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ABSTRACT

One of the most relevant issues in classrooms today is the incorporation of technology, specifically computers, into classroom instruction. A review of the literature reveals that six of the most important variables in determining the degree to which teachers integrate computers into their instruction and planning are knowledge, anxiety, personal attitudes, professional attitudes, school support, and school resources/set-up; with knowledge being the most critical. This study consisted of a survey, with questions pertaining to these variables, given to 74 elementary school teachers. Based on their answers to 8 knowledge-based questions, 48 teachers were coded as possessing limited computer knowledge. Of the five remaining variables, level of anxiety proved to have the strongest correlation with computer use for these limited knowledge teachers. The report includes specific suggestions for limited knowledge teachers to integrate computers into their instruction. The complete text of the survey is included. (Contains 22 references.) (Author/ND)

Teachers with Limited Computer Knowledge: Variables Affecting Use and Hints to Increase Use

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COMPUTER USE OF LIMITED COMPUTER KNOWLEDGE TEACHERS

Abstract

One of the most relevant issues in classrooms today is the incorporation of technology, specifically computers, into classroom instruction. The literature reveals that six of the most important variables in determining the degree to which teachers integrate computers into their instruction and planning are knowledge, anxiety, personal attitudes, professional attitudes, school support and school resources/set-up; with knowledge being the most critical. This study consists of a survey, with questions pertaining to these variables, given to 78 elementary school teachers. Based on their answers to 8 knowledge based question, certain teachers were coded as possessing limited computer knowledge. Of the five remaining variables, level of anxiety proved to have the strongest correlation with computer use for these limited knowledge teachers.

Teachers with Limited Computer Knowledge: Variables Affecting Use and Hints to Increase Use

PROBLEM STATEMENT

One of the most relevant issues in classrooms today is the incorporation of technology, specifically computers, into classroom instruction. In the US, approximately 98% of all preK-12 schools have at least one computer and nine out of ten teachers understand that computers in the classroom is not another passing fad. Clearly, computers are firmly planted in our schools. However, their pervasiveness in schools does not necessarily correlate with classroom use. Research shows that there is a wide variation in the amount different teachers use computers in their classrooms (Wirthlin Group, 1989).

Beyond this variation in computer usage, there is also a marked difference in the amount of knowledge about integrating computers in the classroom possessed by teachers (Becker, 1992). The scholarly literature written about this subject either discusses the entire range of knowledge or focuses upon teachers with exemplary knowledge. Therefore, we have chosen to concentrate on only those teachers with near average to below average computer knowledge. For the purpose of our research, we will call these teachers limited knowledge teachers.

By no means do we intend to imply that this categorization reflects upon their overall teaching ability.

Teachers whose knowledge of computers is superior will be instrumental in implementing future computer use, but if the use is to be widespread we must also focus on those teachers whose computer knowledge is significantly less (Cory, 1991). The purpose of our research is to study these limited knowledge teachers and offer some insight into what variables lead them to incorporate technology into their instruction to the extent that they do. Hopefully, this study will give future researchers a degree of understanding into this sector of the teaching population.

By looking only at limited knowledge teachers, we hypothesize that the following five variables will correlate with the amount of computer use by these teachers: level of anxiety, personal and professional attitudes, technical and administrative support, and the set-up/resources of the technology at the school. Furthermore, we hypothesize that of these five variables, level of anxiety will have the strongest and personal attitudes will have the weakest correlation with computer use. Second, had we not controlled for knowledge, computer knowledge would have been the strongest correlating variable to computer use, for the general teaching population.

The remainder of this paper will be divided into four sections. In the first, we will synthesize the body of literature pertaining to the

variables identified above and how they influence the amount and the effectiveness of computer use in the classroom. Next, we will offer an overview of the design of our specific study. In this section we will discuss the quantitative study we used to pursue our hypotheses. Third, we will analyze the results and determine which variables were of the greatest significance in determining level of computer use among teachers with limited computer knowledge. Finally, we will highlight our conclusions and offer suggestions for limited knowledge teachers in various situations. These hints will allow them to be able to more fully integrate computer technology into their planning and instruction.

REVIEW OF LITERATURE

Introduction

Too often, the teachers who do not have a great deal of computer training or knowledge are not focused upon when it comes to planning for the future of instructional technology. Research seems to either look at all teachers, no matter how much knowledge they possess (Wirthlin Group, 1989, Davidson & Ritchie, 1994, and Cobbs, 1990), or it concentrates on those teachers who have exemplary computer knowledge (Becker, 1992). The four citations listed above are all surveys that were conducted to assess different aspects of computer use in the classroom.

Of the four, the most comprehensive survey on this subject was commissioned by International Business Machines (IBM) and conducted by the Wirthlin Group. For this, thousands of teachers across the nation were polled about factors that influenced technology use in their classrooms, while others were interviewed about their opinions on the same subject.

Conversely, the surveys conducted by Davidson & Ritchie (1994) and Cobbs (1990) were more limited in their range. Davidson and Ritchie investigated the change in teacher attitudes and anxieties in a single K-5 elementary school in an urban Texas school district over the course of two years. Cobbs' survey field consisted of the elementary

classrooms of the Atlanta Public School System. He wanted to "measure second, third and fourth grade teachers' perceptions of computing practices and potentials in [their schools]" (Cobbs, p. 7-8).

One of the most thorough examinations of the important topic of effective computer use among teachers was conducted by Becker (1992). He used survey data collected from personnel in 1,400 U.S. schools. The respondents to the questionnaire were not selected at random, but rather were the principals, the school-level computer coordinator and a sample of teachers in which regular computer users were disproportionately represented. With this respondent pool, the results focused on teachers with high computer knowledge.

Through their answers to the surveys, Becker was able to identify five percent of teachers as exemplary when it came to using the computer. Exemplary teachers were those who passed at least 51% of the criteria set to identify "a classroom environment in which computers were both prominent in the experience of students and employed in order that students accomplish intellectual growth and not merely development of isolated skills" (Becker, p. 6). Unlike the others, he was interested in finding the differences between the teaching environments of these exemplary teachers and other computer users.

The findings of these surveys as well as other qualitative and quantitative research have demonstrated that knowledge, attitudes, anxiety, set-up/resources and support are critical factors in determining

the amount that classroom computers are utilized. As was stated earlier, this research has not focused solely on limited knowledge teachers. Controlling for knowledge then, we hypothesize that these same variables will be of great importance among limited knowledge teachers. We will review the literature pertaining to the importance of each of these five variables. We will begin with knowledge, which in many ways is the most important of the five.

Knowledge

As is the case with almost anything, there must be some level of knowledge before any computer use can occur. On the most basic level, if a teacher does not know how to turn the computer on, (s)he is not going to be able to effectively integrate it into his/her classroom! There are clearly many ways to gain computer knowledge (practice, training, and studying just to name a few). Research has shown that training is a highly effective method to increase knowledge. Courses in computer literacy significantly improve teacher's knowledge about computers (Madsen & Sebastiani, 1987, Thompson, 1985) Furthermore, 38% of teachers cited a lack of training as **the** greatest obstacle to more effective computer use (Wirthlin Group, 1989). Additional research has shown that any training can be useful, but the types of training teachers received is also relevant.

The two most common types of training are preservice and inservice. The literature clearly states that there are similar ways to

make both types of training more effective. First, hands-on training has proved to be the most adequate means of increasing knowledge for teachers (Madsen & Sebastiani, 1987; Thompson, 1985). Second, the training needs to be relevant to the type of teaching and situations that the teacher will/does find (Novak & Knowles, 1991; Oliver, 1994). For example, teachers need "specific curricular skills and classroom implementation strategies" to maximize computer use in actual situations (Oliver, p. 87).

The acquisition of knowledge plays a vital role in the increase of computer use. Since training has been linked so strongly to a rise in knowledge, it is not surprising to find that training tends to increase use (Dupagne & Krendl, 1992). Phillips, Nachtigal and Hobbs (1986) concluded that a significant increase in the number of teachers using computers in the classroom could be directly attributed to training.

