Faculty Computer Use and Training: Identifying Distinct Needs for Different Populations

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One of the most dramatic changes in the last three decades has been the rapid development of information technology, which has gradually found its way into both business and industry and into the classroom through computers and computer-related technologies. Many jobs in the twenty-first century will involve computers in some way, and members of the workforce who are not able to use them will be at a disadvantage (Fary, 1984). Therefore, it is critical for individuals to have the necessary education and skills to compete in the next information-intense century.

Although computers are more attainable than ever before, their price having decreased even as their capabilities have increased exponentially (Breithaupt, 1997, Marcinkiewicz, 1996), research indicates that educators are more averse to using computers than other professionals (Hanushek, 1998; McKenzie & Clay, 1995; Paprzycki & Vidakovic, 1994). Despite the increasing availability of computer technologies as well as recent efforts to connect each classroom and library to the Information Super Highway, integration of computers by community college faculty into the classroom has not kept pace (McKenzie & Clay, 1995). Yet faculty play a decisive role in how successful technology will be in education (Yildirim & Kiraz, 1999; Office of Technology Assessment, 1995). Therefore, investment in technology cannot be fully effective (and may be counterproductive) unless faculty receive the necessary training and support *and* are willing to become fully capable of using these technologies (Office of Technology Assessment, 1995).

Availability of computers in the classroom, supporting and sharing resources, a supportive administration, and a strong support staff contrib-

ute to the successful integration of instructional technology into the classroom (Ely, 1995). But availability and support are not the only factors critical to getting faculty to use technology. Anxiety levels, self-confidence, and perceived relevance influence faculty intentions to use computers in instruction (Morton, 1996). Woodrow (1991) believes attitudes not only influence whether one accepts computers, but also influence future behaviors such as using the computer as a professional tool or introducing computer applications into the classroom. Attitudes are defined as an evaluative disposition based upon cognition, affective reactions, behavioral intentions, and past behaviors; that evaluative disposition can influence future cognition, affective responses, intentions, and behaviors (Zimbardo & Leippe, 1991). Simonson (1995) emphasizes the importance of positive attitudes in the learning process. He claims that promoting positive attitudes will also promote achievement, liking, and learning.

Across a range of studies, a strong conclusion has emerged that staff development programs are integral to integrating computers into the curriculum (Goodson, 1991, Parker, 1996). Yet, although the literature emphasizes the necessity of providing training for faculty, it does not distinguish between the types of training required by faculty who use computers for instruction and faculty who do not currently use computers for instruction, nor for those who may be computer-phobic. Pina and Harris (1994) stress strategies to lessen computer anxiety and increase computer confidence among teacher educators and teacher preparation programs, but they do not address the fact that some of those educators needing or wanting additional training have high computer confidence levels. In a journal maintained by one instructor while working to gain more technology experience, the instructor commented, "My limited infusion of technology was not related to 'techno-phobia', but . . . to lack of understanding of what the computer can do and how technology could transform my college-level course" (Beisser, Kurth, & Reinhart 1997).

Roberts and Ferris (1994) revealed that barriers to technology integration included lack of knowledge of available hardware and software, time commitment, and the risk of using technology. Abbey (1997) acknowledged that integrating technology begins with positive acceptance by "early adopters" but raises the following question: What do we do about faculty who do not want to use technology? The training issues of

early adopters and nonanxious computer users are clearly very different from those who are reluctant to try.

Based on these assessments of the status of faculty technology training, the purpose of this study was to explore the relationships among basic demographic variables, different attitudes toward computer use, and subsequent use of computers for instruction. Further, the research was designed to explore the relationship between attitudes toward computers and computer use as well as the types of training faculty are most likely to respond to positively.

Method

Sample

A survey was distributed to all 550 full and part-time faculty at one urban California community college to determine demographic information about the faculty, their level of computer use for instruction and administration, and their feelings toward computers in education. Thus, the sample of this study was nonrandom, and the participation was voluntary; 117 faculty members (21% of the population) responded to the survey.

Instruments

Quantitative Survey. An initial quantitative survey attempted to explore such issues as how faculty use computers for teaching and administration, what variables are correlated with computer use in the classroom, and whether a relationship exists between certain demographic information (age, gender, highest degree, ethnicity, full or part-time, and number of years teaching) and computer use. Thus, a number of demographic categorical variables were used in the study: gender, full- vs. part-time status, ethnicity, highest college degree, having or not having a home computer, and degree of use for instruction.

