Journal of Agricultural Education
Volume 41, Number 1, pp. 79-87
DOI: 10.5032/jae.2000.01079

A TELECOMMUNICATIONS NETWORK FOR DISTANCE LEARNING: IF IT'S BUILT, WILL AGRICULTURE TEACHERS USE IT?

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Abstract

As the technology of food agriculture, and natural resources continues to develop rapidly, agricultural education programs must continually adapt to change. Distance education technologies may be able to facilitate the modernization and improvement of high school agriculture programs. Are agriculture teachers interested in teaching via a live, two-way, interactive telecommunications system? A need exists to identify priorities for agricultural distance education related to specific courses and units of instruction suitable for delivery via this type of distance education system. The data from this study in Iowa suggest that most agriculture teachers may not use the system to teach classes to other schools or to share instruction with teachers in other schools. The researchers found that scheduling, coordination, training, and preparation time remain problematic with respect to agriculture teachers' use of this technology. Teachers were using this technology for meetings, professional development programs, and graduate courses. Teacher educators and others who may be interested in increasing the use of this technology by agriculture teachers need to consider the obstacles identified by the teachers and the curricular areas identified as most appropriate by the teachers. Training programs should also address the concerns related to supervised agricultural experience and laboratory experiences.

Introduction/Theoretical Framework

Distance learning is becoming a possibility in many of the nation's schools. With advances in the fields of telecommunications and computers, it has become technologically possible and economically feasible to establish live, two-way, full motion, interactive audio and video systems to connect schools together (Miller & Miller, 1998; Rudd & Telg, 1998; Swan, 1998). These systems are often called "compressed video" or "teleconferencing." Groups of schools and in some cases entire states are building these types of systems.

One such system is the Iowa Communications Network (ICN). The State of Iowa launched the ICN during the fall of 1993 (Miller, 1994; Miller & Miller, 1997). It has now grown to more than ,400 sites across Iowa. There is at least one ICN classroom in each of Iowa's 99 counties, all of the community colleges, the three state universities, several public facilities and hospitals, and Iowa's National Guard armories. Most of the ICN classrooms in the schools are located in the high school buildings. The ultimate goal is to have one or more ICN classrooms in each school district (374) across the state by 2000. It is estimated that the number of ICN classrooms at that time will be approximately 800.

In the book Understanding Agriculture, the National Research Council (1988) maintained that in order for agricultural education to grow and prosper, educators should borrow from the best current programs while creating new ways to deliver agricultural education. The implementation and spread of distance education technology may represent one way to answer this challenge. Distance education offers a viable opportunity for agricultural educators to battle declining enrollments, increased graduation requirements, decreased funding, and changing clientele. Distance learning provides students with opportunities to enroll in courses they may not have had the opportunity to take previously and

allows schools to offer subjects for which they have no qualified teachers (Swan, 1992). If distance education technology is such a powerful instructional tool, can the profession expect to see agriculture teachers adopting it?

Faculty resistance is often listed as the major obstacle keeping distance education technologies from being implemented (Dillon & Walsh, 1992). Negative teacher attitudes, additional workloads, lack of funding, reduced student interaction, lack of time, and technical problems have been identified as obstacles to the adoption of distance education technologies (Dillon & Walsh, 1992; Hansford & Baker, 1990; Jackson & Bowen, 1993; Miller, 1995; Murphy & Terry, 1998; Torrie & Miller, 1995). But, the same researchers found that faculty with distance teaching experience generally had more positive attitudes toward technology-mediated instruction. What attitudes do secondary agriculture teachers in Iowa currently hold toward telecommunication instruction, and what obstacles do they perceive to be most inhibiting to the use of ICN, the state's two-way, interactive fiber optic network?

As the technology of food, agriculture, and natural resources continues its rapid development, agricultural education programs must keep pace. Distance education technologies may be able to facilitate the modernization and improvement of secondary agriculture programs. Several curriculum initiatives in agricultural education are currently being promoted. Which curriculum initiatives do secondary agricultural education teachers perceive to be priority areas? Can certain priority initiatives be accelerated through distance education? What courses can agriculture teachers offer through the ICN to schools that currently do not have agriculture programs? A need exists to identify priorities for agricultural distance education related to specific courses and units of instruction suitable for delivery via the ICN.