Attitudes

Research has been conducted on teachers' attitudes toward computers in the classroom (Becker, 1992; Chin & Hortin, 1993; Cobbs, 1990; Davidson & Ritchie, 1994; Delcourt & Kinzie, 1993; Hickey, 1993; Novak & Knowles, 1991; Piña & Harris, 1993; Wirthlin Group, 1989). As expected, the more positive the teachers' attitudes toward computers, both personal and professional, the more likely they are to use computers to their advantage in the classroom. Unfortunately, although computers are common, many teachers are still skeptical of the value

computers have in education (Chin & Hortin, 1993). "The level of feelings teachers have toward computer usage range from uncertainty to hostility, to fear, to euphoria" (Chin & Hortin, p. 84).

On the more positive end of this range, Davidson and Ritchie (1994) found that an overwhelming percentage of teachers felt that computer use is of value to students and concluded that positive attitudes are directly related to the successful integration of computers in the classroom. In addition, teachers who use or have their own computers are more likely to show more positive attitudes toward using computers in the classroom (Bassler, Almeida & Van Voorst, 1984) and some concentrated experience with computers is a critical area in formation of positive attitudes (Delcourt & Kinzie, 1993). One of the major factors promoting computer use among first year teachers was their "strong personal beliefs in the importance of developing computer skills in their students" (Novak & Knowles, p. 49). These findings all lead to the same conclusion: the better teachers feel about computers the more likely they are to use them.

Anxiety

Computer anxiety among teachers is another factor that affects the use of computers in the classroom. The research clearly demonstrates that teachers who have high levels of anxiety are less likely to integrate computer technology into their curricula (Barker, 1994; Piña & Harris,

1993; Chin & Hortin, 1993; Savenye, et. al., 1992). Much of the anxiety stems from teachers who feel they need to be proficient at programming in order to use computers. Some teachers went so far as to report that they were "afraid of looking foolish, getting lost or pushing the wrong button and damaging the computer" (Piña & Harris, p. 3). While teachers with less computer experience tend to be less enthusiastic about integrating computers into their classrooms, one of the more encouraging findings is that a majority of teachers are becoming more comfortable with computers and are overcoming their feelings of fear and anxiety (Dupagne & Krendl, 1992). One way to further this trend toward reducing computer anxiety among teachers is to insure that all teachers are technologically informed (Barker, 1994; Saveyne, 1992).

Support

For the purposes of this study, support will be defined as the administrative leadership and technical assistance offered at the individual schools. It is how the administrators, exemplary computer knowledge teachers, and other support personnel at the school encourage the rest of the teachers to utilize the equipment they have at their disposal that is, in essence, support. Turning first to the school administration, positive leadership from the principal and/or assistant principal(s) promotes teachers' professional growth in all areas (Armstrong & Trueblood, 1985), and specifically computer technology (Chin & Hortin, 1993). In addition, a principal who defines training as a

encourage the rest of the teachers to utilize the equipment they have at their disposal that is, in essence, support. Turning first to the school administration, positive leadership from the principal and/or assistant principal(s) promotes teachers' professional growth in all areas (Armstrong & Trueblood, 1985), and specifically computer technology (Chin & Hortin, 1993). In addition, a principal who defines training as a top priority will instill in teachers the desire to be committed and successful (Anderson & Odden, 1986). To put it simply, "principals play a key role in the implementation of microcomputers in school" (Dupagne and Krendl p. 422).

Beyond the principal, Weaver (1987) concluded that the school's computer facilitator or other computer support personnel are a crucial resource to be utilized. He went on to say that effective support personnel will make teachers feel comfortable about asking for help and will possess enough knowledge to provide immediate assistance in problem solving situations. They need to be knowledgeable **and** be able to impart this knowledge to teachers when it is requested.

The overall philosophy of the school also plays an important role. McMahon (1990) concluded that the general school mentality may be the most prominent factor in determining the implementation of computers in schools. For instance, schools which tended to be more progressive in their instruction and favored discovery learning were more likely to integrate problem solving software into their curriculum. On the other

increase the use of instructional technology because they search out opportunity for change and derive great satisfaction from taking risks (McMahon, 1990). Schools need innovative teachers to help the technology take hold.

In the Becker (1992) survey, three of the five factors that most directly correlated with exemplary computer use were in the area of support. The first was camaraderie among computer users at the school. This included the number of teachers who use computers, those who were thought to be expert users and those who started using computers through system wide coordination. The second such variable was school support for maximizing the amount of computer time allotted for purposeful applications (e.g. creating a school newsletter or a student created multimedia project). The final factor was principals' concern for equity of access to different categories of students (i.e. sex, ability and ethnic groups). These findings punctuate the importance of school support in increasing the the application of technology in the classroom.

Set-up/Resources

At a very basic level, all the positive attitudes, decreases in anxiety, and support do almost no good if the resources to implement the technology are not available. An expert computer user without a computer in his/her classroom is not going to be very effective. It is crucial for teachers to be able to use the knowledge they possess and without proper hardware or software this is impossible. "It is essential for

teachers to practice what they have learned" (Chin & Hortin, 1993).

In the Wirthlin (1989) survey, teachers identified the amount of resources a school had as one of the most important variables impacting use. Resources include money, computers, software, and space. In fact, 68% of teachers felt that a lack of resources kept them from using computers more often than they did. Furthermore, a statewide survey of California public schools in 1989 determined that three of the six major roadblocks to increasing the use of instructional technology were the lack of funds, limited or inadequate facilities and lack of equipment (the other three were a lack of training opportunities, teachers' negative attitudes and high levels of computer anxiety) (Main & Roberts, 1990). Finally, the fourth and fifth correlating factors cited by Becker (1992) related to school set-up and resources. The fourth involved the amount of resources allocated to staff development and computer coordination, including spending money on hardware, software and staff development to support effective computer use. Finally, smaller class size and a better ratio of students to computers proved to lead to more effective computer use. Beyond these survey findings there is other research to support the importance of resources in computer use. Novak and Knowles (1991), through interviews and observations, concluded that teachers felt constrained by limited computer equipment when they were in a classroom with only one computer. Similar results were also found in other research (Chin & Hortin, 1993; Dupagne & Krendl, 1992).

Summary

As we have attempted to demonstrate through this review of the literature, five of the most important variables influencing computer use among teachers are knowledge, attitudes, anxiety, support and set-up/resources. Accepting this to be fact, we now turn to our study in which we examine computer use among elementary school teachers. We plan to identify certain teachers as being limited in their computer knowledge and we expect to find that the same variables which affect all teachers will be particularly relevant to these limited knowledge elementary school teachers.

STUDY DESIGN

Sample

The study was conducted during the spring of 1995 using 74 elementary school teachers. The majority of these teachers work in one of four public elementary schools (grades K-6), representing two school districts, located within a 30 mile radius of a large university in central Virginia. The remainder of the teachers surveyed taught in various schools which were up to a 75 mile radius from this same university. We gathered information from no more than 3 teachers from each of these other schools. The four main schools were not selected at random; rather, they were schools with which we had working relationships. These schools serve a relatively diverse population in terms of socioeconomic and racial backgrounds. Three of the schools are situated in a more rural setting, while the fourth school is more suburban.

Measures

We created a questionnaire that contained 86 questions pertaining to attitudes, computer use and school computer set-up/resources (Appendix A). These questions were based, in part, on items from a computer attitude survey developed by Davidson and Ritchie (1994). In 79 of the questions, teachers were asked to agree or disagree with a statement using a five-point Likert-type scale. The remaining seven questions were in a multiple choice format.

For purposes of data analysis, we coded the items into seven categories: knowledge, personal attitudes, professional attitudes, anxiety/comfort level, school support, school computer set-up/resources, and usage. The items from each category were interspersed throughout the questionnaire. We chose these categories after hypothesizing that they would be the most important variables affecting the amount limited knowledge teachers integrate computer technology into academic curricula.