Faculty also were asked to rate the extent of their computer use in the following areas: preparing tests and handouts; preparing homework assignments; administrative tasks; grading, testing, and evaluation; demonstrations and simulations; drill and practice; and tutorials.

A Computer Competency Scale (CCS) with nine categories of computer applications commonly used by faculty was developed. The CCS was found to be a reliable measure of competency (Cronbach $\alpha = 0.87$).

Faculty were asked to rate their competency in the following areas: word processing such as Microsoft *Word* or *WordPerfect*, database management such as *Access*, spreadsheets such as *Excel*, presentation software such as *PowerPoint*, telecommunications (e-mail, *CU-See Me*), web browsing (*Netscape*, AOL), education (discipline specific software), desktop publishing (*PhotoShop*), and games. Competency in each area was rated from 0 (not familiar) to 3 (proficient).

The initial quantitative survey also used three subscales—computer anxiety, confidence, and liking—from the computer attitude scale developed by Loyd and Gressard (1984). Each sub-scale had 10 items rated on a Likert-type scale of *1* to *4* where *1* represented *strongly disagree* and *4* represented *strongly agree*. The three scales combined yield a Computer Attitude Scale (CAS) that has a high measure of reliability (Cronbach $\alpha = 0.88$).

Follow-Up Questionnaire. Faculty who responded to the initial quantitative survey were asked if they were willing to participate in a follow-up questionnaire. Of the 88 who agreed to the follow-up survey, 24 faculty members responded to open-ended questions in a written survey format. The follow-up survey was designed to determine how users and nonusers felt about computers in the classroom, positive or negative experiences that they believed may have influenced their choice to use or not use computers, what type of training they had experienced, and what type of training they would like to have had. Finally, respondents were asked to define the most important reason for why they were or were not seeking computer training.

Findings

Summary of Observed Variables

Descriptive profile. Data were collected from 117 (49 female, 68 male) faculty members at one California community college. Table 1 presents a descriptive summary of the respondents. The participants in this study were predominantly male (58%, $n=68$), part-time (55%, $n=64$), White (62%, $n=72$), and holding at least one master's degree (66%, $n=77$).

In this sample of 117 faculty, 101 (85%) reported having a computer at home. Of the respondents, 16 (15%) reported that they did not use

Table 1
Description of Sample

Variables	N	%
Gender		
Male	68	58
Female	49	42
Ethnicity		
White	72	68
African American		
Spanish		
Other		
Home Computer		
Yes	101	85
No	16	15
Full- or Part-Time		
Full-time	53	45
Part-time	64	55
Highest Degree		
B.S. or B.A.		
M.S. or M.A.	77	66
Ph.D. or Ed.D.		
Use Computer for Instruction		
Yes	101	85
No	16	15

	Minimum	Maximum	M	SD
Age	25	76	46.5	10
No. of Years in Teaching	1	57	14	11.5
No. of Computer Courses Taken	0	30	4	7

computers for instruction or administration. Of the 16 who did not own a computer at home, 7 (44%) did not use computers in the classroom; 6 of the remaining 9 used a computer for four or fewer uses. Ten of the 91 (11%) who had home computers reported that they did not use them for instruction or administration. Of the full-time faculty members who responded to the survey, 72% indicated that they used computers for instruction whereas 92% of the part-time faculty respondents reported using computers for instruction.

Computer Attitude and Competency. Means and standard deviations of the observed variables (computer attitude scale) for the sample

are presented in Table 2. The maximum possible score for all three attitude subscales and overall attitude was 3.0. In addition, faculty who responded rated themselves most competent with word processing programs (M=2.8, SD= 0.8) and least competent with presentation programs (M=0.8, SD=1.00). Although the total possible score for competency was 27, the maximum reported score was 25, indicating that at least a few respondents were quite competent in nearly all areas of computer use. Nearly all respondents who scored 20 or above taught a technology-related field (such as computer science or communications).

