

1997

Teachers' attitudes toward computer technology and factors influencing their attitudes and adoption of computer technology in classroom instruction : a literature review

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Ding, Huiping, "Teachers' attitudes toward computer technology and factors influencing their attitudes and adoption of computer technology in classroom instruction : a literature review" (1997). *Graduate Research Papers*. 530.

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Teachers' attitudes toward computer technology and factors influencing their attitudes and adoption of computer technology in classroom instruction : a literature review

Abstract

With the introduction of computer literacy into curriculum, teachers' attitudes toward computer technology and computer adoption in the classroom teaching remain major concerns for educators. This paper is intended to review the literature on teachers' attitudes toward the use of computer technology as an instructional tool in classroom teaching and factors influencing their attitudes toward their use of computers. Their attitudes differ but are positive about teaching with computers if some barriers are overcome and some problems are solved, such as lack of training and accessibility.

The literature review reveals that teachers have concerns and anxieties concerning computer technology, its effectiveness in learning, the quality and availability of appropriate software, time required for learning computer technology and some other unanticipated problems through using the software in their teaching. Finally, the literature review suggests that sufficient teacher training and professional support are the crucial elements to changing teachers' attitudes toward more positive direction and improving their classroom use of computers to achieve the successful implementation and integration of computer technology into curriculum in education.

Teachers' Attitudes toward Computer Technology and Factors
Influencing Their Attitudes and Adoption of Computer Technology in
Classroom Instruction: A Literature Review

A Research Paper

Submitted to

The Department of Curriculum and Instruction

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts in Education

University of Northern Iowa

By

Huiping Ding

November 1997

This Research Paper by: Huiping Ding

Entitled: Teachers' Attitudes toward Computer Technology and Factors
Influencing Their Attitudes and Adoption of Computer Technology in
Classroom Instruction: a Literature Review

has been approved as meeting the research requirement for the Degree of
Master of Arts in Education.

12-9-97

Date Approved

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5th December 1997

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ABSTRACT

With the introduction of computer literacy into curriculum, teachers' attitudes toward computer technology and computer adoption in the classroom teaching remain major concerns for educators. This paper is intended to review the literature on teachers' attitudes toward the use of computer technology as an instructional tool in classroom teaching and factors influencing their attitudes toward their use of computers. Their attitudes differ but are positive about teaching with computers if some barriers are overcome and some problems are solved, such as lack of training and accessibility. The literature review reveals that teachers have concerns and anxieties concerning computer technology, its effectiveness in learning, the quality and availability of appropriate software, time required for learning computer technology and some other unanticipated problems through using the software in their teaching. Finally, the literature review suggests that sufficient teacher training and professional support are the crucial elements to changing teachers' attitudes toward more positive direction and improving their classroom use of computers to achieve the successful implementation and integration of computer technology into curriculum in education.

Table of Content

Chapter	Page
I	Introduction. 3
	Statement of the Problem. 5
	Significance of the Review. 7
	Definition of Terms. 8
II	Methods and Procedures. 10
	Description of Methods. 10
	Description of Procedures. 14
III	Review of the Literature. 16
	Attitudes toward Computers. 16
	Perceived Effectiveness of Computers. 18
	Amount and Type of Computer Use. 20
	Factors Influencing Their Attitudes and Use of Computers. 22
IV	Discussion and Implications. 37
	References. 40

Chapter I

Introduction

American society is experiencing a technological revolution as computers become an important part of everyday life. This revolution is changing the way people communicate with each other, the way they possess and access information and even the way they entertain their lives (Manarino & Cotton, 1985). Sanders (cited in Besser, 1994) said: "America's future is in high technology" (paragraph 79). Many parents themselves, touched by the computerization of the workplace, feared that their children might lag behind in college and job competition. Television commercials showed teachers suggesting to anxious parents the purchase of a home computer that would help their child do homework. Parents urged school boards to buy classroom computers (Fiske, cited in Cuban, 1986). As Villegas (cited in Besser, 1994) remarked parents wanted to do what's best for their children. Their responsibilities began and ended with buying a computer for the child. Villegas has pointed to advertisement images as that of the father holding a one-year old who touches the keyboard over a caption reading "1st step towards Rhodes Scholarship" (paragraph 101). Confronted with pressures from the general public, parents in particular, schools are trying their best to purchase computers for their schools. As a matter of fact, educators have used computers and other information technologies as tools

to enhance students' learning in American elementary and secondary schools for more than three decades. In 1975, the first microcomputer was developed. The mass production of personal computers in the late 1970s (and particularly the introduction of the IBM PC in 1981) shifted these machines from hobbyist tools to tools of business (Besser, 1994). With the development and increased availability of those low cost personal computers, the use of computer technology has broadened both at home and in schools. According to Mehlinger (1996), computer technology appeals to students, and may enhance learning and schools can offer no reasonable defense for rejecting it. Currently, outside of the schools, students are surrounded by technology. Their daily lives deal with complex video games, whether it be Nintendo or on computers, compact discs, and video cassette players.