Purpose/Objectives

The purpose of this descriptive study was to investigate the usefulness of the ICN for agricultural education at the secondary level during two years, 1994 and 1997. The objectives were to:

1. Examine the use of the ICN by Iowa's secondary agriculture teachers.
2. Describe obstacles that may inhibit use of the ICN by secondary agriculture teachers and determine if there have been any changes in teachers' perceptions of obstacles.
3. Describe secondary agriculture teachers' attitudes toward using the ICN for delivering agriculture instruction and determine if there have been any changes in attitudes.
4. Identify curricular areas in secondary agriculture programs that are appropriate for delivery via the ICN and determine if there have been any changes since 1994.

Methods/Procedures

The population for the 1994 study consisted of all secondary agriculture teachers in Iowa (N=216). The frame for the study was developed from lists supplied by the Iowa Bureau of Career Education and the Agricultural Education and Studies Department at Iowa State University. The lists were cross-referenced to minimize frame error. Based on Krejcie and Morgan's (1970) formula for a five- percent margin of error, a random sample of 140 teachers was drawn. In 1997, the entire population of secondary agriculture teachers (226) was surveyed because there was a need to inventory the use of the ICN.

The questionnaire used in the study consisted of four parts including attitude toward using the ICN; obstacles that may inhibit use of the ICN, priorities for collaboration and course offerings, and selected demographic questions. A panel of experts in agricultural education established content and face validity for the

questionnaire. Minor modifications were made for the 1997 study by summarizing and grouping . course offering data from the 1994 study.

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 and agriculture teachers not included in the sample, as well as from an instrument used by Swan (1992) for a similar purpose in North Dakota. Likert-type response categories for the 16 items ranged from insignificant (1) to significant (6). Teacher attitude toward the ICN was measured with 28 items using a Likert-type scale with five response categories ranging from strongly disagree (1) to strongly agree (5). Both instruments were tested for suitability and reliability with a group of 10 secondary agriculture teachers not included in the sample. Cronbach's alpha was used to estimate the internal consistency of the instruments. The reliability coefficients were .82 for the obstacle scale and .93 for the attitude scale.

Data were collected by mailed questionnaires. In 1994, 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 complete package was mailed, a reminder letter was sent to all nonrespondents stressing the importance of their participation. Approximately 10 days after the reminder letter, 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). The results of t-tests indicated that no significant differences existed between. early and late respondents on the obstacle scale, attitude scale, and demographic variables.

In the 1997 study, data were collected in a similar fashion. The questionnaire, along with a cover letter and stamped return envelope, was sent to all secondary agriculture teachers. Fourteen days later a second complete package was mailed. A third complete mailing was sent out 14 days after the first follow-up. The response rate for the second study was 66%. The results of t-tests indicated that no significant differences existed between early and late respondents in this survey on the obstacle scale, attitude scale, and demographic variables.

Results/Findings

The agricultural education teachers were asked to report their highest level of education. In 1994, bachelor's degrees were held by 7 1% of the teachers compared with 76% in 1997, 27% held master's degrees compared with 23% in 1997, and 2% held doctoral degrees as opposed to 1% in 1997. The agricultural education teachers also were asked to indicate the number of years they had taught agricultural education. Years of experience in 1994 ranged from 1 to 35, with a mean of 12.44 and a standard deviation of 8.51. In 1997, the range was from 1 to 39, with a mean of 13.57 and a standard deviation of 8.09.

In the first study, the 102 respondents were asked if their school was 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 1994 study, 23% (22) of the schools represented by the agriculture teachers were connected to the ICN. None of the agriculture teachers had taught using this technology. Nine teachers (8.8%) indicated that they had taken at least one course via the ICN. By 1997 only four teachers (2.7%) reported teaching a class via the ICN and nearly all teachers had either taken a class or attended another type of meeting held over the ICN. In 1997, the percentage of schools with ICN classrooms had grown to 58.7% of those responding (88 out of 150).

