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ABSTRACT

An exploratory study of the factors underlying vocational teachers' attitudes toward using microcomputers to supplement inservice education found that two factors (the teachers' belief in the educational value of microcomputers and their confidence in using the computers) accounted for about 44 percent of the variance in their attitudes. Data were collected by mailed questionnaire from a computer-generated random sample of 350 vocational teachers drawn from a frame of 1,341 vocational teachers in central Ohio. The return rate of usable questionnaires was 72 percent. The questionnaire consisted of 37 items to which the subjects could respond on a 5-point Likert-type scale. (Abbreviated examples of the items are as follows: "Microcomputer use should be encouraged"; "Microcomputers create problems"; "I wouldn't want to use microcomputers"; "Using microcomputers adds interest"; "Microcomputers can help individuals acquire knowledge"; "Microcomputers are too complicated to use"; "I'd be willing to send electronic messages"; and "I know about commercially produced computer programs.") Factor analysis of the data was conducted. The researchers recommend that teacher educators planning inservice education programs ensure (through practical examples and application of microcomputer use for teaching and learning activities) that teachers understand the value of microcomputers and that they reinforce the teachers' confidence in computer use by demonstrating how microcomputers can be used in computer conferencing and electronic mail. (Contains 20 references.) (CML)

LATENT FACTORS UNDERLYING VOCATIONAL TEACHERS' ATTITUDE TOWARD USING MICROCOMPUTERS FOR SUPPLEMENTING IN-SERVICE EDUCATION

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INTRODUCTION

Throughout history, technological change has influenced the teaching and learning process. Vocational teachers will continue to be challenged by new and emerging technology. Cetron and Davies (1989) suggested that the present level of technical knowledge available, will only represent one percent of the knowledge that will be available by the year 2050.

The technological advances in microcomputers have greatly influenced the teaching-learning process. Passmore (1983) indicated that the integration of microcomputers has enhanced the efficiency and productivity in vocational education. Two areas of enhancement are: (1) the management of vocational instruction (e.g., organizing curricula and student data, monitoring student progress, evaluating learning outcomes) and (2) the processing of administrative information (e.g., budget development and justification, personnel management, supply management).

More recently, the interactive capabilities of microcomputers have been incorporated into the teaching-learning process. Microcomputers have been used for computer-assisted instruction (CAI), computer-managed instruction (CMI), computer-based training (CBT), and for supporting a variety of educational programs.

Using microcomputers in conjunction with electronic communication (telecommunications) has offered yet another valuable instructional tool for vocational education. Specifically, telecommunication can be used to enhance in-service programs for vocational teachers. However, the concept of telecommunications is in its formative stage. "Microcomputer owners who engage in telecommunication today are pioneers, like those who drove cars when horses were still the most practical modes of transportation..." (Graham, 1989, p.254). Graham (1989) referred to telecommunications as any form of electronic communication.

There are several forms of telecommunications that are valuable to education. Telecommunication forms encompass electronic mail (e-mail) systems, bulletin board systems, and information utilities. Information utilities include access to data bases, news, and computer conferencing.

Computer conferencing, in particular, offers promise for supplementing in-service programs for vocational teachers. Norton and Stammen (1990) described computer conferencing as an innovative form of in-service training that addresses many barriers vocational 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. Computer conferencing refers to the idea of establishing ongoing discussion devoted to a particular subject using some type of communication with one or more people through a computer that is connected to network of other computers.

Adopting this type of electronic distance education for supplementing in-service programs is not simple. Martin & Lundstrom (1988) suggested that attitudes toward educational

technology can play an important role in the acceptance of an innovation such as microcomputers.

Theoretical Framework

Fishbein and Ajzen (1975) proposed that attitudes are necessary precursors to changing behaviors. This theoretical structure or conceptual framework (Figure 1) 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.

