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Factors Underlying Agriculture Teachers' Attitude Toward Using Microcomputers for In-service Education

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Agriculture teachers are facing rapid changes in both the knowledge base and technology available to help them work with young people and adults. Cetron and Davies (1989) indicated that the present level of technical knowledge will represent only one percent of the knowledge that will be available in 2050. Advances in technology such as computers, lasers, and robots will open many new avenues for providing and enhancing innovative ways of teaching. These technological changes will have a dramatic impact on agricultural education, including the way teacher educators deliver in-service education.

One way that technology can impact in-service education is through the interactive capability of microcomputers, namely electronic mail and computer conferencing. Norton and Stammen (1990) described computer conferencing as an innovative form of in-service training that addresses many barriers agriculture teachers face when attempts are made to take college courses to further their education. Such barriers include demands of work and family, long commutes to class, and conflicts with time schedules. Martin & Lundstrom (1988) suggested that attitudes toward educational technology can play an important role in the acceptance of an innovation such as microcomputers.

Fishbein and Ajzen (1975) proposed that attitudes are necessary precursors to changing behaviors. This theoretical structure or conceptual framework assumes a causal chain linking beliefs, formed on the basis of available information, to the person's attitude; beliefs and attitudes to intentions; and intentions to behaviors. It is necessary to distinguish among beliefs, attitudes, intentions, and behaviors and consider the relationships among the variables. In terms of the relationship between beliefs and attitudes, the conceptual framework suggests that a person's attitude toward some object is related to the set of his/her beliefs about that object, but not necessarily to a specific belief. Additionally, attitudes toward an object are viewed as being related to the person's intention to perform a variety of behaviors with respect to that object. Fishbein and Ajzen also indicated that ". . . attitude is viewed as one major determinant of the person's intention to perform the behavior in question" (p. 16). If teacher educators are to use microcomputers for supplementing in-service educational programs, it is important for them to know agriculture teachers' attitude toward this technology prior to its use.

Several studies (Birkenholz & Stewart, 1991; Miller & Kotrlik, 1987; Malpiedi & Blake, 1987; and Raven & Welton, 1989) have examined the use of microcomputers in agricultural education programs. None of these studies examined the factors underlying agriculture teachers' attitude toward the use of microcomputers for enhancing in-service programs.

Teacher educators lack information regarding the factors underlying the attitude agriculture teachers have toward using microcomputers to supplement in-service education. Information is unavailable regarding the proportion of variance in the attitude toward microcomputers that these underlying factors explain. Teacher educators need to know what information regarding these factors they should collect and use as they plan, design, and implement in-service programs.

Purpose and Objectives

The purpose of this study was to identify factors underlying agriculture teachers' attitude toward the use of microcomputers in supplementing in-service activities. Specifically, the objectives addressed were to:

Describe selected demographic characteristics of agriculture teachers in the Central region of the state of Ohio.

Identify factors underlying agriculture teachers' attitudes toward the use of microcomputers in supplementing in-service education activities.

Determine the proportion of variance in the teachers' attitudes toward the use of microcomputers that can be explained by these factors.

Procedures

The population for this exploratory study was the agriculture teachers in the Central region of the state of Ohio (N=115). A mailing list for the 1990-91 academic year was obtained from the State Department of Education and served as the frame for the study. According to Krejcie and Morgan (1970), a representative sample for a population of 115, within a five percent margin of error, was 94.

The data were collected by a mailed questionnaire based on an instrument developed by Yeun (1984). A panel of graduate students and faculty in agricultural education (n=12) were used to establish content and face validity. Thirty purposely selected vocational teachers outside the Central region of the state served to establish the reliability of the questionnaire. The resulting Cronbach's Alpha reliability coefficient for internal consistency was .87. The final instrument consisted of 37 Likert type items measured on a five point scale.

Useable data collection instruments were returned from 62 (66%) respondents. Nonresponse error was controlled by comparing early and late respondents as suggested by Miller and Smith (1983) with late respondents serving as a surrogate for nonrespondents. No significant differences were found between the two groups of respondents.