Design

Our study design consists of three layers. In the first, we will identify the limited knowledge teachers as determined by their responses to the knowledge questions on our survey. Second, focusing on these teachers, we will examine the degree of correlation between the amount of time a teacher uses the computer and the variables identified above (personal attitudes, professional attitudes, anxiety/comfort level, school support, and school computer set-up/resources). Third, returning to the responses of all the teachers, the correlation between knowledge and use will be determined.

Analysis

Each of the parts of the design call for a different method of analysis. For determining limited knowledge teachers, we ascertained each teacher's "knowledge score", based on their answers to the eight questions in the survey that were coded as knowledge questions (see

Table 1). Seven of these questions were on the 5 point Likert-type scale with a 5 indicating the most knowledge and a 1 indicating the least knowledge. The eighth question was a multiple choice question with five

Table 1
Knowledge Questions

	Item	Mean	SD
1-5.	I know enough about computers to integrate them into my instruction.	3.43	1.11
1-7.	I see myself as one of the more knowledgeable computer users in my school.	2.78	1.28
1-8.	Other school personnel see me as one of the more knowledgeable computer users in my school.	2.55	1.15
1-9.	I feel comfortable sharing my knowledge about computers with other faculty.	3.14	1.30
1-10.	I feel comfortable sharing my knowledge about computers with my students.	3.72	1.03
1-33.	I have taken courses in instructional technology.	3.39	1.33
1-34.	I have attended in-services that focus on instructional technology.	3.70	1.19
3-7.	In the past 4 years, the number of formal hours of computer training I have had is (total hours not credit hours): 1. Less than 4 2. 4 - 7 3. 8 - 11 4. 12 - 15 5. over 15	2.84	1.78
Totals		25.57	7.21

Scale for all section 1 questions: 1 Str. Disagree 2 Disagree 3 Neutral 4 Agree 5 Str. Agree

choices numbered 1 to 5. Again, 5 suggested the most knowledge and 1 suggested the least knowledge.

The highest score on each question was 5 ("strongly agree") and the lowest was 1 ("strongly disagree"). Therefore, a "perfect knowledge score" was 40, the lowest possible score was 8 and an average response of 3 on each item yielded a 24. Our aim was to identify the teachers who were not exemplary. With this in mind, we determined that a respondent who's average response to each question was 3.5 or below (or a total of 28 or below) was not exemplary in their computer knowledge, hence we categorized them as having limited knowledge.

The logic for this decision was based upon the fact that an average score of 3.5 or below would mean that the respondent would have chosen an equal or greater number of "neutral", "disagree" and "strongly disagree" answers, than "agree" or "strongly agree". Basically, to be categorized as limited knowledge, a respondent would have had to either disagree or be neutral on at least half of the questions. In our sample, scores ranged from 40 to 10 with a mean of 25.57 and a standard deviation of 7.21. 48 of the 74 teachers who were surveyed, or 64.9%, fit the criteria for being limited knowledge computer users.

To examine the degree of correlation between each of the five dependent variables and use, five separate Pearson product-moment correlation tests were conducted. The correlation between each of the five aforementioned variables to the amount of school related computer

use was tested and a correlation coefficient, ranging from 1.00 to -1.00, was determined. Since survey items were worded both positively and negatively the scales for some of the items needed to be reversed prior to correlation analysis. Scales for the negatively worded items were reversed so that a score of 1 was the most negative and a score of 5 was the most positive. (This was not a concern for the determination of limited knowledge teachers since all of those questions were worded positively.)

In the next section of the paper, we will return to our original two hypotheses. Through analysis of our results, as was described above, we will show the degree to which these hypotheses were proven to be true. This analysis will demonstrate which of the five isolated variables was the most closely correlated to computer use.

ANALYSIS OF RESULTS

Hypothesis 1: By looking only at limited knowledge teachers, we hypothesize that of the five identified variables, level of anxiety will have the strongest and personal attitudes will have the weakest correlation with computer use.

Turning now to these 48 teachers, on whom this part of the statistical analysis will focus, the knowledge scores ranged from a high of 28 to a low of 10. The mean was 20.39 and the standard deviation was 4.80. None of these scores ranged beyond two standard deviations above the mean and only one score ranged beyond two standard deviations below the mean. We will now examine the questions that determined the amount these respondents used the computers at their disposals.

Nine questions in the survey were coded as use questions (see table 2). The first seven of these questions went to the integration of computers into the instruction of different disciplines, the eighth to integration of computers into curriculum development, and the ninth to amount of time a typical student used a computer during a given week. The first eight questions were all scored on a five point Likert-type scale while the fifth was a multiple choice question with five possible responses. A score of one was given for the lowest of the responses up to a score of five for the highest of the responses. Therefore, all nine

Table 2
Use Questions

Item	Mean	SD
I integrate computers into my:		
1. reading instruction	2.90	1.22
2. writing instruction	3.02	1.26
3. science/health instruction	1.98	1.08
4. math instruction	2.94	1.33
5. social studies instruction	2.08	1.09
6. art instruction	1.60	0.92
7. music instruction	1.33	0.63
8. curriculum **development** (determining and developing the materials I use in my teaching)	2.23	1.37
3-5. The amount of time the average student in my class spends on a computer per week is:	1.19	0.76
a. 0 - 1 hours		
b. 1 - 2 hours		
c. 2 - 3 hours		
d. 3 - 4 hours		
e. more than 4 hours		
Totals	19.23	5.82

Scale for all section 1 questions: 1 Str. Disagree, 2 Disagree, 3 Neutral, 4 Agree, 5 Str. Agree

questions were scored on a scale from one to five. The highest possible use score was a 45 and the lowest possible was a 9.

For the limited knowledge teachers, the use scores ranged from a high 35 of to a low of 9 with a mean of 19.23 and a standard deviation of 5.82. There were three respondents who scored more than two standard deviations above the mean and no respondents who scored more than two standard deviations below the mean. The correlations between

these use scores and the scores of the other five variables for these 48 teachers will now be examined.

Anxiety

Five questions in the survey were coded as anxiety questions (see Table 3). All five of these questions were on the 5 point Likert-type scale. Questions 1-12, 1-15 and 1-17 were worded negatively so the scores for these three questions were reversed prior to totaling of the anxiety score and correlation analysis. Therefore, the higher a respondent's score on the anxiety questions, the less anxiety that teacher showed toward the computer.

Table 3
Anxiety Questions

	Item	Mean	SD
1-2.	I feel comfortable using the computers in my classroom.	3.36	0.92
1-3.	I feel comfortable using the other computers in my school.	2.88	1.00
1-12.	I feel tense when people start talking about computers.	2.65	0.91
1-15.	I feel intimidated by people who know something about computers.	2.56	0.82
1-17.	I fear that computers may take over some parts of a job I enjoy.	1.88	0.76
Totals		17.08*	2.79

* The scores for questions 1-12, 1-15 and 1-17 were reversed prior to determining totals.

Scale for all section 1 questions:	1 Str. Disagree	2 Disagree	3 Neutral	4 Agree	5 Str. Agree

The highest possible score (which would have showed the least possible anxiety) was 25 and the lowest possible score (which would have shown the highest possible anxiety) was five. For the teachers identified as limited knowledge computer users, the anxiety scores ranged from a high of 24 to a low of 11. The mean score was 16.80 with a standard deviation of 2.91. One teacher was more than two standard deviations above the mean and one teacher was more than two standard deviations below the mean.

The results of a Pearson product-moment correlation test between the amount of computer use and the level of non-anxiety gave a result of r=.333. This correlation coefficient is significant at a confidence level of .02 where n=48.

Professional Attitudes

Nine questions in the survey were coded as professional attitude questions (see Table 4). All nine of these questions were on the 5 point Likert-type scale. Questions 1-11 and 1-14 were worded negatively so the scores for these questions were reversed prior to totaling of the professional attitudes score and subsequent correlation analysis.