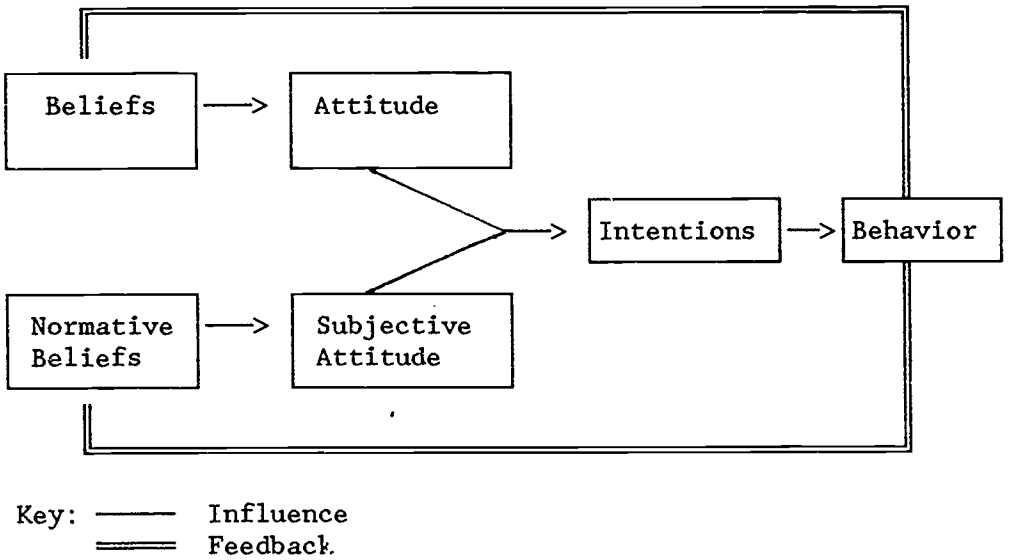

Figure 1. Fishbein and Ajzen's Model (1975)

Therefore 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, in this case microcomputers. Fishbein and Ajzen (1975) also indicated that "...attitude is viewed as one major determinant of the person's intention to perform the behavior in question" (p.16). Thus, if teacher educators preparing vocational teachers are to use microcomputers for supplementing and enhancing in-service educational programs, it is important to know vocational teachers' attitude toward this technology prior to its use.

Related Research

Several studies (Floyd, 1983; Lichtman, 1979; Martin & Lundstrom, 1988; Pickard, 1983; Malpiedi & Blake, 1987; Raven & Welton, 1989; Taylor & Parrish, 1978; Yuen, 1984, 1985) have assessed the attitudes educators have toward microcomputers. It was found that vocational teachers tend to have positive attitudes toward microcomputers, but will vary in degree based on their educational level, microcomputer experience, microcomputer training, microcomputer utilization, microcomputer accessibility, age, and years of teaching experience.

However, teacher educators preparing vocational teachers using microcomputers lack information regarding the factors underlying the attitude vocational teachers have toward the use of microcomputers for in-service education. Thus, there is a paucity of research that identify the factors underlying vocational teachers' attitude toward the use of microcomputers for supplementing in-service education.

PURPOSE AND OBJECTIVES

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

1. To describe selected demographic characteristics (age, years of teaching, gender, educational degree, and teaching area) of vocational teachers in the Central region of Ohio.

2. To identify factors underlying vocational teachers' attitudes toward the use of microcomputers for supplementing in-service education activities.

3. To determine the proportion of variance in the vocational teachers' attitudes toward the use of microcomputers that can be explained by the identified factors.

PROCEDURES

Population and Sample

The accessible population for this exploratory study was vocational teachers in the Central region of Ohio (N=1,341). A mailing list for the 1990-91 academic year was obtained from the Ohio Department of Education and served as the frame for the study. Duplicate names were purged from the list to control for selection error. According to Krejcie & Morgan (1970), a representative sample for a population of 1,341, within a five percent margin of error, was 350. A random sample (n=350) was computer generated from the list of vocational teachers.

Instrumentation and Data Collection

The data were collected by a mailed questionnaire adapted from an instrument developed by Yuen (1984). The questionnaire was field tested with a panel of 12 graduate students and faculty in the Department of Agricultural Education at The Ohio State University to establish content and face validity.

Thirty purposely selected vocational teachers outside the Central region of Ohio served to establish the reliability of the questionnaire. The questionnaire obtained a reliability coefficient of .87 using Cronbach's alpha as a measure of internal consistency. The final questionnaire consisted of 37 Likert-type items measured on a five point scale ranging from 1=Strongly Agree to 5=Strongly Disagree. In addition, the questionnaire contained a section to collect demographic information.