In January 1991, the Electronic Industries Association(EIA) estimated that twenty-eight percent of US households owned a personal computer (Dupagne & Krendl, 1992). The number of computers in K-12 schools rapidly increased in the early 1980s. Between 1981 and 1983, the number of elementary schools using computers increased from eleven percent to sixty-two percent and the number of high schools using computers increased from forty-nine percent to eighty-six percent (Hanson, cited in Besser, 1994). From 1991 to 1992, the ratio improved on an average of 18.9 pupils per computer (Market Data Retrieval, 1992). By spring 1995, schools in the United States were estimated to have 5.8 million computers, or about one computer for

every nine students (OTA Report, 1995). However, despite technologies available in schools, a substantial number of teachers reported they do not use computers and other technologies regularly for instruction (OTA Report, 1995). In their survey of computer use, Sheingold and Hadley (1990) found that only one teacher per school had integrated computers into their classroom teaching even though the number of computers available in the schools surveyed was more than double the average number of computers available for schools in the United States.

The underutilization of computers in schools and educators' expectations of its usage formed a sharp discrepancy. There are many factors contributing to the under use of computers in school settings. One of the reasons for such low usage may be that the decision of using computer technology in teaching was the top-down (Cuban, 1986) and that the push for computers didn't come from within the schools but from upper-middle-class parents convinced that computers were destined to play a very important role in the workplace (Tuckers, cited in Winnans & Brown, 1992). However, often teachers lacked the experience and expertise needed for using computer technology in their instruction (Winnans & Brown, 1992).

Statement of the Problem

The research shows that although teachers have concerns, anxieties and fears about computer technology, and its effectiveness in classroom teaching, their attitudes in general is positive and their interests are high

(Euchner, cited in Cuban, 1986). As Education of the States summary indicates that the advocacy of computer use in these studies is "fairly widespread" but "uncertainty remained about how computers are best used in the curriculum" (Education Commission of the States, cited in Besser, 1994, paragraph 69). Most teachers are positive about the effectiveness of computer technology and its integration into the classroom teaching. To them, computers can serve as instructional tools to enhance and motivate students in their learning. Some other teachers are uncertain about whether computer technology really works as the public have assumed it does. They are reluctant in using it before its effectiveness is demonstrated. Many teachers exhibit a high level of anxiety when faced with the prospect of using computers, often higher than that experienced by student novices (Cambre & Cook, cited in Woodrow, 1989). Stevens (cited in Dupagne & Krendl, 1992) surveyed 657 K-12 teachers and reported that they were supportive of computer literacy instruction in secondary schools. However, ninety percent of them responded that they didn't consider themselves qualified to teach computer literacy classes, and furthermore, nearly forty percent of teachers felt anxious not only when they were around computers but also when others were talking about computers. The problem is that even those teachers who have positive attitudes toward computer technology don't necessarily use computers available in their instruction, let alone those who are not sure about whether computer technology really works as the general public

expects. Therefore, it is of significance to investigate what teachers think about computer technology, what factors influence their attitudes toward computer technology, and, most of all, why they haven't used computers regularly in their teaching and how to direct their attitudes in a positive direction to help them overcome their anxieties about computers and achieve the fullest potential of computer technology and show its effectiveness in education.

Significance of the Review

This paper is intended as a general review of the literature from 1980s to the present about teachers' attitudes towards computer technology and factors influencing their attitudes toward its adoption in the classroom teaching. Through the review, it is possible to identify the problem related to the issue and possible ways to solve the problem. The paper consists of four chapters. The first chapter is the introduction, providing some background information and the problem concerned. The second chapter is to review the methods and the procedures that the researchers have commonly used to study teachers' attitudes toward computer technology. The third chapter is to review the related literature for the purpose of finding out the factors that influence their attitudes and adoption of computer technology in their classroom teaching. Particularly, this chapter will reveal teachers' different perceptions of computers in teaching, their concerns, and anxieties. The fourth section discusses the results after reviewing the related literature, and

offers implications or ways to changing teachers' attitudes to more positive direction and improve their use of computer technology in their teaching to integrate computer technology successfully into the curriculum.

Definition of Terms

1. Computer---an electronic device that accepts and processes information mathematically according to previous instructions, provides the results of this processing via visual displays, printed summaries or in audible forms (Newton, cited in Amico, 1995).
2. Computer literacy---an understanding of computer characteristics, capabilities, and applications, as well as an ability to implement this knowledge in the skillful productive use of computer applications suitable to individual roles in society (Simonson, Mauer, Montang, & Whitaker, 1987).
3. Computer anxiety---the fear of using computers as measured by physiological changes or responses on self-report instruments. It is viewed best as a temporary anxiety state, rather than a permanent anxiety trait, as such, it should be susceptible to change (Cambre & Cook, cited in Pina & Harris, 1993).
4. Computer confidence---the confidence in the ability of one to learn about and use computers (Koohang, 1989).
5. Computer liking---enjoyment or liking of computers (Koohang, 1989).
6. Self-efficacy---one's belief in being capable of a certain performance (Marcinkiewicz, 1993-94).