The highest possible score was 45 and the lowest possible score was nine. The professional attitudes scores ranged from a high of 36 to a low of 18 for the limited knowledge computer user teachers. The mean score was 29.10 with a standard deviation of 3.06. One score was more than two standard deviations above the mean and one score was more

Table 4
Professional Attitudes

Item	Mean	SD
1-1. I like to teach with computer technology.	3.45	0.77
1-4. I think quality instruction using technology will only enhance my teaching.	4.02	0.56
1-6. I enjoy learning about new technology.	3.77	0.86
1-11. I wish I could find a way to have my students use computers more than they do now.	4.08	1.01
1-13. I enjoy reading about new computer software and hardware.	2.46	1.01
1-14. I rely on others to inform me about new software.	3.81	0.94
1-20. I think that using computer technology for instruction will help improve students' performance.	3.75	0.73
1-21. When utilizing computers, the teacher becomes guide/facilitator.	3.88	0.82
1-23. When utilizing computers, the teacher is further able to individualize instruction.	3.75	0.73
Totals	29.10*	3.06
* The scores for questions 1-11 and 1-14 were reversed prior to determining totals.		

Scale for all section 1 questions:	1	2	3	4	5
	Str. Disagree	Disagree	Neutral	Agree	Str. Agree

than two standard deviations below the mean.

The results of a Pearson correlation test between the amount of computer use and the strength of professional attitudes gave a result of r=.203. This correlation coefficient is not significant where n=48.

Support

Five of the survey questions were identified as being related to the support offered by the school in the integration of computer technology (see Table 5). All five of these questions were on the 5 point Likert-type scale and none of them were worded negatively.

The highest possible score on the school set-up/resources questions was 25 and the lowest possible score was five. Three of the respondents left the question 1-29 blank. The other answers of these three respondents were included for calculations of means and standard deviations for the other four questions. However, they were neither

Table 5
School Support

	Item	Mean	SD
1-27.	I know which faculty member is the technology coordinator at my school.	4.56	0.80
1-28.	When I have a question about computers I feel comfortable asking my school's technology coordinator.	4.35	0.86
1-29.	When I have asked my school's technology coordinator a question, (s)he has been helpful.	4.42	0.84
1-35.	My school has helpful in-services for integrating computers into the curriculum.	3.31	1.07
1-36.	The principal at my school makes good use of the computer(s) at his/her disposal.	4.25	0.79
Totals		21.18	2.86

Scale for all section 1 questions: 1 Str. Disagree, 2 Disagree, 3 Neutral, 4 Agree, 5 Str. Agree

included in the determination of the group mean and standard deviation nor the correlation coefficient for this section.

This set of scores ranged from of 25 to 13. The mean was 21.18 and the standard deviation was 2.86. No scores were more than two standard deviations above the mean and only one score was more than two standard deviations below the mean.

The results of a Pearson correlation test between the amount of computer use and the degree of support offered by the school gave a result of r=.024. This correlation coefficient is not significant with a sample size of 45.

Personal Attitudes

Five of the survey questions were identified as personal attitude questions (see Table 6). All five of these questions were on the 5 point Likert-type scale. Questions 1-16, 1-19 and 1-24 were worded negatively. Therefore, the respondents' scores for these questions were reversed prior to totaling of the overall personal attitudes score and subsequent correlation analysis.

The highest possible score was 25 and the lowest possible score was five. The scores on the personal attitudes section ranged from a high of 25 to a low of 13. The mean was 18.88 and the standard deviation was 2.12. One score was more than two standard deviations above the mean while two scores were more than two standard deviations below the mean.

Table 6
Personal Attitudes

Item	Mean	SD
1-16. I think computers are dehumanizing.	2.23	0.93
1-18. I think students are more motivated when they can learn using computer technology.	3.85	0.71
1-19. I think instruction by computer technology is just another fad.	1.83	0.69
1-22. When utilizing computers, the teacher's role becomes more complex.	3.15	0.87
1-24. When utilizing computers, the teacher's role is diminished.	2.06	0.70
Totals	18.88*	2.12
* The scores for questions 1-16,1-19 and 1-24 were reversed prior to determining totals.		
Scale for all section 1 questions: 1 Str. Disagree, 2 Disagree, 3 Neutral, 4 Agree, 5 Str. Agree		

The results of a Pearson correlation test between the amount of computer use and the strength of personal attitudes gave a result of r=.097. This correlation coefficient is not significant with a sample size of 48.

School Set-up/Resources

Six questions on the survey were identified as being related to the computer set-up and/or resources at the individual schools. Four of those questions were on a 5 point scale (See Table 7). Question 1-32 was worded negatively and the respondents' scores for this question were reversed prior to determining the totals and subsequent correlation

Table 7
School Set-up/Resources

Item	Mean	SD
1-25. The number of students in my class affects my ability to integrate computers in the curriculum.	3.90	1.19
1-30. I feel that all teachers have relatively similar access to computers in my school.	3.60	1.07
1-31. In terms of instructional technology, I feel that my school is relatively well-equipped in relation to others in the area.	3.45	1.27
1-32. The computer equipment at my school is outdated.	2.69	1.21
Totals	14.19*	3.30
* The scores for question 1-32 was reversed prior to determining totals.		

Scale for all section 1 questions:	1	2	3	4	5
	Str. Disagree	Disagree	Neutral	Agree	Str. Agree

analysis. The other two questions were in a multiple choice format (See Table 8) and a separate analysis was carried out for them.

For the Likert-type questions, the highest possible score was 20, while the lowest possible score was four. The highest score on this section was a 20 while the lowest was an 8. The mean was 14.19 and the standard deviation was 3.30. No scores were either two standard deviations above or below the mean.

The results of a Pearson correlation test between the amount of

Table 8
Other School Set-up/Resources questions

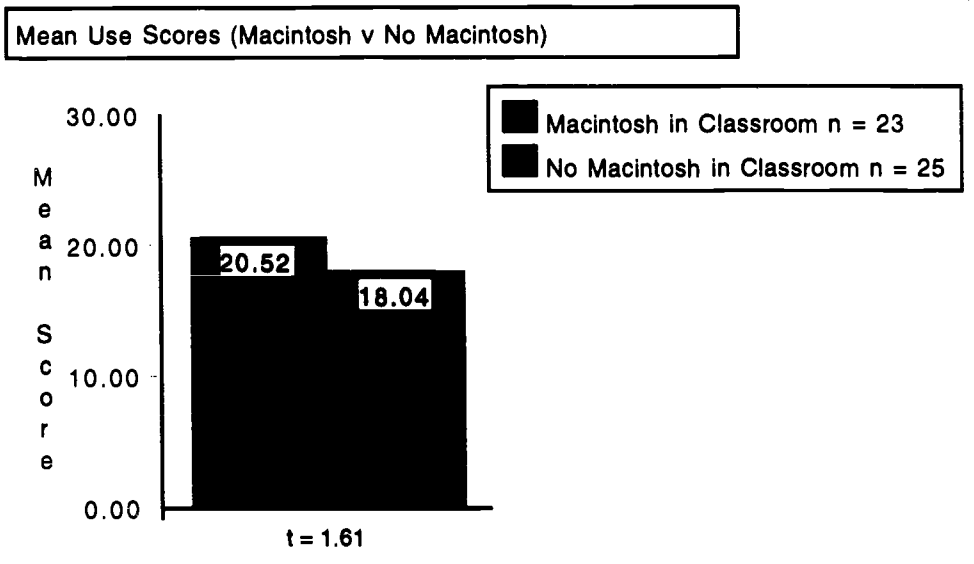
3-2.	In my classroom, I have (Circle all that apply): a. Apple II series b. Macintosh c. IBM compatible d. No computers in my classroom.
3-6.	The number of students in my classroom is: a. less than 15 b. 15 - 18 c. 19 - 22 d. 23 - 26 e. more than 26

computer use and the computer set-up/resources at the school gave a result of r=.105. This correlation coefficient is not significant with a sample size of 48.

