DOCUMENT RESUME

ED 373 739 IR 016 749

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TITLE Subjective Norms Predicting Computer Use.
PUB DATE 94
NOTE 7p.; In: Proceedings of Selected Research and Development Presentations at the 1994 National Convention of the Association for Educational Communications and Technology Sponsored by the Research and Theory Division (16th, Nashville, TN, February 16-20, 1994); see IR 016 748. For related article. see IR 016 748.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Adoption (Ideas); Computer Attitudes; *Computer Uses in Education; Educational Environment; *Educational Innovation; Elementary Education; Elementary School Students; *Elementary School Teachers; Expectation; Individual Differences; Norms; *Predictor Variables; Principals; Rural Areas; Self Concept; *Significant Others; Teacher Attitudes; Teacher Characteristics
IDENTIFIERS *Subjective Judgment

ABSTRACT

This study was part of a series of studies examining the relationship of teacher variables to teachers' adoption of computer use. Previous studies have considered computer use as a process of the adoption of innovation and as a result of the influence of the internal variables of the person. This study adds the variable of subjective norms because they suggest a means of accounting for a person's decision-making behavior by specifying influential environmental factors represented by significant other people. Subjects were 138 elementary school teachers from a rural midwestern state. Computer use was classified into nonuse, utilization, and integration. Subjective norms were identified through the impact of four significant members of the environment (principals, colleagues, students, and the profession). Teacher-perceived relevance and self-competence were also measured. Results indicate that subjective norms are predictive of teacher computer use and that the expectations of teachers' significant others in a professional sense are influential in developing teachers' own expectations of computer use. One table summarizes study findings. (Contains 22 references.) (SLD)

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Perspectives

There is much support for the opinion that educational technology—especially computer technology—could have a major positive impact on improving the educational system (See The National Task Force on Educational Technology, 1986; Shanker, 1990; Sheingold & Hadley, 1990; United States Office of Technology Assessment [OTA], 1988). Indeed, the availability of computers for teaching has increased rapidly (OTA, 1988). Yet, despite the increased availability and support for computers in teaching, relatively few teachers have integrated them into their teaching. A recent survey of teachers who were exceptional users of computers for teaching averaged only about one such teacher per school (Sheingold & Hadley, 1990). This paucity of teachers existed even though the availability of computers (59) in the schools surveyed was more than double the average number of computers (26) reported available for schools in the United States (Becker, 1989). Extraordinary availability of computers was not matched by an abundance of extraordinary users of computers. The result of this imbalance is that computers are underutilized.

This study was the most recent in a series in which the relationship of teacher variables to their adoption of computer use are being systematically researched. First, computer use was classified as a process of the adoption of innovation (see for example Hall, 1982; Rogers 1962, 1983; Rogers & Shoemaker, 1971; Rutherford & Hall, 1982) or more specifically Instructional Transformation (Rieber & Welliver, 1989; Welliver, 1990).

Secondly, teachers' computer use was examined from an internal perspective—of the influence of personological variables to levels of computer use. In a comprehensive study of the implementation of innovation in education (Berman & McLaughlin, 1977) this class of variables was excluded. Yet, information about the internal variables—the predispositions and the decision-making processes of the person—may be the most valuable for influencing behavior or performance (See also Coovert & Goldstein, 1980; Gallo, 1986; Jorde-Bloom & Ford, 1988; Marcinkiewicz, in press; Marcinkiewicz & Grabowski, 1992)). This viewpoint was supported by data gathered in Sheingold and Hadley's (1990) survey from which teachers who were exceptional users of computers for teaching had been characterized as being highly motivated. From within the broad construct of motivation, Expectancy Theory (Vroom, 1964) guided the selection of variables. In this version of the research series, the variable of subjective norms was included (Ajzen & Fishbein, 1980) because it suggests a means for accounting for a person's decision making behavior by specifying influential envrionmental factors—significant other people.

Sample and Setting

There were 138 elementary school teachers from twelve schools in a rural midwestern state who participated in the study. Teachers were eligible to participate if they and their schools met criteria which controlled for the influence of environmental factors and ensured that the of availability of computers was uniform for the groups of teachers. First, the teachers taught a variety of subjects. This was necessary to control for the influence of the dominance of computer use for a specific subject. For this reason elementary school teachers were studied since they typically teach a variety of subjects. Second, computers had to be available to teachers. Availability was defined as a computer-to-pupil ratio of 1 : 12 (The state average ratio was 1 : 9). Third, computers had to have been available at the schools for at least three years.