7. Locus of control---the pattern of reinforcements contingent upon certain sets of behaviors. It has been investigated in an effort to understand attitudes toward computers. Those individuals who perceive that computer-related events are contingent upon their own behaviors ("Internals") will have more positive attitudes toward computers than those individuals who feel these events are a result of luck, chance, or some powerful other ("Externals") (Kay, 1989).

Chapter II

Methods and Procedures

Description of Methods

To collect the data on teachers' attitudes toward computer technology and factors influencing their attitudes and adoption of computers in their teaching, most commonly, the researchers have used instruments such as surveys (attitude scales, locus of control), direct observations, and case studies.

Surveys

Surveys that researchers employ usually are questionnaires and interviews. Questionnaire is the most basic form that the researchers use in their study. Sometimes the questions are designed by researchers themselves; sometimes, the questions are based on the items developed by other researchers. Questions usually include the following areas: the knowledge of computer software, the level of computer use, the accessibility and availability of computers, the experience with computers, fears, and anxieties concerning computers.

Metu (1994) conducted a study exploring the wide range of computer attitudes among Nigerian teachers in relation to their computer knowledge and skills. The study used a questionnaire to survey a group of teachers who were undergoing a summer program using a Likert scale model, the subjects

rated their attitudes toward the use of computer technology in education from 1 (strongly agree) to 5 (strongly disagree). Okinaka (1992) employed questionnaire to investigate factors that affect the attitudes of pre-service teachers toward computers.

Sometimes, researchers interview teachers or student teachers to get the information about their attitudes toward computers. Interviews enable researchers to elicit data of much greater depth. The interviews that researchers use are either telephone interviews or face-to-face ones. They may be structured, semi-structured or very informal. Based on the nature of the interviews, sometimes, the information the researchers obtained is a little distorted for the interviewees sometimes don't want to tell the truth. Besides, it is subjective and tends to be biased. However, in general, if carefully conducted, this method is really informative and researchers can get in-depth information. Questions in interviews might be larger scope, and personal as well. Polin (1992) conducted a longitudinal research in a K-8 school, in a suburb east of Los Angeles, California. In this five-year research project, he used both questionnaires and interviews.

Attitude Scales

The most commonly used scales are The Computer Attitude Scale, The Computer The Anxiety Rating Scale and The Computer Self-efficacy Scale. Gressard and Loyd (1985) classified computer attitudes into three main categories, (1) computer anxiety, (2) computer confidence and (3) computer

liking. The t-test was used to computer differences between anxiety. The second t-test procedures used computer confidence as the dependent variable. A third t-test used computer liking as the dependent variable. The Computer Attitude Scale(CAS) appeared to be a convenient, reliable and valid measure of computer attitudes.

In addition to the scales mentioned above, a number of other scales have been recently used to measure computer attitudes. The Computer Attitude, Literacy and Interest Profile (CALIP) was developed by Poplin, Drew and Gable (cited in Amico, 1995). Murphy, Coover and Owen (cited in Amico, 1995) created a 32-item self-reporting Computer Self-Efficacy Scale (CSE), to measure perceptions of subjects' capabilities regarding specific computer related knowledge and skills. Heinssen et al (cited in Amico, 1995) developed a 19 item, self-reporting Computer Anxiety Rating Scale (CARS) to evaluate computer anxiety. The other two are Attitudes Toward Computer Technology (ACT), with 19 items in it, assesses perceived usefulness and comfort/anxiety with computer technologies and Self-efficacy for Computer Technologies (SCT), with 25 items in it, assesses perceived self-efficacy for computer technologies (Kinzie & Delcourt, 1991). These two instruments were designed for use with teachers and teacher education students.

Locus of Control

Locus of control has been employed by many researchers to evaluate teachers' attitude toward computers. Coovert and Goldstein (cited in Kay,

1989) suggested that perceived locus of control is one of the best predictors of a person's attitude toward computer use. They, through using locus of control measure, noted that internals had more positive attitudes than externals toward computers. Griswold (1985) reported that gender was not a significant predictor of computer attitudes combined with age, locus of control and mathematical ability. Arndt and others (cited in Kay, 1989), employing Nowicki and Duck's (1974) general locus battery, reported that internals were more accepting of computer technology. Kerber (cited in Kay, 1989) found no relation between locus of control and attitudes. Kay (1989) employed the locus of control battery consisted of questions that focused exclusively on the use of computers. The measure consisted of 14 questions. A high score on this scale indicated a more internal locus of control with respect to computers. Marcinkiewicz (1994-1995) also employed locus of control in his studies.

Direct Observations

In some studies, researchers use a combination of methods including questionnaires, structured or non-structured interviews, observations and case studies. When researchers use direct observation method, they go directly to the schools or the classrooms watching how teachers are teaching and what they employ in order to complete their teaching assignment. They either take notes or video-tape the activities that teachers are doing in class instruction. Then they analyze the behaviors they have observed. Polin is one of them. When Polin (1992) conducted the longitudinal research, within the

period of five years, he employed all the aforementioned methods. Novak and Knowles (1991) also employed classroom observations in their study of beginning elementary teachers' instructional computer use with emphasis on the ways in which those teachers use the computers and influences on these uses.