Examining the two multiple choice questions, question 3-2 gave information about the type of computers the teachers had in their classrooms. Of the 48 limited knowledge computer users, 44 (92%) had at least one computer in their classroom while the other four had no classroom computer but had access to a computer laboratory. 23 or the 48 (48%) had a Macintosh computer while the other 25 (52%) had either an IBM or compatible, an apple II series computer, or no computer at all.

As Table 9 illustrates, the mean use score for the teachers who had Macintoshes in their classrooms was 20.52 and the standard deviation was 7.05 while the mean for teachers who had no Macintosh was 18.04 and the standard deviation was 4.21. An independent t-test

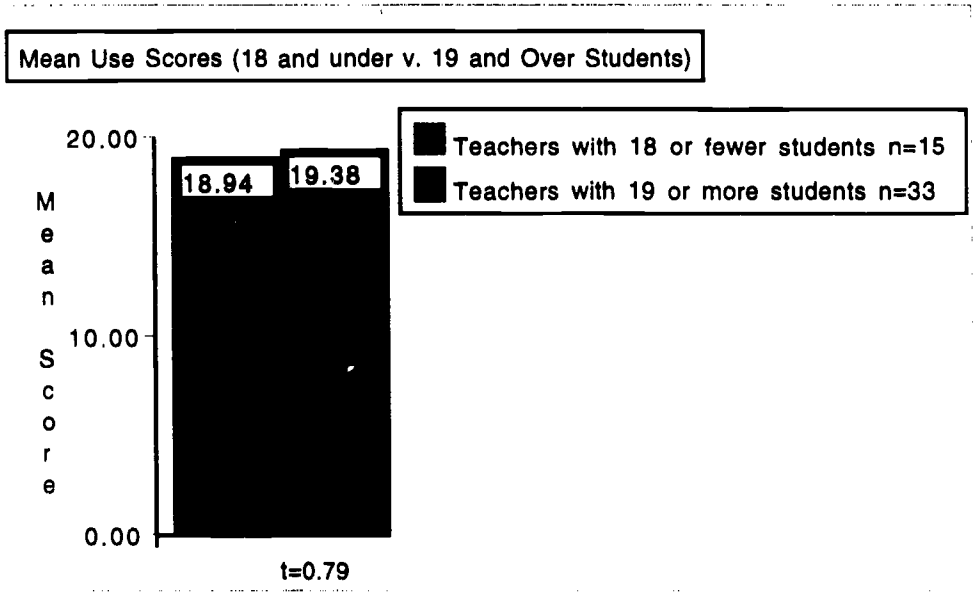
Table 9



was conducted to determine if there was a statistical significance between these two means. The result was t=1.61 which was not statistically significant with 22 degrees of freedom.

The responses to the second multiple choice question gave information regarding class sizes. 15 of the 48 limited knowledge teachers (31%) reported that their classes had 18 or fewer students. The other 33 (69%) had classes containing 19 or more students. The mean use score for the limited knowledge teachers with 18 or fewer students was 18.94 with a standard deviation of 6.91. The mean use score for teachers with 19 or more students was 19.38 and the standard deviation was 5.31 (Table 10). An independent t test gave a result of t=0.79. Once again, this result is not statistically significant with 14 degrees of

Table 10



freedom.

Table 11 shows a summary of the correlation coefficients for each of the five variables when compared to amount of computer use. As can

Table 11
Summary of Pearson Correlation Coefficients

Variable	Correlation with use
anxiety	.333*
professional	.203
support	.024
personal	.097
set-up/resources	.105

* Significant at .02

be seen in the table, the first part of this hypothesis was correct. Anxiety did show the strongest correlation with use among the limited knowledge teachers. However, the second part of this hypothesis was incorrect, school support, not personal attitudes as we had hypothesized, had the weakest correlation with classroom computer use.

Hypothesis 2: Had it not been controlled, computer knowledge would have been the strongest correlating variable to computer use.

To test this final hypothesis, the degree of correlation between knowledge and use for all 74 teachers surveyed had to be determined. Before reporting these findings, a few notes of comparison on the differences between the use scores for all the teachers and just the limited knowledge teachers. The mean use score for all teachers was 21.24 with a standard deviation of 6.62, while the mean for the limited knowledge was 19.23 and the standard deviation was 5.82. Clearly the 26 non-limited knowledge teachers boosted this mean. To see if, in fact, there was a strong correlation between knowledge and use, a Pearson coefficient was determined. This was r=.471. This correlation coefficient is significant at a confidence level of .001. Furthermore, it is a stronger correlation than any other found, proving this hypothesis correct.

To summarize the analysis of results our first hypothesis that we would be able to identify certain teachers as possessing limited computer knowledge proved to be correct. Our second hypothesis,

anxiety would have the strongest correlation and personal attitudes would have the weakest correlation with computer use was only partially correct. Anxiety did have the strongest correlation, but school support and not personal attitudes was the weakest. Finally, our third hypothesis was true; had knowledge not been controlled, it would have shown the strongest correlation with computer use of all variables identified.

SUMMARY AND CONCLUSIONS

The purpose of this study was to identify teachers with limited computer knowledge and offer some insight into what variables lead them to incorporate technology into their instruction to the extent that they do. To reach this goal, we surveyed 74 elementary school teachers about their feelings toward, and knowledge and use of the computers in their schools. From our review of relevant literature we identified six variables that have been shown to influence computer use among teachers. These were knowledge, anxiety, professional attitudes, school support, personal attitudes, and set-up/resources. We developed two hypotheses. First, after identifying certain teachers as having limited computer knowledge, anxiety would have the strongest and personal attitudes would have the weakest correlation with computer use of the five identified variables. Second, had we not controlled for knowledge, it would have had a stronger correlation with use than any of the of the variables.

Since most of the results stem from our definition of limited knowledge teachers, it is logical to begin the discussion at that point. There is no question that the choice of a cut off score for determining limited knowledge was somewhat arbitrary. However, we neither encountered nor were able to devise a set formula to aid us with this decision. It may be argued that a teacher who scored a 28 on the

knowledge section of the survey is not really a limited knowledge computer user, and in many areas of the country this might be the case.

We believe the fact that this survey was conducted entirely within a relatively small radius of a large university which offers technical support both in terms of personnel and hardware to local schools is crucial. In terms of computer technology, this survey was not conducted in an area which contains an accurate representation of the average American school. Therefore, the limited knowledge teacher in this area may not be the same as elsewhere. This does not detract from the degree of arbitrariness, but we believe it does justify the level at which the standard was placed.

Focusing now on the first hypothesis, the strength of the correlation analyses, there were surprising and interesting findings. One of the surprising findings was that four of the five variables; personal attitudes, professional attitudes, school set-up/ resources, and school support, showed very weak correlations to computer use. We believe there are two important reasons for this.

First, the sample we used was relatively small and homogeneous. Since a large majority of the teachers taught at one of four schools, the philosophies of these schools may have dominated the results. In fact, three of these schools have shown a strong commitment to increasing technology use. If our sample had included a larger percentage of teachers from other schools, these four would have not had such a

strong impact on the results.

A second, and very positive, reason for the low correlations was the general strength of support, resources and attitudes. For example, the mean score on the question "When I have asked the technology coordinator at my school a question, (s)he has been helpful" was 4.42 and all the schools from which we received responses had a technology coordinator. Furthermore, all but four of the limited knowledge teachers had computers in their classrooms and these four had access to a computer lab. In the schools sampled, the days of no access to the technology are in the past. Finally, the scores on the questions "I think quality instruction using technology will only enhance my teaching." and "I wish I could find a way to have my students use computers more than they do now" were both between 4 and 4.15. Clearly there is a strong desire among these teachers to increase use of computers as a teaching tool. As was stated earlier, this is in large part due to the support and the resources of the university.

After analyzing these results, it is not entirely surprising that we were incorrect in part of our first hypothesis. Of all the variables we predicted that personal attitudes would have the weakest correlation with use. However, our analysis showed that school support earned this distinction. One reason for this was that of all the variables that had correlations which were not statistically significant, personal attitudes was the one that showed the least positive results. For example the

mean score for the question "I think computers are dehumanizing" was 2.23. This is not extremely disappointing, but it is only between "disagree" and "neutral". Furthermore, the mean score for the question "I think students are more motivated when they can learn using computer technology" was only 3.85. This was not as strong as many of the responses on the set-up, support, and professional attitudes questions.