The teachers responded to 16 statements representing obstacles that might inhibit their use of the ICN. A Likert-type scale with response categories ranging from insignificant (1) to

significant (6) was utilized. An overall mean was calculated for the 16 statements. Table 1 shows that in 1994, 48% of the teachers provided a mean score in the range of 4.51 to 5.50 (moderately significant). The percentage for 1997 (46.1) was very similar. Approximately 39% of the teachers in 1994 reported mean scores in the range of 3.51 to 4.50 (slightly significant) compared with 40.4% in 1997. Mean scores in the range of 1.51 to 3.50 (moderately or slightly insignificant) were reported by fewer than 8% of the teachers in 1994 and 9.2% in 1997. In 1994, the overall mean score for

Table 1. Mean scores for obstacles that may inhibit use of the ICN by agriculture teachers

	1994		1997	
Mean Score	Number	Percent	Number	Percent
1.51-2.50	1	1.0	2	1.4
2.51-3.50	7	6.8	11	7.8
3.51-4.50	38	39.3	57	40.4
4.51-5.50	49	48.0	65	46.1
5.51-6.00	5	4.9	6	4.3
Total	102	100.0	141	100.0

Note. 1994 overall mean = 4.49, SD = 0.63; 1997 overall mean = 4.47, SD = 0.71; t =. 295, p = 0.769. Scale: 1 = insignificant; 2 = moderately insignificant; 3 = slightly insignificant; 4 = slightly significant; 5 = moderately significant; 6 = significant.

the 16 obstacles was 4.49 (slightly significant), with a standard deviation of 0.63. The mean and standard deviation remained virtually the same for 1997 (4.47, 0.71).

Table 2 shows the percentage of who selected slightly significant, moderately significant, or significant for each of the 16 obstacles in 1994 and 1997. The agriculture teachers in both studies considered school and class scheduling problems most significant. In 1994, lack of local support staff, the inability to conduct lab sessions, and materials distribution were each considered significant, moderately significant, or slightly significant by 87% of the respondents. Costs, training, and preparation time were considered obstacles by 80-85% of the agriculture teachers in the first study. In 1994 the obstacles receiving the lowest frequency of responses in the slightly significant, moderately significant, and significant categories were lack of student interest and negative attitudes of teachers toward the ICN. By 1997, the ratings on several items had changed dramatically. There was a 10% decline in the percentage of teachers who perceived that laboratory sessions could not be taught via the ICN as well as in the percentage of teachers who feared that the ICN would reduce the number of agriculture programs in the state. There were smaller drops in the percentage of teachers who thought distributing materials between sites, lack of local support staff, and costs associated with using the ICN are obstacles to using the ICN. There was an approximate 10% increase in the number ofteachers who indicated that preparation time needed by teachers, difficulty in establishing cooperative relationships among schools, and lack of student interest were significant obstacles.

Teachers were asked to respond, using a five-point Likert-type scale, to 28 statements. related to their attitude toward the use of the ICN to teach agriculture. Table 3 reveals that 63% (64) of the teachers had a mean score in the range of 2.51 to 3.50 (neutral) in 1994. By 1997 the number had grown to 123 teachers (93.9%) who had a mean score in the range of 2.5 1 to 3.50.