Case Study

Davidson and Ritchie (1994) used the case study method in Highland Park Elementary School, Texas to investigate how attitudes of parents, teachers and students toward computers affect the integration and use of computer technology in schools.

Description of Procedures

As to the questionnaires, attitudes scales and locus of control with questions, sometimes, the researchers either asked administrator volunteers to distribute the survey to the subjects or they did it in person; sometimes, they mailed survey questions with the return address on it to the subjects. Usually there was a notification that the participation was completely voluntary, their names would remain anonymous, and it was only for the purpose of obtaining information, however, their response would be greatly appreciated and helpful to the study. Usually, participants of the studies were asked to complete questionnaires, the attitudes scales and respond to the interview questions so as to assess teachers' responses to computer technology in classroom teaching, the amount of computer use, factors influencing their

attitudes toward and use of computers in their instruction. In direct observations and case studies, researchers would collect data based on the behaviors recorded, notes taken, and even the subjects' daily or weekly log.

The sample size of studies varies greatly from 2 to more than 1, 000.

In short, from 1980s to the present, researchers have used various methods through different procedures to study teachers' attitudes toward computer technology, teachers' use of computer technology and factors influencing their attitudes and use of computers in their classroom teaching.

Chapter III

Review of the Literature

Attitudes toward Computers

Teachers are the foundation of our educational institutions. They shape the instruction and activities in the classroom and they are role models for our students. Instructional technology won't reach its full potential without their support (Aust, Allen & Bichelmeyer, 1989). In other words, effective use of computers ultimately depends on the knowledge and skills of the teacher, the person with the greatest impact on the classroom environment. Therefore, teachers' perceptions of computers and their attitudes toward computer technology and the effectiveness of integrating it into classroom teaching are of great significance. Many studies have been conducted to examine their attitudes toward computers since 1980s. In general, study findings revealed that most educators are excited about applying computer technology into the classroom (Aust, Allen & Bichelmeyer, 1989) and have positive attitudes toward the computer as a classroom tool and toward the logistics of classroom use of computers (Hannaford, 1988; Olson, 1988). Unquenched enthusiasm for computers in schools continues. Substantial numbers of teachers promoted computers, and networks of computer buffs sprang up across the country (Cuban, 1986). Some

teachers view computer use as a valuable tool for instruction (Dupagne & Krendl, 1992).

According to the findings of the national survey of classroom teachers' attitude toward computer technology released by IBM (How Teachers Grade Computers, 1989), among the 1,100 randomly selected teachers, ninety-one percent felt that computers could be an effective tool for helping students develop basic reading and writing skills. Eighty-seven percent favored the increased use of computers for instruction. The findings of some of studies show that social studies teachers have a positive attitude toward computers. They have wide access to computers. Large number of teachers do use computers in their work. Social studies teachers not only need but desire training in effective classroom techniques and knowledge of software (Northrup, 1990). However a number of studies also examined teachers' anxieties about computers (Koohang, 1987). Some teachers consider computers as a threat to their role as educators (Dupagne & Krendl, 1992).

Today, teachers from kindergarten through high school and college are likely to find themselves face-to-face with students who know more than they do about computers. This can be disconcerting, even threatening for those teachers who believe they must be the highest authority in the classroom (Pack, 1994). Some teachers are resistant to change (Mertens, 1986; Roberts, 1994). And some other teachers have admitted that computer technology was among the most intimidating though they testified the

introduction of computer technology into their classrooms was among the most exciting developments in their careers (Regional Forums, 1995).

Perceived Effectiveness of Computer Technology

Since 1980s, researchers have produced several reviews of the literature, primarily meta-analysis of empirical research on the effectiveness of computer applications in schools. These studies differed from one another in their focus on different time periods, educational levels and computer applications. The results indicated, however, that students who received help from computers generally learned more in classes, remembered longer, and spent less time instructional time learning their lessons (Kulik, cited in Khalili & Shashaani, 1994).

School computers offer students with different abilities differently. By far, the most frequently reported effect on lower-ability students is improved motivation, self-confidence and self-discipline. In addition, teachers also reported that computers help higher-ability students primarily with higher-order thinking skills, program skills, writing, science projects, out of school activities, career preparation, real-world experience and other activities, in other words, high-ability academic directions (Becker, 1987).

Special education teachers and regular teachers had perceived differently about the effectiveness of computer use. Special education teachers reported that miscellaneous computer instruction had its greatest impact on low achievers while regular teachers perceived that the computer technology

had a similar impact on all students or on high achievers in particular. Thus, it seems that the differential experiences of special and regular education teachers have a significant impact on the manner in which they view effective computer technology utilization (Cosden, 1988).

While using computers in their teaching, teachers had academic, rather than social or motivational goals for computer use, but felt that computers' positive effects were in the motivational not academic realm (Cosden, 1988). Similar findings appeared in 1989 national survey of classroom teachers' attitudes toward computers: eighty-seven percent felt that classroom computers could stimulate greater interest in math and science. Becker's (cited in Cosden, 1988) national teacher survey found high levels of computer assisted instruction (drill and practice and tutorial) were in use particularly at the elementary level, but needed few of the positive cognitive outcomes (improvement in academic learning). Instead, teachers felt that the primary impact of computer instruction was increasing student motivation, enthusiasm, or "opportunities to learn". However, according to Liao (1992), the results of the meta-analysis in his study indicated that CAI (Computer Assisted Instruction) has moderately positive effects on student cognitive outcome. The results from his study suggest that outcomes of using CAI extend beyond the content of specific software being used and subject being taught. Students are able to acquire some cognitive skills, such as reasoning

skills, logical thinking and planning skills and general problem solving skills through CAI.