The results on the two multiple choice set-up/ resources questions also offered surprisingly insignificant results. For the answers to the first of these two questions, we divided the respondents into two groups, those with Macintoshes in their classrooms and those without Macintoshes in their classroom. We chose this division because of our observations when we were in the elementary schools. Of the four schools that were highly represented, two had a majority of equipment purchases within the previous two years while the other two had a majority of older equipment. Both the schools with the newer equipment had chosen Macintoshes, while neither of the two schools with the older computers had a majority of Macs. When questioned as to why they had chosen to introduce Macs as the new computers, the principals explained that they believed that Macintoshes were most compatible to classroom use.

With this in mind, we decided to investigate whether the limited knowledge teachers surveyed who had Macs were more likely to use the computers in their classrooms than those without a Mac. There was

a slight difference, about 2.5 points, in the mean use scores of the two groups. However, it was not statistically significant. The teachers with the Macs used their computers more, but not very much more. This was a result we had not expected. We had received comments from the teachers with the new computers about how they felt better able to incorporate computers into their teaching now that they had this new equipment. Whereas this might be the case, it did not translate into a significant difference over the other group of teachers.

The answers to the second multiple choice question were also divided into two groups, classes with 18 or fewer students and classes with 19 or greater students. The reason for this placement of the break was twofold. First, we felt this was the most appropriate under the circumstances. Due to the wording of the question, our realistic options were either to place the division at 18 or 22 students. We chose 18 because we wanted to focus on whether or not a small class size helps limited knowledge teachers integrate computer technology. Since 22 of the 48 limited knowledge teachers, 46%, placed their class in the 19 to 22 student range, we hypothesized that this was the range of the average size classroom for the teachers surveyed. Therefore, to see if a small class size helped these teachers integrate computers, we placed the division in between choices b and c, 18 or less and 19 or greater students. Looking back on our selection of possible responses for this question, we might have been better served if, instead of having choices

end at 14, 18, 22 and 26, we had divided it such that one choice would have ended at 20. A break at 20 would most likely have given us more information about the 46% of teachers who had between 19 and 22 students. The second reason was a division placed there gave us two groups with the most even numbers.

The results for this question were completely unexpected. Not only did the teachers with smaller classes not use the computer significantly more than those teachers with larger classes, they used it less. By a slim margin, a difference in means of just below .5, the teachers with the larger classes used their computers more often. We believe that the results of this as well as the other multiple choice question fit with our findings on the Likert-type set-up/resources questions. With the limited knowledge teachers surveyed, it was not an important variable in determining computer use.

One of the only expected results was the statistically significant correlation between anxiety and use. With an r score of .333, anxiety proved to be the only variable tested that had a significant correlation with computer use. The teachers who felt some combination of being uncomfortable using computers at school, tense when computer were discussed, intimidated by high-knowledge computer users and worried that the technology may eventually take away part of their job, were less willing and/or able to use the computers at their disposal than teachers who did not share these feelings.

More than anything else, a lack of computer anxiety proved to be the strongest predictor of computer use among limited knowledge teachers. However, it is extremely important to point out that correlation does not mean causality. Just because a lack of anxiety had a statistically significant correlation with computer use, it does not necessarily follow that a lack of anxiety causes an increase in computer use. There are a myriad of other uncontrolled variables that could have influenced these results.

Finally, in the second hypothesis we stated that had we not controlled for knowledge, it would have had the strongest correlation with computer use. Our analysis of knowledge scores for all respondents demonstrated that this was the case. Table 12 shows the distribution of knowledge versus use scores for all respondents on an X-Y scatter plot and Table 13 shows the distribution of anxiety versus use scores for limited knowledge respondents on an X-Y scatter plot. A cursory glance at these two scatter plots clearly shows the relative strength of knowledge in determining use. While anxiety was the strongest correlator to use for limited knowledge teachers, it was not nearly as direct as the correlation of knowledge to use for all teachers. With a sample size of 74 , the correlation coefficient of r=.471 was significant to a confidence level of .001. This r is almost .15 larger than the correlation for anxiety and it is even more powerful due to the larger sample size.

Table 12

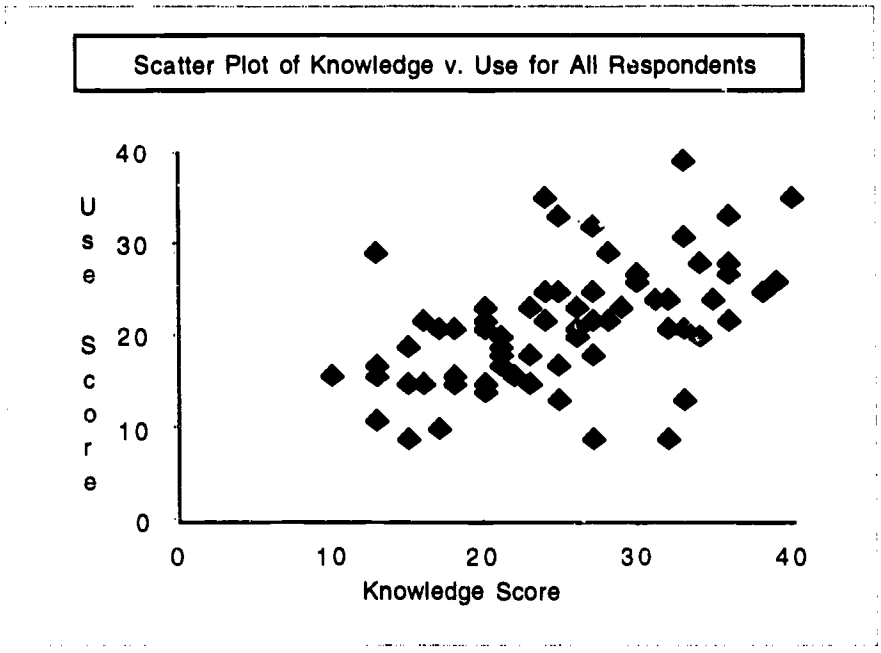
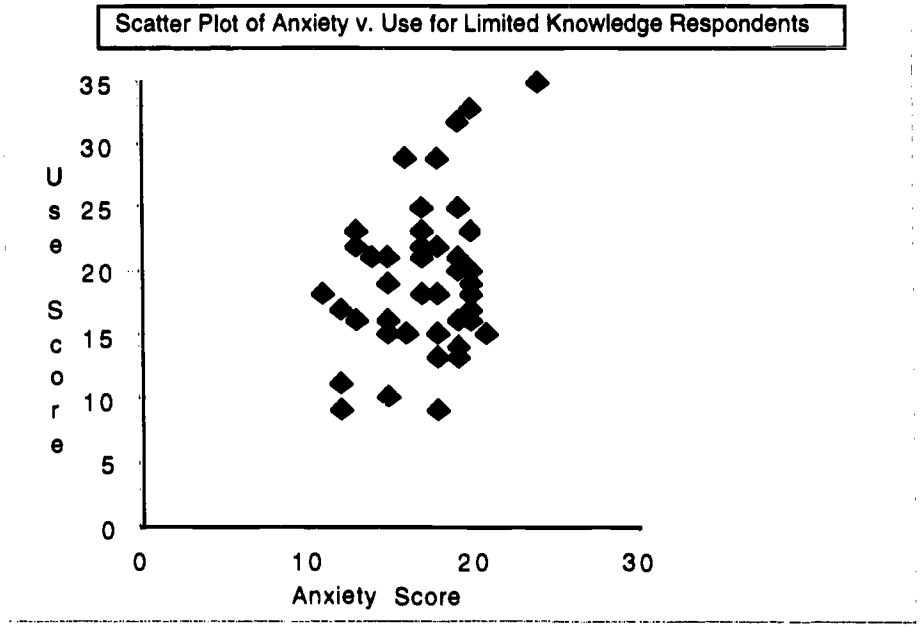


Table 13



This study was not without limitations that need to be discussed. First, some of the questions were written such that there was unintended room for interpretation. For example, question 3-7 asked "in the past 4 years, the number of formal hours of computer training I have had is (total hours not credit hours)" a number of respondents underlined the term "formal hours" and put a question mark next to it. A choice of a different term or more explanation might have cleared up their confusion about this term. Furthermore, question 3-1 asked the respondents to identify the number of computers in their classroom and whether or not they had access to a computer lab. The definition of a computer lab was confusing to some respondents. This point is made clear by the fact that of teachers from the same school with access to the same equipment some responded they had a lab while others did not. A clearer definition of what constitutes a lab would have helped in this example. When questions are intended to be answered with facts, leaving room for the respondent to interpret what the question is asking is not advisable.