After two follow-up efforts, useable data was returned from 72% (244) of the vocational teachers in the sample. Non-response error was controlled by comparing early to late respondents as suggested by Miller and Smith (1983) with late respondents a serving as a surrogate for non-respondents. Using a t-test, no significant differences were found between the two groups of respondents.

Data Analysis

The data from the questionnaires were analyzed using the SPSS/PC+ statistical package. Descriptive statistics such as percentages, frequency counts, means, standard deviations and ranges were used for describing the demographic characteristics of vocational teachers.

Exploratory factor analysis was used to identify the factors underlying the attitude vocational teachers have toward the use of microcomputers for supplementing in-service education. Norusis (1988) indicated that factor analysis is used to identify a relatively small number of factors that can be use 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 (5-10) observations per item (Gorsuch, 1974; Nunnally, 1978; and Arrindell & van der Ende, 1985). The sample size of this study (n=350) was acceptable for an exploratory type of investigation.

RESULTS

Selected demographic characteristics of vocational teachers in the Central region of Ohio included age, years of teaching, gender, highest educational degree attained, and the vocational teachers' service (teaching) area (Tables 1 & 2). The age range of vocational teachers was 23 to 64 years with an average age of 41.7 years (SD=8.7). The data revealed that vocational teachers have taught for an average of 14.2 years (SD=8.6) with a range of 1 to 33 and that 122 (50.0%) were male and 122 (50.0%) were female.

Table 1

Age and Years of Teaching Experience of Vocational Teachers in the Central Region of Ohio (n=244)

Characteristic	Mean	SD	Range
Age	41.7	8.7	23 - 64
Years of Teaching	14.2	8.6	1 - 33

Table 2

Gender, Educational Degree Attained, and Teaching Area of Vocational Teachers in the Central Region of Ohio (n=244)

Characteristic	Frequency	Percent
Gender		
Female	122	50.0
Male	122	50.0
Educational Degree Attained		
Less than a Bachelor's	17	7.0
Bachelor's	117	48.3
Master's	97	40.1
Doctorate	1	0.5
Vocational Area		
Home Economics	56	23.0
Trade and Industrial	55	22.5
Business	29	11.9
Agriculture	20	8.2
Marketing	17	7.0
Health	4	1.6
Diversified occupations	1	0.4
Other	62	25.4

The highest educational degree attained by vocational teachers included 22 (11.1%) with less than a bachelor's degree, 117 (48.3%) with a bachelor's degree, and 97 (40.1%) with a master's degree. Only one (0.5%) respondent reported having a doctorate degree.

Vocational teachers selected themselves into one of the seven teaching areas; agriculture, business, marketing, health, home economics, trade and industrial, and diversified occupations. The data revealed that 56 (23.0%) of the vocational teachers taught

home economics, 55 (22.5%) taught trade and industrial, and 29 (11.9%) taught business. Additionally, 20 (8.2%) of the vocational teachers taught agriculture, 17 (7.0%) taught marketing, 4 (1.6%) taught health, and 1 (0.4%) taught diversified occupations. Sixty-two (25.4%) respondents identified themselves as teaching in other areas such as occupational work experience and occupational work adjustment.

In determining the underlying factors in the attitude vocational teachers have toward microcomputers for supplementing in-service education, it was assumed that the variance of each measured variable could be decomposed into common and unique portions, therefore, 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).

Two factor extraction procedures were employed. First, only factors with eigenvalues greater than 1.0 were considered in the analysis and second, a scree plot of the factor eigenvalues was used to identify breaks or discontinuity in determining the number of major factors. The two extraction procedures resulted in the identification of two factors underlying the attitude vocational teachers have toward microcomputer for supplementing in-service education.

A second maximum likelihood factor model analysis was then conducted with the two factors. Since it was assumed that the two factors were not orthoginal, they were rotated in a final solution using the oblimin procedure (Ford, MacCallum, & Tait, 1986).

An examination of the variables (items) in the factor loading pattern matrix (Table 3) was used to understand the nature of the two factors. The factor loadings indicate the partial regression coefficients in the multiple regression equation with the original variable (item) as the dependent variable and the factor as the independent variable (Norusis, 1988). To assist in the interpretation and to reduce subjectivity, only items with factor loadings of .4 or higher were considered for labeling the two factors.