Type and Extent of Computer Use. As Table 3 indicates, the faculty in this study used computers most often for creating tests, handouts, and homework assignments. On the other hand, 15% (n=16) of the respondents reported not using computers at all for instruction. Moreover, 10% reported just one use, 12% reported two uses, and 17% reported three uses, accounting for 55% of those who responded to the survey. Eight percent reported seven or more uses.

Table 2
Mean and Standard Deviation of Computer Attitude Scale (CAS) Scores

Variable	Mean	SD
Total	2.4	.52
Anxiety	2.6	.51
Confidence	2.5	.67
Liking	2.2	.67

Table 3
Type of Computer Use by Faculty

Type of Computer Use	N	%
Creating tests and handouts	96	82
Homework assignments	93	54
Administrative tasks	49	42
Grading	47	40
Testing and evaluation	40	34
Demonstrations and simulations	35	30
Laboratory classes	31	27
Drill and practice	24	21
Tutorials	23	20

Correlation Analysis

The results of the correlation analysis in Table 4 indicate that having a home computer, attitude, competency, and the number of courses taken were all significantly correlated with computer use. None of the demographic variables were significantly correlated with computer use.

Predicting Computer Use. Multiple regression was used to determine the joint predictiveness of the set of independent variables (competency, home computer, attitude, and number of computer courses taken), with the number of computer uses as the dependent variable. The results indicate a significant relationship, $F=17.1$ (4, 107), $p<.001$, with competency ($t=3.27, p=.001$) and the number of computer courses taken ($t=2.9, p=$ 005) being the only significant variables. The model is meaningful, with $r^2 = .389$, adjusted $r^2 = .367$.

Table 4
Pearson Correlations between Computer Use and Independent Variables

Variable	Pearson Correlation	p	r^2
Home Computer	.16*	.047	.02
Attitude	.46***	<.001	.21
Competency	.6***	<.001	.36
Courses	.45***	<.001	.20
Highest Degree	-.13	.081	.017
Full- or Part-Time	-.086	.186	.007
Gender	-0.42	.327	<.002
Years Teaching	-.109	.127	.01

*Correlation is significant at the 0.05 level.
***Correlation is isgnificant at the .001 level.

Table 5
Multiple Regression with Competency as the Dependent Variable

Variable	β	∃	t	p value
Attitude	6.55	.531	7.53***	<.001
Home Computer	3.60	.194	2.88**	.005
Courses	.262	.287	4.15***	<.001

*Correlation is significant at the 0.01 level.
***Correlation is isgnificant at the .001 level.

Multiple regression was further employed to determine the joint predictiveness of the set of independent variables (home computer, attitude, and number of computer courses taken) with competency as the dependent variable. The results indicate a significant, $F=41.22$ (4, 107), $p<.001$, and meaningful relationship ($r^2=.53$, adjusted $r^2=.52$) with approximately 53% of the variance explained by the model. Competency is significantly related to attitude toward computers (anxiety, liking, and confidence levels), whether or not a faculty member has a home computer, and the number of computer courses taken (Table 5).

Path Analysis

Using Ordinary Least Squares (OLS) regression in a path analysis design, the researchers investigated the effects of the number of computer courses taken, attitude, and having a home computer on competency and computer use in the classroom. The path analysis permits comparison between the direct and indirect effects of competency, training (courses), attitude, and having a home computer on computer use. In addition, the path analysis permits comparison of the direct and indirect effects of training, attitude, and having a home computer on competency.