A second limitation of our study was the number of variables for which we did not account. More demographic data about each respondent, such as their age, grade they taught and their access to computers outside of school are three examples of variables that might have had an impact on the computers use of limited knowledge teachers.

A final important limitation of this study was the narrow range from which the sample originated. As was stated earlier, in terms of access to

and support for computer technology, the sample population is not typical. Furthermore, a large majority of teachers (92%) taught at one of four schools which may have skewed the results toward unaccounted for variables that are unique to one or more of these schools.

Clearly, future research in the area of computer use by limited knowledge teachers is necessary. One aspect that this research should include is a wider range of schools from a more diverse area. Clearly, generalizations made about the results of a survey encompassing a larger and more heterogeneous sample would be useful.

The fact that anxiety had the largest impact on determining the computer use of the limited knowledge teachers in this survey has its own implications. Future research needs to be conducted on ways to decrease computer anxiety among the limited knowledge population. More than offering better support, putting more money into resources and trying to change personal and professional attitudes, the results of this study point out that lowering computer anxiety must be a priority. Teachers who are afraid of touching the computer for fear they will break it are not likely to make progress until this fear is overcome.

A final area which we did not examine is a comparison between how limited knowledge teachers and non-limited knowledge teachers use the technology available to them. As the software available increases and improves, just using computers in the classroom is becoming less important and the way it is being used is becoming more

important. Application programs that are no more than computerized worksheets offer fewer opportunities for students to partake in higher level thinking than do learner based tools that require the student to create. Future researchers may want to investigate the ways limited knowledge teachers incorporate computers. Beyond just increasing use, increasing creative use may also be an issue.

Hints

Since we have found that teachers' anxiety is the most important variable affecting the degree to which limited knowledge teachers integrate computers into their instruction, we would like to provide those teachers with high anxiety with some useful ways to use the computer that are easy to do. To begin, there are some tips regarding computers in general that can be a starting point for the limited knowledge teacher.

The best way to begin using the computer is to practice, and explore what different keys and programs can do. It is hard to "break the computer." Pushing the wrong button will do nothing to harm the computer. Computers have made great advances in recent years, and are very hard to break. Another good way to begin using the computer is to ask questions of knowledgeable staff at school. Often, it only takes a few questions to get one started in the right direction.

Once the decision is made to sit down at the computer for some practice, a teacher who has limited knowledge should remember to start

small. Just feeling competent in one area on the computer is a good start. A good way to begin would be to focus on one curriculum area and explore different ways to integrate the computer into instruction for that area. After one feels comfortable with that area, then it is time to move on to another area, and practice more. Teachers must remember that the computer is a great motivational tool for most students and it would be a shame to have computers available and then not use them.

With basic word processing and graphics software, teachers with limited computer knowledge and their students can successfully utilize computers. We hope these simple activities will decrease some of the anxiety that hinders teachers from using computers.

Teacher Applications

The most basic use of the computer for a teacher is the word processing program. Teachers can begin by writing letters to parents on the computer. Teachers can also use word processing programs to create schedules and report cards, or create their own worksheets and tests. Graphics programs can be used to create banners for the classroom, decorative certificates for students, or calendars. Spreadsheet software allows a teacher to organize information about his/her students in a way that is meaningful for different purposes.

Student Applications

Just as there are teacher applications for computers that do not require a lot of knowledge on the part of teachers, there are also many

student applications that do not inolve a great amount of computer knowledge on the part of the teacher. Following are some of these activities.

Word Processing

Word processing programs can be a wonderful tool for integrating computers into language arts instruction. Whether there is only one computer in the classroom, or a lab full of computers, teachers can have their student authors type their stories on the computer. If there is only one computer. time needs to be scheduled for each child to use the computer, or for pairs or groups of students to write a story together. If time is a problem, students could dictate to a an instructional aide or a parent volunteer. With a lab, obviously, students can each work on their own story. If students are able to do their drafts on the computer (probably only possible in a lab situation), revision seems much less threatening and will be a lot less work, since the whole piece will not have to be rewritten.

Students could create their own picture books by deciding how much text to put on each page, and then illustrate their stories after they are printed. An attractive cover and title page can also be created with a basic word processing program. Students should be encouraged to make use of the spell checkers in most word processing programs.

Another word processing activity, and one that works particularly well in a classroom with only one computer, is to write mystery pen pal

letters. Each student should be given a mystery pen pal (this can be done by pulling names out of a hat). Then each child should have a time scheduled when (s)he can write a personal message to the mystery pen pal. The message should be saved on the computer's hard drive using the pen pal's name as the file name. After all the messages have been written, each student should be given a chance to bring up the file under his/her name to read and answer the message. After everyone has read and responded to their own personal message, they should then have a time scheduled when they can write a new message to their mystery pen pal. Each child is actually corresponding with two classmates. To help children come up with ideas for their messages, topics or themes can be designated by the teacher that relate to topics being studied in class. This project can last as long as it holds the students' interest. It can also be done throughout the year with different subgroups of the class working on the project at a time (Platt, 1993).

Desktop Publishing

With desktop publishing software, more creative pieces can be produced than with a plain word processing program. With a desktop publishing program, students can combine art and writing, and can use a non-traditional format. For example, newsletters for a classroom can be created. These can contain columns and artwork done by the students on the computer.

Graphics

Graphics programs further increase the capabilities of the computer. Computer-originated artwork can be created to enhance a story or stand on its own. Many of these programs have pictures or stamps already made from which the students can choose, or the students can draw their own pictures using the tools of the program. Virtually all areas of the curriculum can benefit from a graphics program.

Again, for language arts, picture books can be created using a graphics program, so that students would not illustrate their stories by hand. The graphics program would also be a good tool for making an alphabet book for younger students. With one computer in the classroom, each student could be assigned a letter, and then they could create a picture to correspond with that letter.

For math, students could create stamp books of word problems. Each student could write their own word problem. They would then type that problem on the computer and illustrate it using the various stamps the program offers. Again, all the problems could be put together in a book format for each student to use. Another math activity involves creating geometric robots, in which students have to use various geometric shapes to create a robot. Once students know the shapes they must include on their robot, they can find different ways to use the shapes to create their own individual robot.

Other Programs

Various other programs exist that require a little knowledge to use,

but can be easy once the basics are known. With a database, students can categorize information about almost any subject, from classmates' favorites to state facts. With a spreadsheet program, students can create graphs for any information they have collected, integrating other subjects with math.

Conclusion

The incorporation of technology, specifically computers, into classroom use is one of the most relevant issues facing schools today. The literature suggests that six of the most important variables in determining the degree to which teachers integrate computers into their teaching are knowledge, anxiety, personal attitudes, professional attitudes, school support and school resources/set-up; with knowledge being the most critical. Bearing this in mind, we focused on teachers with limited computer knowledge and sought to determine the relative strength of the correlations of the other five variables with use. Of the five, only anxiety proved to be statistically significant. Two major reasons for this were the general strength of the other four variables and the relative homogeneity of the sample. Furthermore, when all the teachers were examined, the correlation between knowledge and use was significantly greater than it was between anxiety and use for the limited knowledge teachers.