Moreover, the National Survey of Classroom teachers (How Teachers Grade Computers, 1989) shows that seventy-five percent of teachers felt using computers allowed them to spend more one-on-one time with students. Seventy-four percent felt that using computers in the classroom allowed them to be more creative in their instruction. Eighty-two percent felt that increasing students' time-on-task was one advantage of using computers in the classroom. Paula, a computer teacher commented that it's usually the students that didn't succeed in a variety of other classes who were successful in computer-assisted instruction. Some teachers remarked that even the one computer they have had in their classrooms for the past year has made a big difference. The computer touched students in a unique way and sparked enthusiasm for learning and were changing the way they were teaching, because of the kinds of things they were able to do with computers in their classrooms (Regional Forums, 1995).

Amount and Type of Computer Use

Up to the present, several studies have reported the amount and type of computer use in schools.

According to Becker (1987), in schools available with computers, one-fourth of the teachers use computers regularly with students. A much larger proportion of elementary school teachers do so (thirty-seven percent in the K-

6 schools) than do secondary school teachers (fifteen percent). The study of Winnans and Brown (1992) reported that even though computers were available at school, eighty-one percent of all respondents reported using a computer at school less than 2 hours per week. Of the twenty-six percent who owned a computer at home, seventy-two percent reported that they used it less than 2 hours per week. It appeared that teachers aren't using computers to a great extent.

Elementary school teachers use drill software in skill subjects, and the use of LOGO and programs for writing is reportedly growing. Lambrecht (1986) collected data from Minnesota secondary and post-secondary business teachers. The business microcomputer applications currently taught most frequently were word-processing, accounting, basic programming, spreadsheet use and database applications. Computers were infrequently used to teach content. Teachers infrequently used computers as a teaching management tool. Generally, math and science teachers use machines for classroom instruction more often than English, social studies and foreign language teachers (Cuban, 1986). There was very little use of computers in areas other than reading and mathematics. Computers were generally used in special classrooms and resource rooms, rather than being integrated into regular classroom activities (Bcerkholder, 1985).

Findings reveal a higher level of computer use in secondary social studies instruction than previously reported (Ross, 1988). Becker (1987) found

that high school teachers who use computers are much more computer knowledgeable than their elementary school counterparts.

In 1983, it was found that schools that had owned computers for 3 or more years were using them more for basic programming and less for drill and practice than schools in the first year of computer ownership (Becker, cited in Sutton, 1991). By the end of 1980s, a trend away from programming in high schools had been reported (Yoder cited in Sutton, 1991), and an emphasis on using the computer as a tool integrated into the curriculum was evident (Becker, cited in Sutton, 1991).

From kindergarten through 8th grade, computers are used primarily for enrichment. They also play a remediation role from 1 through 7 grades, but remediation is never more than thirty-three percent of all computer use. In the secondary grades, computers become integrated to class instruction, especially in the 11th and 12th grades (Becker, 1987). Becker's study (1994) also noted that a number of classroom computers might be used more effectively with groups of students in a collaborative activity or by the teacher in a demonstration mode than if each student used a separate computer.

Factors Influencing Teachers' Attitudes and Use of Computers

Literature review showed that there are many factors influencing teachers' attitudes toward computer technology and their adoption in the classroom teaching. Among them, the most commonly studied factors are:

age, gender, availability/accessibility, availability and quality of software, training or experience, fears and anxieties.

Age

It might be argued that computer literacy is an attribute of the young and that age is equated with a reluctance to entertain new strategies (Woodrow, 1989). However, studies yielded somewhat diverse results concerning the effect of age on teachers' attitudes toward computers and their use in the instruction.

The results of Woodrow's study in 1989 indicated that teacher age had little or no significant correlation with teachers' familiarity with the educational applications of computers. According to Loyd and Gressard (cited in Koohang, 1989), some statistically significant age effects were found, but no clear trend was demonstrated. Rogers (cited in Dupagne & Krendl, 1992) reported that the elderly favor change and that senior teachers desired more and better training and greater access to hardware and software. Zandri and Charness (cited in Parry & Wharton, 1995) reported that older participants (aged 50-84) took twice as long as young participants (aged 20-39) to acquire skills. This observation was supported in another study which found younger participants were quicker to learn new technology but there were no differences between the groups in attitudes toward computer technology and its applications (Czaja et. al., cited in Parry & Wharton, 1995).

Gender

The same is true to the issue of gender in terms of its effect on teachers' attitudes toward computers, that is, the research has yielded mixed results.

According to Stasz, Shavelson, and, Stasz (1986), although male teachers were more experienced on most of experiential measures, the difference was significant only for the number of different types of hardware used. There were no differences among interviewers' ratings of male and female teachers. All received high ratings. Similar result was shown in Loyd and Gressard's study (cited in Koohang, 1989).