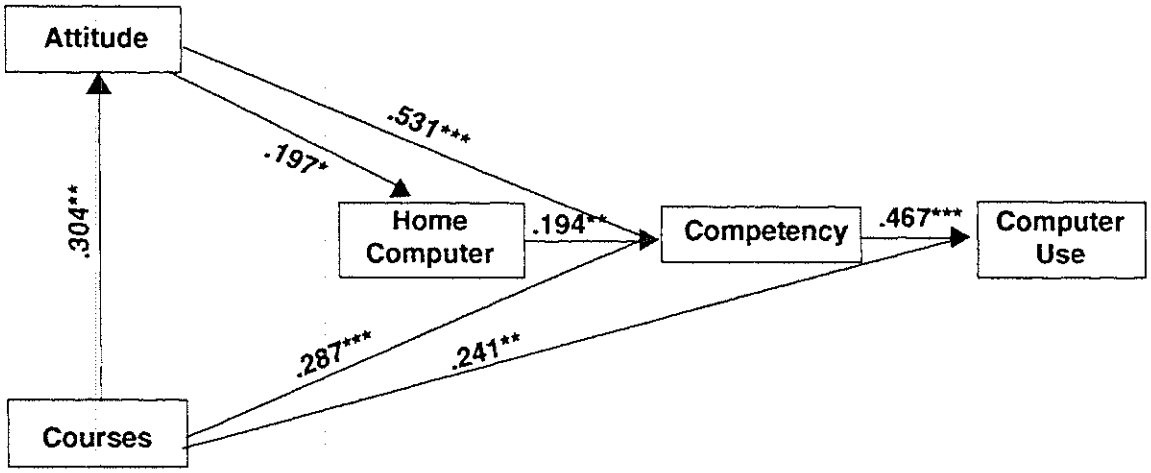
Figure 1 shows the path analysis model used to explore the relationships among the variables. Table 6 shows the results of path analyses for each outcome, exploring the effects of attitude, home computer, and training courses, as they operate through competency level to directly or indirectly influence computer use. The table shows that, of the four measures, only competency ($\alpha=.362, p=.001$) and courses ($\alpha=.244, p=.005$) related significantly and directly to computer use in the classroom. The model accounts for approximately 37% of the variation in faculty members' computer use ($R^2=.389$, adjusted $R^2=.367$).

At the next level, competency is positively related to all three variables: courses ($\alpha=.287, p<.001$), home computer ($\alpha=.194, p<.001$), and attitude ($\alpha=.531, p=.005$). The model accounts for approximately 53% of the variance ($R^2=.534$, adjusted $R^2=.521$). Having a home computer was significantly related to attitude ($\alpha=.197, p=.033$). Finally, the number of computer training courses was significantly related to attitude: $\alpha=.304, p=.001$.

The theoretical basis for the path analysis comes from both the literature and the answers to the open-ended questions from the survey

Figure 1

Path Analysis Model to Explore the Influence of Competency, Attitude, Home Computer, and Training Courses on Faculty Classroom Computer Use



*significant at the 0.05 level
**significant at the 0.01 level
***significant at the .001 level

Table 6

Path Analysis—Regression Results Examining Predictor Variables of Computer Use in the Classroom and Computer Competency

Predictor	Criterion	∃	p Value
Competency Courses	Use	.467***	<.001
	Use	.241**	.005
Attitude	Competency	.531***	<.001
Courses	Competency	.287***	<.001
Computer	Competency	.194**	.005
Attitude	Home Computer	.197*	.033
Courses	Attitude	.304***	.001

*significant at the 0.05 level
**significant at the 0.01 level
***significant at the .001 level

participants. Computer courses have been shown to significantly influence attitude toward computers and competency (Yildirim, 1997). It is

intuitively obvious that competency will affect a faculty member's choice to use computers in the classroom, as a faculty member is less likely to attempt to use a teaching tool with which they are incompetent or unfamiliar (Colon, Willis, Willis, & Ausrin, 1995). The following discussion of the qualitative questionnaire highlights how these individual faculty members' attitudes and training were linked to their competency and their choice to use or not use computers in the classroom. Finally, access to computers has been shown to have a significant relationship with faculty member's choice (or ability) to use computers for instruction; having a home computer dramatically improves access (Topp, Mortenson, & Grandgenett 1995).

Follow-Up Questionnaire

The responses to open-ended questions from the faculty who used computers indicated that they had a positive attitude toward technology prior to using computers in their classrooms. The following statement is representative of the responses: "I've always had a positive attitude toward computers—I just never fully realized their potential in an educational setting."

User respondents indicated a number of other factors that contributed to their positive attitudes: workshops, conferences, availability of suitable equipment, and having friends who own computers. The following statement expresses the positive effect of exposure to training and experience with computers: "Learning how to use PowerPoint, scanning, and so forth. Developing my coursework—so easy to go back and correct anything."