Table 2. Percentage of teachers who selected slightly significant, moderately significant, or significant for each obstacle

Obstacle		1994	1997
1.	Coordination of schedules between schools	94.1	94.6
2.	The ICN could create scheduling problems	88.2	91.3
3.	Laboratory sessions cannot be taught via the ICN	87.3	77.2
4.	Distributing materials between sites	87.3	80.5
5.	Lack of local support staff	87.3	82.4
6.	Supervised agricultural experiences can't be managed via the ICN	86.3	83.1
7.	Costs associated with using the ICN	85.3	78.4
8.	Lack of training	83.3	84.5
9.	Preparation time needed by teachers	82.4	92.6
10.	Fear the ICN would reduce the number of agriculture programs	78.4	68.5
11.	Agriculture teachers are too busy to teach via the ICN	77.5	77.2
12.	Lack of incentives for teaching	77.5	77.0
13.	Administrators do not understand ICN teachers' needs	77.5	75.0
14.	Difficulty in establishing cooperative relationships among schools	68.6	81.1
15.	Negative attitude of teachers toward ICN	61.8	66.9
16.	Lack of student interest	58.8	68.9

In 1994, 32.4% (33) of the agriculture teachers reported a mean score in the range of 3.5 1 to 4.50 (agree). By 1997 the number had dropped to only 6.1% (8) who reported a mean score in the range of 3.51 to 4.50. The remaining 4.9% of the respondents in 1994 had mean scores between 1.5 1 and 2.50 (disagree) whereas there were no respondents in 1997 with mean scores between 1.5 1 and 2.50. In 1994, the overall mean score for the 28-attitudinal statements was 3.22 (neutral) with a standard deviation of 0.47. The overall mean score in 1997 remained almost the same, 3.23 with a standard deviation of 0.17.

In the 1994 study, agriculture teachers were asked to list units of instruction that they would be willing to teach via the ICN. The 102 agriculture teachers who participated in the study listed 164 units of instruction. 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%) followed by agronomy (11.6%), horticulture (8.5%), agricultural mechanics (7.3%), and leadership (5.5%). The units identified in the 1994 study became the basis for a similar question in the 1997 study. The results between the two studies are not directly comparable, but inferences can be drawn.

In 1997, teachers were asked to rate the appropriateness of the ICN to deliver selected curriculum areas to high school students (Table 4). Curriculum areas rated most appropriate for ICN delivery were agri-cultural economics and agricultural marketing. Teachers also tended to agree that areas of securing and keeping a job, agricultural sales and service, leadership, entrepreneurship, animal science, and natural resources were appropriate for ICN delivery. Curriculum areas that often include laboratory, shop, or other hands-on activities were rated as not appropriate for ICN delivery. These areas included agricultural mechanics and horticulture.

Table 3. Mean scores for agriculture teachers' attitude toward using the Iowa Communications Network to teach agriculture

Mean	1994		1997	
	Number	Percent	Number	Percent
1.51.2.50	5	4.9	0	0.0
2.51-3.50	64	62.7	123	93.9
3.51-4.50	33	32.4	8	6.1
Total	102	100.0	131	100.0

Note. 1994 overall mean = 3.22, SD = 0.16; 1997 overall mean = 3.23, SD = 0.1 t = -.436 p = 0.66. Scale: 1 = strongly disagree; 2 = disagree; 3 = neutral; 4 agree; 5 = strongly agree.

Table 4. Appropriateness of the ICN to deliver agricultural curriculum areas to high school students – 1997

Curriculum Area	Mean	SD
Agricultural economics	4.07	.77
Agricultural marketing	4.02	.83
Job getting and keeping skill	3.99	.88
Agricultural sales and service	3.87	.88
Leadership	3.83	1.02
Entrepreneurship	3.76	.90
Animal science	3.62	.94
Natural resources	3.53	1.01
Food science	3.41	.95
Agricultural production	3.26	1.06
Plant and crop science	3.20	1.06
Biotechnology	3.03	1.09
Horticulture	2.86	1.20
Agricultural mechanics	2.09	1.12

Note. Scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

The 1997 study reaffirmed agricultural economics as a possible curriculum area for the ICN system. There were some interesting differences, however, between the two studies. The 1994 study included horticulture, animal sciences, and agronomy as possible topics that agriculture teachers would consider delivering via the ICN. In 1997 the corresponding areas (units)were rated much lower. Business, social, and leadership areas were rated higher in the 1997 study.