The data from the questionnaires were analyzed using the SPSS/PC+ statistical package. Descriptive statistics such as percentages and frequency counts were used to examine the demographic characteristics. Exploratory factor analysis was used to identify the factors underlying the attitude agriculture education teachers had toward the use of microcomputers for in-service education. Norusis (1988) indicated that factor analysis is used to identify a relatively small number of factors that can be used to represent relationships among sets of many interrelated variables. The evidence on the number of subjects recommended for conducting factor analysis varies from five to ten observations per item (Gorsuch, 1974; Nunnally, 1978; and Arrindell & van der Ende, 1985). Since no studies were identified that specifically examined agriculture teachers' attitudes toward using microcomputers for in-service programs, this initial exploratory study was conducted using the accessible sample.

Findings

The demographic characteristics collected from the agriculture teachers in the study included age, years of teaching, gender, and highest educational degree attained. This information is provided to give the reader an overview of the type of teachers that were included in the sample and which were the source of information for the factors. The

average age of the agriculture teachers was 40.2 years (SD=9.7) and they had taught an average of 14.0 years (SD=9.0). The data on the agriculture teachers indicated that 85 percent (53) were male and 14.5 percent (9) were female. In addressing the educational degree attained, approximately 7 percent (4) of the agriculture teachers reported having a high school diploma and 1.6 percent (1) reported having an associate degree. Additionally, 53.2 percent (33) of the teachers reported having bachelor's degrees and 38.7 percent (24) reported having a master's degree. None of the agriculture teachers reported having earned a higher degree.

It was assumed that the variance of each measured variable could be decomposed into common and unique portions and a maximum likelihood (common factors) factor analysis of the data was conducted. This approach is considered to be appropriate in cases where the measured variables are assumed to be a linear function of the unmeasured (latent) variables (Ford, MacCallum, & Tait, 1986). Since the analysis was done on a sample rather than a population, maximum likelihood factor analysis was considered appropriate.

Only factors with eigenvalues equal to or greater than 1.0 were considered in the analysis. In addition, a scree plot of the eigenvalues was used to identify breaks or discontinuity in determining the number of factors. The two procedures resulted in identification of three factors underlying the attitude vocational teachers had toward microcomputers for supplementing in-service education.

A second maximum likelihood factor model analysis was conducted with the three factors retained. Since it was assumed that the three factors were not orthoginal, they were rotated in a final solution using the oblimin procedure (Ford, MacCallum, & Tait, 1986). An examination of the items in the factor loading pattern matrix (Table 1) was used to understand the nature of the three factors. These factor loadings indicated the correlation between each item and the derived factors. To assist in the interpretation and to reduce subjectivity, only items with factor loadings of .4 or higher were considered for labeling the factors.

The factors were labeled as (1) *Educational value* of microcomputers, (2) *Confidence* in using microcomputers, and (3) *Apprehensions* toward microcomputers by the researchers. The three factors accounted for approximately 54 percent of the variance in the teachers' attitude toward microcomputers for supplementing inservice education (Table 2). The Cronbach's Alpha reliabilities of the three microcomputer attitude factors were .47 for the *Educational Value* factor, .90 for the *Confidence* factor, and .66 for the *Apprehension* factor.

The interfactor correlations for the oblique rotated factors (Table 3) indicated low positive and negative correlations ranging from .15 to .39. These factors are relatively independent in explaining the attitudes teachers had toward using microcomputers to supplement and enhance in-service education.

Conclusions and Recommendations

Teacher educators in agriculture will be faced with many technological advances in the delivery of in-service programs. These changes will call for teacher educators to consider new and creative ways of offering in-service programs. The use of microcomputers together with telecommunications technology to supplement in-service education is one technique that is available. Due to the exploratory nature of this study, no attempt was made to generalize to all agriculture teachers.