Gilliland (cited in Marcinkiewicz, 1993-94) found that females had more negative attitudes toward computers and expressed lower expectations of computer use and its usefulness while males held more positive attitudes toward computers. Lee (1995) found that men continue to dominate the use of computer in all areas, whereas women have less time and opportunity to activate their computing skills. However, a one-way analysis of the data using gender as the independent variable found no significant difference in computer application and knowledgeability between the male and the female teachers in the study.

The lack of gender difference is particularly noteworthy in light of the many studies that indicate female attitudes towards computers are significantly lower than male attitudes (Woodrow, 1989). Similarly, Okinaka (1992) reported that the results of his study have revealed that no significant

differences in the areas of computer background, attitudes and topic interest between males and females, though some studies indicated the results that females appeared to be more favorable towards the concept of computer-assisted instruction and flow-charting whereas males indicated more positive feelings toward the concepts of programming and basic language. According to Becker (1994), the greatest difference between male and female teachers revealed by the data of his study was in the amount of time they spent using computers. When all time spent on computers was combined, the male teachers spent nearly four hours per week using computers than did the female teachers.

In short, gender did not make a significant difference in indicating teachers' attitudes toward computers and their use in classroom teaching.

Accessibility

Several studies indicate that one of the factors that influence teachers' attitude toward computers and their use of such technology in their teaching is accessibility. The meaning of accessibility here is twofold---(1) computers are available to teachers, (2) teachers can easily get access to computers, software, and manuals and access to people who can serve as experts to teach how to use computers. As Becker (1994) commented:

If teachers are to successfully incorporate a new and complex resource like computer software into their teaching, they must have access to other people from whom they can learn, either experts who have

already mastered the resource or a community of teacher learners who pool their efforts and share their exploratory findings (p.303).

It may be argued that with the increased availability of computers in schools, teachers will use the resources. As a matter of fact, although the ratio between the number of computers and that of the students is increasing, it is still not satisfactory. At the elementary level, most teachers reported having students use computers for their classes but a majority of these teachers had only one or two computers for their classes (Becker, 1994).

According to Woodrow(1989), the strongest guideline suggested by the study he conducted was that computers must be made available for teachers to use. Schools should be encouraged to place computers in staffrooms, library and departmental offices. Teachers must become computer literate. The first step in this literacy was to make sure that all teachers get access to computers and through using computers, realize the value of computers as educational tools. As teachers gained more experience with computers, their interest in using computers and their breadth of knowledge of possible computer applications would increase concomitantly. Yuen's (1984) study indicated that teachers who had computers available for their use showed more support than those who didn't have computers available.

As Fuetz (Regional Forums, 1995) argued most emphatically, that not every teacher has embraced technology, and teachers have been blamed for this. But it's not teachers, it's teachers' access to technology that's the problem.

According to Bell (cited in Shick, 1996), at the collegiate level, it's not uncommon to find a computer on most professors' desks. However, public school technology has not led itself to this luxury. He believed that all teachers should have access to computer and the best software available.

First of all, to effectively use computer technology, teachers need to have physical access to it. Although many survey and reports revealed that the number of computers in schools is steadily increasing, according to Stasz, Shavelson, and, Stasz (1986), schools average 12.23 computers but the number ranged from 1 to 55. Many teachers find it hard to get access to available computer technology. Two factors contribute to such difficulty. The first one is the location of the computers and the second one is scheduling time. Studies show that the majority of schools are likely to put computers in a special computer lab. Eighty-two percent of secondary schools had adopted the use of special computer rooms or science labs (Holligan, Heeks, & Fidderman, 1986). Researchers found that computer use depended upon where in the building the machines were put (Cuban, 1986). Secondly, teachers were concerned with scheduling problems (Olson, 1988) and felt constrained by the time required to plan for computer use, select software and cope with individual student needs (Novak & Knowles, 1991).

Anxiety

The anxiety or lack of confidence that teachers display towards computers and other new technologies is a subject which should be of primary importance to teacher educators and educational technologists, since many teachers feel ill-prepared and resist the integration of computers and other technologies into their teaching (Pina & Harris, 1993).

Many studies have been conducted concerning the effect of anxiety on teachers' attitudes toward computers and their use of computers in their instruction.

The national survey of classroom teachers' attitudes toward computer technology in the schools (How Teachers Grade Computers, 1989) revealed that fifty-two percent of teachers felt that their students were more computer literate than they were. This feeling was especially pronounced among older teachers but not among teachers who used computers in their classrooms. Many teachers resist the use of technology in their classrooms, holding an anti-machinery bias much like that of the Luddite movement of 19th century England. The degree of resistance to new technology increases as the new technology takes over more of the teacher's dominating role in the classroom. Many teachers feel that they need to be proficient at programming in order to use computer while others are afraid of looking foolish, getting lost, or pressing the wrong button and damaging the computer (Pina & Savenye cited in Pina & Harris, 1993). Attitudinal surveys administered at the target site and

three surrounding educational facilities found that frustration and anxiety were evident in the majority of the teachers in their attempt to implement computer technology in their classrooms (Shick, 1996).