In contrast, the attitudes reported by nonusers were mixed, ranging from "against it," "great," "I am somewhat anxious," and "uncomfortable, uneasy, confused." The reasons for not using computers were equally varied: "too much trouble," "need additional training," "I did not have the software," "just don't take the time," and "I have doubts about how I, the department, or the students would pay for the software and hardware." These comments coincide with their range of ratings on the attitude scale. For example, the respondent who commented "great" rated 3 out of 3 on the attitude scale whereas the respondent who commented "uncomfortable, uneasy, confused" rated 1.33 on the attitude scale.

When user participants were asked which factors most influenced their use of computers in the classroom, they focused on benefits of computer use as expressed by the following respondent: "The color that comes with *PowerPoint* slides just adds so much to lecture and makes it more interesting to the students. The lecture focus is not on the color of the slide but how the content comes across."

In contrast, when nonusers were asked what they thought would be most influential in getting them to use computers in instruction or administration, their responses varied as follows: "show me the benefits and how to save time, and reduce problems," "additional training," and "having help in the computer lab for myself and for my students. I know that the staff is willing; it is my flesh and spirit that are scared." Nonusers are concerned with both the benefits of using computers in the classroom and also the type of training and assistance available to them.

The computer users who responded to the follow-up survey reported minimal amounts of formal training, and from 50% to 100% of their computer knowledge was self-taught. Interestingly, whereas nonusers also reported minimal formal training, one faculty member who described his attitude towards computers in the classroom as "against it" reported having six college-level computer courses.

When asked about what formal training they would like to pursue, the computer users who responded requested specific training on high-end software such as interactive video and sound, presentation software, and designing Web pages. When given choices of training formats, nonusers clearly favored short training sessions, preferably with one-on-one attention, versus longer courses or with larger groups.

When asked what if anything is preventing them from obtaining that formal training, both users and nonusers indicated lack of time as the most important factor.

Discussion and Recommendations

This study was designed to identify the variables that best predict whether a faculty member is likely to use computers in the classroom. Second, the researchers attempted to determine if distinct training needs could be identified by faculty computer users and nonusers. The study employed quantitative and qualitative data from faculty at one California community college. The limitations of the study include the fact that the

responses were voluntary; therefore, the survey was nonrandom. In addition, the disciplines of the faculty members were not considered as a variable for the quantitative analysis of data; the follow-up qualitative survey, however, provided information that supported the results of the statistical analysis.

The results indicated that competency and previous computer training courses were significant predictors of whether a community college faculty member used a computer for instructional use. The results further indicated that for faculty responding to the survey, although attitude is not significantly correlated with computer use in the classroom when other variables are in the model, attitude (anxiety, confidence, liking) is significantly related to competency, and therefore has an indirect effect on computer use.

The follow-up survey indicated that users and nonusers prefer different styles of training, depending on their confidence, anxiety, and competency levels. Whereas experienced users requested specific training on high-end software, nonusers clearly favored short sessions with personal attention and expressed concern with learning the benefits of computers in education, as well as knowing that help is available after the training. This leads to the conclusion that dealing with their anxiety and concerns was more important to nonusers, whereas experienced users were more focused on improving their skill levels.

The follow-up survey further revealed that the amount of previous training is not a consistent determinant of whether a faculty member will use computers in the classroom. Training for nonusers will not be useful unless it addresses their anxiety when appropriate, improves their attitudes toward computers when needed, and clearly demonstrates the benefits of computer technology in the classroom. This supports findings in the existing literature on faculty development. A number of researchers underline the importance of providing technology training in a context that directly parallels the individual's discipline or uses subject matter that allows the individual to see and experience the use of technology specifically in his or her professional field (Davis, 1999). In contrast, nonanxious users may be self-taught and expect training to be software or hardware specific, or both; they require little or no anxiety-reducing interventions.

Based on the results of the surveys, it seems clear that an effective way to encourage faculty to use computers in the classroom is to increase

their level of competency. This can be achieved by providing training that is designed for each individual's level of anxiety, liking, and confidence when using computers. Finally, because having access to a home computer is also significantly correlated with competency, and therefore also has an indirect effect on computer use in the classroom, the researchers believe that encouraging faculty to purchase and use a home computer will increase overall classroom use.

Further research is needed to determine if computer users and nonusers should be further classified by attitude, competency levels, and discipline, perhaps leading to a tier-approach to staff development and training with appropriate methods for each distinct group.

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