture programs were in the areas of agricultural economics and horticulture. Teachers also cited units of instruction (aquaculture and biotechnology) that are related to current curriculum initiatives in agricultural education as priorities for collaboration. Teacher educators should plan, organize, and deliver inservice education for agriculture teachers in curriculum development and strategies for lesson presentation particularly for agricultural economics and horticulture related units. The data suggest an adequate number of teachers are willing to teach units of instruction in the priority areas via the ICN. Teacher educators should promote the involvement of secondary agricultural education teachers in using the system to improve agriculture curriculum in secondary agriculture programs.

Interestingly, different teachers perceived the same content-related categories of courses to be both suitable and unsuitable for delivery via the ICN to schools with no agriculture teacher. A clear pattern was evident regarding the suitability of agricultural mechanics courses and agricultural economics courses. Teachers generally agreed that agricultural mechanics courses were not suited to ICN delivery, but agricultural economics courses were suited to ICN delivery. Teacher educators, secondary agriculture teachers, administrators and others with an interest in agriculture should work collaboratively to facilitate the delivery of instruction in and about agriculture to schools without agriculture teachers. The teachers who participated in this study placed considerable emphasis on agricultural economics, but agronomy and animal sciences courses were also listed as promising areas for course delivery.

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