What causes teachers' anxiety? Age and gender have been mentioned as possible correlates to anxiety in some of the studies. Cambre and Cook (cited in Pina & Harris, 1993) found significantly higher anxiety in females than in males. Older learners were also found to possess a higher degree of anxiety than younger learners. But the studies of Powers; Raub; and Gressard and Loyd (cited in Honeyman & White, 1987) didn't find any significant relationships between age, gender and the levels of anxiety. Honeyman and White's (1987) study also indicated no significant correlation's could be found between the age of the participants and their levels of anxiety.

Okinaka (1992) revealed to us that because teachers and teacher candidates were aware of the complexity of the computer and the time required to master these systems, there was sometimes a great deal of fear where computer use was concerned. Many teachers felt threatened by the prospect of having to learn a subject that was completely foreign. Many professionals didn't feel comfortable with teaching in an area where their students might have more ability and experience.

Then how to reduce teachers' anxiety and improve their use of computers? Studies indicate that exposure to computer and prolonged use of computers can promote computer use in teaching and reduce teachers'

anxiety. Besides, as Bowman (1983) mentioned, teachers introducing children to computers must themselves have an interactive relationship with computers.

Lack of Training

Blaming teachers for the failure of integrating computer technology in education is a historical theme (Cuban, 1986).

Availability of computers doesn't necessarily increase the improved use of computers in classroom instruction among teachers and further the integration of this new technology into the curriculum. Simply putting computers in classrooms doesn't itself persuade teachers to improve its use although acquisition of computers is essential.

Teacher training is critical. If teachers cannot use the technology, they won't use it. As Pack (1994) commented: "The computer can be a powerful learning tool. But for the uninitiated and perhaps technophobic teachers, mastering this complex tool requires lots of encouragement and on-going training" (p.366).

Many studies showed that lack of training or insufficient teacher preparation was the major obstacle contributing to teachers' high level of anxiety and lack of confidence in computers and therefore bring about the under use of computers in schools (Olson, 1988; Ross, 1988; Okinaka, 1992; Roberts, 1994; Shick, 1996). In Manarino and Cotton's (1985) study concerning training, even though sixty-nine percent of respondents reported having

received some inservice or formal training on computers, they maintained a low level of computer competence. Moreover, nine percent indicated a strong desire for more training and ninety-seven percent felt that all teachers should be trained for computer usage.

The national survey of teachers' attitudes (How Teachers Grade Computers, 1989) revealed that thirty-eight percent said that inadequate computer training or experience was an important obstacle to more effective use of computers for instruction. Fifty-nine percent agreed that most teachers who were using computers for instruction were inadequately trained in their use and sixty-six percent of the surveyed elementary school teachers felt this way. Ross' study (1988) revealed that seventy-four percent of respondents had no computer experience.

As commented in Regional Forums (1995), today's teachers have not been taught with computer technology and other technological tools. Today's teachers have not even been taught to teach using such tools. Simply put, pre-service education does not teach the effective use of such tools. Indeed, according to a survey conducted by Princeton Survey Research Associates for the National Education Association, a major barrier to the effective use of classroom computer technology among teachers is lack of training. It flies in the face of reason to expect teachers and those school staff to use computer technology effectively to improve the achievements of students without

giving them access to computers and teaching them how to use them effectively.

To reduce the anxiety level of teachers, to increase their confidence, and understanding of computers, the best possible way is to provide enough training to those teachers, such as providing teachers with workshops, intensive programs in teacher preparation or introductory computer courses to allow teachers the opportunity to learn more about the instructional use of computers.

According to Okinaka (1992), results indicated that teachers' attitudes toward computers were affected more favorably when an understanding as to how computers could be used effectively was achieved and when teachers were informed about the power of computers in the classroom. Similarly, teachers who had received training in the use of computers were more in favor of using them in the classroom than those who had not received such training. Through training in the use of computers in their programs, teachers learned how computers would benefit and improve education programs. Thus, they showed positive attitudes toward computer technology (Yuen, 1984). In addition, some studies (Koohang, 1986; Amico, 1995) have suggested that computer experience is significantly related to a more positive attitude toward computer use and that an introductory course in computer can influence teachers' attitudes toward computers in a positive direction.

Pina and Harris (1993) pointed out that educators and teacher preparation programs could play a vital role in helping teachers become less anxious and more confident in computers. According to OTA Report (1995), despite the importance of technology in teacher education, it is not central to the teacher preparation experience in most US colleges of education today. Most new teachers graduate from teacher preparation institutions with limited knowledge of the ways technology can be used in their professional practice.

To maximize the success of computers in education at all levels of the educational spectrum, teachers need to understand that computers have the potentials to assist in the teaching/learning process. To achieve this, teachers should be provided with both opportunities to acquire appropriate computer skills and reasonable access to adequate computer facilities at the time they receive computers. That is, they should get sufficient training and support they need in the use of computers.