Since anxiety was found to be the strongest correlating variable for limited knowledge teachers, future research should concentrate on

methods to decrease computer anxiety for this population. Another possible direction for future research is the examination of the ways in which limited knowledge teachers use the available technology in comparison to non-limited knowledge teachers.

Appendix A

FOR ALL QUESTIONS CIRCLE THE MOST APPROPRIATE ANSWER

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

Attitudes

1.	I like to teach with computer technology.	1	2	3	4	5
2.	I feel comfortable using the computers in my classroom.	1	2	3	4	5
3.	I feel comfortable using the other computers in my school.	1	2	3	4	5
4.	I think quality instruction using technology will only enhance my teaching.	1	2	3	4	5
5.	I know enough about computers to integrate them into my instruction.	1	2	3	4	5
6.	I enjoy learning about new technologies.	1	2	3	4	5
7.	I see myself as one of the more knowledgeable computer users in my school.	1	2	3	4	5
8.	Other school personnel see me as one of the more knowledgeable computer users in my school.	1	2	3	4	5
9.	I feel comfortable sharing my knowledge about computers with other faculty.	1	2	3	4	5
10.	I feel comfortable sharing my knowledge about computers with my students.	1	2	3	4	5

	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
11.	I wish I could find a way to have my students use computers more than they do now.	1	2	3	4	5
12.	I feel tense when people start talking about computers.	1	2	3	4	5
13.	I enjoy reading about new computer software and hardware.	1	2	3	4	5
14.	I rely on others to inform me about new software.	1	2	3	4	5
15.	I feel intimidated by people who know something about computers.	1	2	3	4	5
16.	I think computers are dehumanizing.	1	2	3	4	5
17.	I fear that computers may take over some parts of a job I enjoy.	1	2	3	4	5
18.	I think students are more motivated when they can learn using computer technology.	1	2	3	4	5
19.	I think instruction by computer technology is just another fad.	1	2	3	4	5
20.	I think that using computer technology for instruction will help improve students' performance.	1	2	3	4	5
21.	When utilizing computers the teacher becomes guide/facilitator.	1	2	3	4	5
22.	When utilizing computers, the teacher's role becomes more complex.	1	2	3	4	5

	1 Strongly Disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly Agree
23. When utilizing computers, the teacher is able to further individualize instruction.	1	2	3	4	5
24. When utilizing computers, the teacher's role is diminished.	1	2	3	4	5
25. The number of students in my class affects my ability to integrate computers in the curriculum.	1	2	3	4	5
26. I am the technology coordinator at my school.	1	2	3	4	5
27. I know which faculty member is the technology coordinator at my school.	1	2	3	4	5
28. When I have a question about computers I feel comfortable asking my school's technology coordinator.	1	2	3	4	5
29. When I have asked my school's technology coordinator a question, (s)he has been helpful (Please leave question blank if this does not apply to you).	1	2	3	4	5
30. I feel that all teachers have relatively similar access to computers in my school.	1	2	3	4	5
31. In terms of instructional technology, I feel that my school is relatively well-equipped in relation to others in the area.	1	2	3	4	5
32. The computer equipment at my school is outdated.	1	2	3	4	5

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

33.	I have taken courses in instructional technology.	1	2	3	4	5
34.	I have attended in-services that focus on instructional technology.	1	2	3	4	5
35.	My school has helpful in-services for integrating computers into the curriculum.	1	2	3	4	5
36.	The principal at my school makes good use of the computer(s) at his/her disposal.	1	2	3	4	5

1	2	3	4	5
Never	**Infrequently (1 or 2 times a year)**	**Sometimes (2 or 3 times a semester)**	**Often (Usually when I have access to technology)**	**Always (Whenever I have access to technology)**

Computer Use

I integrate computers into my:

1.	reading instruction	1	2	3	4	5
2.	writing instruction	1	2	3	4	5
3.	science/health instruction	1	2	3	4	5
4.	math instruction	1	2	3	4	5
5.	social studies instruction	1	2	3	4	5
6.	art instruction	1	2	3	4	5
7.	music instruction	1	2	3	4	5
8.	curriculum **development** (determining and developing the materials I use)	1	2	3	4	5

1 Never	2 Infrequently (1 or 2 times a year)	3 Sometimes (2 or 3 times a semester)	4 Often (Usually when I have access to technology)	5 Always (Whenever I have access to technology)

I utilize the following programs for classroom use:

Macintosh:

1.	ClarisWorks	1	2	3	4	5
2.	Microsoft Word	1	2	3	4	5
3.	The Writing Center	1	2	3	4	5
4.	Other word processing/publishing program	1	2	3	4	5
5.	HyperCard	1	2	3	4	5
6.	KidPix	1	2	3	4	5
7.	KidWorks	1	2	3	4	5
8.	SuperPaint	1	2	3	4	5
9.	Other drawing/painting program	1	2	3	4	5
10.	MicroWorlds	1	2	3	4	5
11.	LOGO	1	2	3	4	5
12.	Other mathematical applications	1	2	3	4	5
13.	Drill and practice games (Number Munchers etc.)	1	2	3	4	5
14.	Oregon Trail	1	2	3	4	5
15.	Carmen San Diego	1	2	3	4	5
16.	Other simulations	1	2	3	4	5
17.	Keyboarding	1	2	3	4	5

Apple II series:

1.	Drill and practice games (Number Munchers etc.)	1	2	3	4	5
2.	Oregon Trail	1	2	3	4	5
3.	Other simulations	1	2	3	4	5
4.	Word Processing program	1	2	3	4	5
5.	Keyboarding	1	2	3	4	5
6.	Other _____	1	2	3	4	5

1 Never	2 Infrequently (1 or 2 times a year)	3 Sometimes (2 or 3 times a semester)	4 Often (Usually when I have access to technology)	5 Always (Whenever I have access to technology)

IBM:						
1.	WordPerfect	1	2	3	4	5
2.	Microsoft Works	1	2	3	4	5
3.	Other word processing/publishing program	1	2	3	4	5
3.	Toolbook	1	2	3	4	5
4.	MicroWorlds	1	2	3	4	5
5.	Other mathematical applications	1	2	3	4	5
6.	CorelDRAW	1	2	3	4	5
7.	Other drawing/painting program	1	2	3	4	5
8.	Drill and practice games (Number Munchers etc.)	1	2	3	4	5
9.	Oregon Trail	1	2	3	4	5
10.	Carmen San Diego	1	2	3	4	5
11.	Other simulations	1	2	3	4	5
12.	Keyboarding	1	2	3	4	5

School Computer Set-Up

1. Please circle the choice that best describes your situation.
   a. 1 or 2 computers in the classroom and no computer lab.
   b. 1 or 2 computers in the classroom and a computer lab
   c. No computers in the classroom and no computer lab
   d. No computers in the classroom and a computer lab
   e. More than 2 computers in the classroom and no computer lab
   f. More than 2 computers in the classroom and a computer lab

2. In my classroom, I have: (Circle all that apply)
   a. Apple II series
   b. Macintosh
   c. IBM compatible
   d. No computers in my classroom

3. In my school's lab, we have: (Circle all that apply)
   a. Apple II series
   b. Macintosh
   c. IBM compatible
   d. No computer lab

4. In my school's computer lab,
   a. there are enough computers for each student to work on his/her own computer.
   b. students must share computers.
   c. N/A

5. The amount of time the average student in my class spends on a computer per week is:
   a. 0 - 1 hours
   b. 1 - 2 hours
   c. 2 - 3 hours
   d. 3 - 4 hours
   e. more than 4 hours

6. The number of students in my classroom is:
   a. less than 15
   b. 15 - 18
   c. 19 - 22
   d. 23 - 26
   e. more than 26

7. In the past 4 years, the number of formal hours of computer training I have had is (total hours not credit hours):
   a. less than 4
   b. 4 - 7
   c. 8 - 11
   d. 12 - 15
   e. over 15

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