The two factors were labeled by a panel of seven faculty members and graduate students as (1) Educational Value of microcomputers and (2) Confidence in using microcomputers. The two factors (Educational Value and Confidence) accounted for 43.9% of the variance in attitude vocational teachers have toward using microcomputers for supplementing in-service education (Table 4).

To determine the degree of orthogonality between the oblique rotated factors, a Pearson product-moment correlation was calculated resulting in r=-.49. Cronbach's alpha reliabilities, as measures of internal consistency, of the two factors were .34 for the Educational Value factor and .44 for the Confidence factor.

Table 3

Rotated Factor Pattern Matrix Loadings Order of the 34* Microcomputer Attitude Items on Oblique Factors (n=244)

Abbreviated Items	Factor Loadings	
	FACTOR I Educational Value	FACTOR II Confidence
Microcomputer use should be encouraged	.88	
Microcomputers create problems	-.79	
I wouldn't want to use microcomputers	-.77	
Using microcomputers adds interest	.77	
Microcomputers makes learning too mechanical	-.75	
Microcomputers are useful instructional tools	.73	
Microcomputer use should occur	.71	
Microcomputers can improve my effectiveness	.71	
Microcomputers can be used as a tutor	.68	
Microcomputers help individuals acquire knowledge	.67	
Microcomputers provide a supplemental approach	.67	
Microcomputers are a flexible medium for instruction	.66	
Schools should have microcomputers available	.65	
Microcomputers can improve the quality of instruction	.64	
Microcomputers used for inservice educ. isolate teachers	-.64	
Microcomputers are of little value in voc-education	-.64	
Vocational teachers should be computer literate	.64	
Using microcomputers to network frightens me	-.63	
Teachers should understand the impact of microcomputers	.61	
Microcomputer are too expensive	-.57	
I'm interested in microcomputers for enhancing student learning	.57	
Microcomputers are too complicated to use	-.53	-.41
I'd like to exchange information by microcomputer	.48	
I do not enjoy using a microcomputer	-.46	
Microcomputers have an adverse effect on teachers	-.46	
I'd try alternative instructional methods	.43	
I'd be willing to send electronic mail messages	.43	
I am informed about microcomputer use in my field		.73
I know about commercially produced computer programs		.69
I enjoy reading about microcomputers		.55
I know how microcomputers affect our society		-.50
I'd prefer using a microcomputer with an instructor		.49
My job requires me to learn about microcomputers		.47
I have personal interest in learning about microcomputers		.46

Note. *Three items had factor loading less that .40, thus were not used in the interpretations.

Table 4

Percent of Variance Explained by Factors Influencing Vocational Teachers' Attitude Toward Using Microcomputers for In-service Education (n=244)

Factors	Percent of Variance Explained	Cumulative Percent
1. Educational Value of microcomputers	38.4	38.4
2. Confidence in using microcomputers	5.6	43.9

Pearson Product-Moment ($r = -.49$)

CONCLUSIONS AND RECOMMENDATIONS

The sample provides a basis for beginning to understand the factors underlying vocational teachers' attitude toward microcomputers to supplement in-service education. From the attitudinal 34 items, Maximum Likelihood factor analyses and an oblimin rotation were conducted producing two latent factors. It was concluded that two factors accounted for approximately 44% of the variance in vocational teachers' attitude toward microcomputers. The factors were (1) Educational Value of microcomputers, and (2) Confidence in using microcomputers.

In planning, designing, and implementing in-service education programs using microcomputers for vocational teachers, teacher educators should be cognizant of the two factors identified. To increase the effectiveness of in-service education using microcomputers, it is recommended that teacher educators ensure that vocational 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.

It is also recommended that teacher educators reinforce the microcomputer confidence vocational teachers bring into the in-service education program. In-service programs offered should include time for vocational teachers to demonstrate their ability in the basic uses of microcomputers. Additionally, it is recommended that teacher educators demonstrate how these competencies can be use in areas such as computer conferencing and electronic mail.

Further investigation of factors accounting for additional variance in the attitude of vocational teachers toward microcomputers needs to be undertaken. Additionally, studies should be conducted to determine how these attitudes subsequently influence vocational teachers' microcomputer behavior and knowledge. Furthermore, research should be undertaken with a

larger sample of teachers to test the stability of the factors identified in this exploratory study.

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