According to Savenye (1993), well-trained teachers are the key to effective use of computer and other technologies. Becker (1994) noted that over time and with more experience, teachers became enthusiastic about seeing their students exploiting intellectual tools for writing, analyzing data and solving problems, and then they became more comfortable and confident about using computers themselves.

Other Concerns

In addition to all mentioned above, studies showed that teachers also have some other concerns such as, the quality and availability of appropriate software, unanticipated problems arising through the use of educational programs in their teaching and the time required for learning computer technology.

First of all, software has been developing and changing quickly in the past decades. Recently, there are relatively few researches conducted to study the quality and availability of appropriate software and its influence on teachers' attitudes toward computers and their actual use of computers. However, earlier studies revealed to us that inadequate software, especially in social studies, English, foreign languages, art, and music continues to weaken efforts to increase teacher use. Unsuitable programs persist since costs to produce improved software remain high Cuffaro and others single out the computers' power to teach many significant, misleading, and unintentional lessons to children beyond the programmed ones (Cuban, 1986).

Secondly, some unanticipated problems appear while teachers use educational software designed for teaching. For example, in Olson's (1988) study, Mrs. Melville complained that using computers exposed her to risks of unanticipated problems and ambiguous situations, such as, in the farming game, students grew potatoes in Southern Ontario for ten years and made a lot of money, but making money was not the point of the exercise. They

didn't learn the geographical lessons and so were wasting their time on the computer. Having a computer in her classroom created situations that were ambiguous, took her time to sort out and pressed upon her, though she agreed that it had the potential to stimulate students under the right conditions. Besides, teachers have well established practices for conducting everyday life in their classrooms which allowed the business of the class to be done. To them, routines embodied meaning. While computer based learning threatened those routines. Furthermore, teachers reported that they didn't have enough time to carry out computer activities in the classroom (Dupagne & Krendl, 1992).

Finally, another major concern, according to Okinaka (1992), which has caused many teachers to shy away from computer use has been the difficulty of learning how to use the computer, and the associated amounts of time that must be devoted. Many teachers realized that a substantial amount of time must be devoted not only to learn the basic functions of the computer, but also to master the intricacies of any programming that needed to be applied, to reviewing and applying specific software packages, and to learn any useful utility programs, such as test constructors, word processors, and spreadsheets.

In summary, although teachers' attitudes toward computers differ, they are mostly positive about teaching with computer technology. However, they haven't used it to its fullest potential. Through the literature review, we know that age and gender don't make significant difference in teachers'

attitudes toward computers and their use of computers in teaching. Other factors have affected teachers' attitudes and their use of computers to some extent, such as, the availability and accessibility of computers, the quality and availability of appropriate software, time required for learning computers and some other unanticipated problems arising from using software. However, lack of sufficient training and professional support are the key factors that have caused teachers' anxiety and lower use of computers in their teaching.

Chapter IV

Discussion and Implications

The findings of earlier studies show a general trend that most teachers are positive about the computer technology and computer integration in classroom teaching.

Many teachers agree that computers have some true advantages as far as educational enhancement is concerned. Many of them regard it as a useful tool that will stimulate students' interest, motivate students in their learning and enhance their learning, bringing about not only motivational outcomes but cognitive ones as well. Besides, it is able to increase teachers' one to one interactions with students.

Yet, some teachers exhibit high levels of anxiety toward computer technology. Age and gender don't make a significant difference in indicating teachers' attitudes toward and use of computers although some studies revealed that older learners spend more time acquiring the computer skills than younger learners do and male and female teachers have different preferences in terms of programs. However, even those teachers who have favorable attitudes toward the use of computers have not necessarily moved toward using available computers in their classrooms (Turner, cited in Okinaka, 1992).

Through the review of literature, we know that the big problem of underutilization of computers in school settings lies in the fact that teachers haven't possessed the necessary skills to use computers and expertise to integrate computer technology into classroom instruction. In other words, the problem that teachers have not used the computer technology to its fullest potential is that teachers have not been taught the necessary skills to use computers in their instruction. A large part of the problem is the result of not having any kind of training or experience with the instructional use of computers among most of the teachers. Although some teachers might have received some kind of training, their training is not sufficient for their professional practices. Equipment without teacher training is really a waste of money.

To solve the problem, to improve the use of computers in school settings and to implement computer technology into curriculum, teacher training and continuous professional encouragement are critical, since software is developing and changing quickly in modern society.

Many training programs and introductory courses have proved to be very effective in reducing teachers' anxiety and increasing their confidence in using computers. The Sallis Committee (cited in Gilmore, 1995) identified three areas where teachers needed professional support to enable them to use computers effectively in the classroom. First, teachers who have never used computers need some training in simple technical aspects prior to using a

computer in a classroom; second, teachers who have some knowledge of the technology require assistance in integrating computer use across the curriculum and in developing management strategies within the classroom; and third, all teachers need the opportunity from regular discussions with peers and a recognized educational computing expert to share ideas, reflect upon and evaluate current strategies, and to be informed about new developments.

In conclusion, instructional computer technology requires support. If teachers are to employ computer technology in their instruction, they not only need equipment but training and professional support as well. To solve the problem of computer underutilization in classroom teaching, sufficient computer training and continuous professional support are critical.

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