Conclusions And Recommendations

This study was conducted to determine the usefulness of the ICN for agricultural education at the secondary level. The 1994 survey was conducted at a time when the ICN was new and was not available to most agriculture teachers. By 1997, the ICN was available in the majority of schools, but usage by agriculture teachers was still very low. Results of both surveys were used to determine if the obstacles to usage and teacher attitudes have changed and if the ICN remains an appropriate delivery mechanism for various areas of the agriculture curriculum.

The availability of an ICN site in the respondents' schools grew from 23.0% in 1994 to

58.7% in 1997. This increased availability, however, did not translate into increased use. In 1994 none of the teachers had taught a class via the ICN and by 1997 only four teachers reported teaching a class. In 1994 many of the teachers had limited experiences with the ICN, but by 1997 nearly all of the teachers had experienced this system through ICN training sessions or in workshops, short courses, and meetings held via the ICN in their schools or neighboring schools. It appears that the teachers know about the ICN but are not using it themselves.

Overall, the 16 obstacles to using the ICN in secondary agriculture programs were perceived to be slightly or moderately significant. This finding did not change very much from 1994 to 1997. In both years of the study, teachers were most concerned with coordinating scheduling between schools and other scheduling problems caused by the ICN. In 1994 teachers were also concerned with the inability to teach laboratory sessions via the ICN and with logistical problems such as the distribution of materials and local support staff. By 1997 their concern had grown with respect to increased teacher preparation time, the difficulty in establishing cooperative relationships among schools, and the lack of student interest in using the ICN. Teachers in the later study were less concerned about teaching labs via the ICN, costs associated with using the ICN, and fear that the ICN would reduce the number of agriculture programs. Coordination of supervised agricultural experience and lack of training remained as obstacles in the 1997 study.

When the overall mean is considered, teacher attitude toward using the ICN to teach agriculture remained almost unchanged between 1994 and 1997. There were a higher percentage of teachers (93.9%) who were neutral in their opinions about the ICN in 1997 compared with 62.7% in 1994, but this difference did not alter the overall results.

In 1994 the most frequently listed topics that could be taught via the ICN included animal sciences and agricultural economics. Lower numbers indicated topics in agronomy, horticulture, agricultural mechanics, and leadership. By 1997, curricular areas in agricultural economics and marketing were rated highly, but other topics emerged that were different from the 1994 study. Curricular topics in job getting and keeping skills, agricultural sales and service, leadership, and entreprenership emerged. There seemed to be a concern that some topics were less appropriate, perhaps because these areas often need laboratories, shops, greenhouses, or hands-on activities.

Scheduling, coordination, training, and preparation time remain problematic with respect to agriculture teachers' use of the ICN. Local control of curriculum and scheduling remains a cornerstone in Iowa's schools. In addition, many schools in Iowa are converting to various block-scheduling arrangements. It is difficult, if not impossible, to use the ICN to share instruction between two or more schools due to the aforementioned obstacles. Therefore, it is recommended that teachers should consider teaching classes via the ICN at times other than the normal school day; perhaps an "earlybird" class before school. They should also consider using the ICN for purposes other than teaching regular classes. The ICN is appropriate for meetings, professional development programs, guest speakers, and other formats where live interaction is desirable. It is a useful tool in offering graduate courses and professional development offerings to teachers.

If the decision is made to build a telecommunications network for distance learning, how will high school agriculture teachers use it? If Iowa's experience proves to be typical then one may not expect agriculture teachers to use the system to increase the number or variety of agricultural courses for secondary school students in their schools. Other teachers may offer advanced placement, college preparatory, foreign language, specialized courses, and low demand courses in general academic areas. Agriculture

teachers' use has been primarily on the "receiving end' (professional development and graduate courses), not the "origination end" (teaching classes and conducting meetings). Possible areas for increased use of the ICN by agriculture teachers include offering courses to other schools that do not have agriculture programs and offering college transfer (articulated) agriculture or natural resources courses in cooperation with colleges and universities.

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Journal Paper No. J-l 8341 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa. Project No. 3265, and supported by Hatch Act and State of Iowa funds.