Method

Computer use, the dependent variable, was classified into three ordered levels: *Nonuse*, *Utilization*, and *Integration* using the Levels of Use scale (Marcinkiewicz in press; Marcinkiewicz & Welliver, 1993) based on the Model of Instructional Transformation. The independent variables were: subjective norms, innovativeness, perceived relevance (of computers to teaching) and self-competence (in the use of computers). Subjective norms were measured using a measure based on the steps described by Fishbein and Ajzen (1980). Four significant others—members of the environment—were identified who may impact on the teachers intent to use computers in teaching. Subjective norms reflects a person's choice to behave based on the influence of others.

Innovativeness defined as "willingness to change" was assessed using the Innovativeness Scale by Hurt, Joseph, and Cook (1977). Data were collected for three relevant demographic variables: age, gender, and years of computer experience. An attribute which the demographics share contrasts them importantly with the other variables—they are not amenable to influence by any sort of intervention, remediation, or staff development. Yet, they may be significant in influencing teachers' computer use. All variables were assessed using a composite questionnaire.

The last two variables, perceived relevance and self-comptetence, fit the formula of expectancy theory which was structured to predict behavior based on three elements: 1) valence—a goal one values or desires; 2) expectancy–the expectation that one's effort is capable of achieving some performance; and 3) instrumentality–the belief that an achieved performance results in attaining the valued goal (Vroom, 1964). The performance studied was the use of computers for teaching. The goal of the performance was "quality instruction." Valence of providing quality instruction was assumed to be true and positive for teachers.

Teachers' feelings of self-competence of capability in using the computer in teaching were assessed to reflect expectancy. A measure developed for this study was used. Instrumentality was assessed by perceived relevance—teachers' perception of computer use as relevant to teaching. An originally developed measure was used.

Results

Table 1 shows the distribution of categories of computer use for the sample.

Table 1
Distribution of Teachers by Levels of Computer Use

Level	Number	Percentage
Nonuse	31	31
Utilization	66	66
Integration	3	3

Note. The observations with missing values were not included.

A univariate intercorrelational analysis was computed. Subjective norms, innovativeness, and perceived relevance were equally correlated with computer use ($r = .26$). The relationships may suggest a theoretical complementary nature of these variables or collinearity. Other high correlations that emerged were between perceived relevance and self-competence ($r = .53$) perceived relevance and innovativeness ($r = .42$) and innovativeness and self-competence ($r = .31$). Age and computer experience were moderately correlated ($r = .30$).

A partial correlation was computed to remove the influence of the overlapping variables to identify the variable with the strongest relationship to computer use. Subjective norms was shown to have the highest partial correlation to computer use (r =.23). The correlations between perceived relevance and both innovativeness and self-competence remained nearly unchanged as did that between gender and innovativeness, age, and experience.

Intercorrelations were cast to test for relationships among variables. Because of the categorical nature of the criterion variable, logistic regression procedures were computed to identify the contribution of the variables to teachers' computer use. First, the predictiveness of the entire set of variables was examined c2(7, n = 100) = 15.7, p < .028. Then, a stepwise procedure was computed to identify the predictiveness of individual variables. Subjective norms was retained, c2(7, n = 100) = 5.11, p < .024. No other variables added to the predictiveness of the logistic regression model. Another logistic regression was computed for the simple main effects of subjective norms,
c2(1, n = 100) = 7.09, p < .01.

Analysis

The results indicate that the selected internal variables, subjective norms is predictive of teachers' levels of computer use. These results support the theories which suggested the strength of its being an indicator of behavior—the theory of reasoned action. It is possible that the summary of studies in this series will be informative for the characterization of teachers with respect to computers.

Educational importance

This research was motivated by the concern that teachers were underutilizing computers. The goal was to identify internal variables which would predict computer use. In planning intervention, remediation, or staff development—designing instruction for computer use, teachers' subjective norms deserve addressing. It is also important to consider that the construct of subjective norms is based on one's perceptions of the expectations of others. In light of this assumption, it can be inferred that the expectations of computer use from among teachers' significant others'—principals, colleauges, students, and the profession—are influential in developing teachers' own expectations of computer use.

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