Table 1. Rotated Factor Pattern Matrix Loadings Order of the 27 Microcomputer Attitude Items on Oblique Factors (n=62)

Abbreviated items	Factor loadings		
	Factor I Ed Val[a]	Factor II Con[b]	Factor III App[c]
Microcomputers add interest	.81		
Microcomputers provide a supplemental approach	.78		
Microcomputers cause more problems	-.76		
Microcomputers improve instructional quality	.74		
Microcomputers should be encouraged	.73		
Microcomputers isolate teachers	-.72		
Microcomputers improve my effectiveness	.70		
Microcomputers should be made available	.60		
Microcomputers are useful instructional tools	.60		
Microcomputers help acquire knowledge	.57	.42	
Teachers should be computer literate	.57		
Microcomputers are flexible instructional tools	.52	.51	
Microcomputers can be used to tutor	.52		
I would not want to use microcomputers	-.52		.48
Microcomputers should be used in agriculture	.50		
Microcomputers are of little value	-.50		
Microcomputers make learning to mechanical	-.50		
I would try alternative instructional methods	.44		
I am knowledgeable about microcomputer programs		.74	
I have personal interest in microcomputers		.70	
I consider myself informed about microcomputers	-.41	.65	-.60
I would send electronic mail		.63	
I enjoy reading about microcomputers		.62	
My job requires me to learn about microcomputers		.59	
I have an interest in enhancing student learning		.56	
I would exchange information with others		.53	
I know how microcomputers affect society		.53	-.41
Teachers should understand microcomputer impact		.47	
Microcomputers frighten me			.78
Microcomputers adversely affect teachers	-.51		.54
Microcomputers are too complicated			.53
Supervisors pressure me to use microcomputers			.52
Microcomputers are too expensive			.51
I do not enjoy microcomputers			.46
Microcomputers require a math background			.43
Peers pressure me to use microcomputers			.42

Note: [a]Educational Value, [b]Confidence, [c]Apprehension

Table 2. Percent of Variance Explained by Factors Influencing Agriculture Teachers' Attitude Toward Using Microcomputers for In-Service Programs (n=62)

Factors	Percent of Variance Explained	Cumulative Percent
Educational value of microcomputers	40.1	40.1
Confidence in using microcomputers	8.0	48.1
Apprehension toward using microcomputers	6.2	54.3

Table 3. Interfactor Correlations for the Oblique Rotated Factors Underlying Attitude Toward Microcomputers (n=62)

Factors	Factor I	Factor II	Factor III
Educational Value (I)	1.00		
Confidence (II)	.39	1.00	
Apprehension (III)	-.32	-.15	1.00

Based on the results of the study, it was concluded that three underlying factors accounted for approximately 54 percent of the variance in the attitudes agriculture teachers have toward using microcomputers for supplementing in-service education programs. The factors were (1) educational value of microcomputers for in-service education, (2) confidence in using microcomputers, (3) and the apprehensions agriculture teachers have in using microcomputers.

In planning, designing, and implementing in-service education programs using microcomputers for agriculture teachers, teacher educators should be cognizant of the three factors identified. To increase the effectiveness of in-service education using microcomputers, teacher educators should first ensure that agriculture teachers understand the value of microcomputers for in-service education. This may be accomplished by providing practical examples and applications of microcomputer use for teaching and learning activities. Second, teacher educators should reinforce the microcomputer confidence agriculture teachers bring into the in-service education program. In-service programs offered should include time for agriculture teachers to demonstrate their ability in the basic uses of microcomputers. Teacher educators also should demonstrate how these competencies can be used in areas such as computer conferencing and electronic mail.

Third, teacher educators should design their in-service approach in a manner that reduces the apprehensions agriculture teachers might have toward using microcomputers. Instructional approaches with clear examples should be provided that allow agriculture teachers to have a positive experience in interacting with microcomputers.

Further investigation of other factors accounting for additional variance in the attitude of agriculture teachers toward microcomputers needs to be undertaken. Studies should be conducted to determine how these attitudes contribute to agriculture teachers' microcomputer behavior and knowledge. Research should be undertaken with a larger sample of agriculture teachers to test the stability of the factors identified in this exploratory study.

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