To the Graduate Council:

I am submitting herewith a dissertation written by Gonghua Liu entitled "The Attitudes of Chinese Students at The University of Tennessee, Knoxville Toward the Computer." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Education.

E. Dale Doak, Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Associate Vice Chancellor and
Dean of The Graduate School

The Attitudes of Chinese Students at The University of Tennessee Toward the Computer

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Gonghua Liu

December 1996

Dedication

This dissertation is dedicated to my family:

First to my father and mother:

Their unconditional love for me has made what I am today.

Next to wife, Li-hua:

Your care and love are always the fountain of my strength.

Finally to my daughter, Ya Ya:

She brings hope, meaning, and happiness to my life.

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ABSTRACT

As computer literacy and computer use become more and more important in the educational environment, the attitudes of international students toward computers may play an important role in their academic success in this country. The study investigated the attitudes of Chinese students at The University of Tennessee, Knoxville toward computers and explored the possible effects of gender, age and computer experience on these students' attitudes toward computers.

The primary instrument used in the study was Drs. Loyd and Gressard's Computer Attitude Scale. The scoring strategy results in higher scores on the computer anxiety subscale corresponding to lower anxiety, and higher scores on the confidence and computer liking subscale corresponding to higher confidence and liking. The demographic questions in the survey provided information regarding subjects' gender, age, and their experience with computers .

The collected data were analyzed by using the SPSS computer statistics program SPSS. Analyses of variance (ANOVA) were conducted for subscores of computer attitudes on each of the factors examined in the current study (e.g. age, computer experience, and gender). The study found that the general computer attitudes of Chinese students currently studying at The University of Tennessee were positive. The study found that the age factor doesn't appear to make any difference on the Chinese students' attitudes toward computers. Nor does gender appear to have any effect on Chinese students' attitudes toward computers when the factor of computer experience was ruled out. However, the

study found that there were significant differences among the groups of Chinese students with difference levels of computer experience on their attitudes toward computers, with those who had more computer experience having more positive attitudes toward computers.

The current study confirmed the results of many previous studies that claim computer experience is important in determining computer attitudes. The researcher of the current study suggests that specially designed computer literacy courses for the international students could be a great help for them to quickly adapt to their new academic environment.

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CHAPTER I

INTRODUCTION

I. BACKGROUND OF THE STUDY

As a typical technologically-oriented nation, computers can be found almost everywhere in American society. Companies are automating their operations in order to improve productivity, competitiveness, and profits. As a result, computers have become an integral part of corporate work life. In the medical world, computer-controlled equipment has been utilized in different circumstances. Super-computers now help design aircraft and car models and simulate the effects that different environmental forces might have. More recently, with the maturity of multimedia technology, commuter are used widely in computer-aided teaching and learning and computer-based learning. At present, computers even have made their way into the average American's home. In a word, unless one intends to be a hermit, computers will affect his or her life in one way or the other if he/she lives in the United States.

Due to the wide application of computer technology in American society, the knowledge and skills of the computer has become an important factor for people to succeed in many different fields. In the realm of education, familiarity with computers and the ability to use them effectively have been more and more recognized as a very important part of educational practice in this country. Unprecedented number of computers are introduced into labs, libraries, and classrooms. Ways of computer-based teaching and learning designed to achieve

better and more efficient teaching and learning results are accepted by more and more teachers and students alike. The importance of computer technology in educational environment is pointed out by Marchoulides (1988) even in late 80s.

> The recent growth in the availability of computers in the work environment has made familiarity with commuter and the ability to use them effectively a requirement for success in most fields. Educational systems that seek to prepare students for effective participation in the work force are recognizing this as a crucial component of the educational process. (p. 151)

With the increasingly important role that computer technology plays in the educational environment, there has been a wide infusion of personal computers at every corner of educational institutions in this country. As a matter of fact, it is almost unimaginable to go to a university in the United States without utilizing personal computers in one way or the other. The following is Resta's (1992) description of what a student's life would be like on a typical university campus equipped with computer technology.

> A new era of computing technologies is appearing on the university campus. These radically transform the ways in which knowledge is created, managed and disseminated. Students with knowledge about and access to computers are able to use personal productivity tools such as word-processing, spelling-checkers, graphics, databases, spreadsheets, statistical and other analytic programs, and telecommunications, to enrich their learning experiences and enhance their academic performance. (p.119)

In contrast to American students with what is available to them in terms of utilization of computer technology, Chinese students, at least at present, are far from being as fortunate as their American counterparts. While the personal computer has already been a part of daily life of many ordinary American students, it still remains a luxury item for many Chinese students in their academic pursuit in many Chinese universities. Despite the usefulness of the computer in education, the dire reality is that an average student in China, as those in any other developing countries, is much less likely to be exposed to modern technology than an average American student.

Along with thousands of international students from all over the world, some Chinese students are able to come to the United States to study and enjoy many modern technologies they did not have access to in their home country. However, the lack of exposure to modern technology back in their home country may give rise to some problems at the early period of their academic life in the United States. When suddenly placed in such a computer-permeated academic environment, these students may find themselves at a loss as to how to cope with the drastic change in their lives. They might find it hard to do things the way they used to do in China once they start studying here. Instead of writing with a pen, they may have to learn how to use a word processing program; instead of thumbing through a stack of index cards, they may have to use a on-line catalogue terminal to look for a book in the library; instead of face-to-face socializing, they may have to learn how to communicate with their classmates and their instructors via computer. They may even have to learn how to program a computer to pass a required computer language examination! In other words, this

drastic change could be overwhelming to the international students. It is possible that this sudden change may strike fear in those whose lives computers have never been a part. They may be at a loss as to what to do about the avalanche of new technologies which they encounter. It is possible that they may become anxious about the impact computers will have on their academic lives.

An analogy may be used here to refer to this change. To face a sudden challenge of a new technology environment is somewhat like a cultural adaptation. It would be easier for those whose native culture is close to American culture, for they may have experienced some of the things in their native culture they encounter in the United States. They will not get "shocked", and therefore feel more comfortable with the new environment. On the contrary, life can be harder in the new environment for those who come from a quite different culture and who could be "caught off guard" by many things they see or experience in a new culture. Worse still, they could be "turned off" by this change.

From the analogy of cultural adaptation above, one can see that the "experience" can be an important factor that influences attitudes toward a new culture. People tend to accept things they are familiar with and suspicious or even fearful of things with which they are not familiar. If experience is a factor that affects one's cultural adaptation process, one may ask whether the amount of experience with computers will have any influence on the attitudes toward computers. In other words, people may be computer anxious simply because they have little or no computer experience before they entered this country. More questions could be asked for this matter: Do they have any confidence of being able to learn how to use computers even if they may appear to be at a

disadvantageous position compared with American students? Are they willing to learn how to use computers in order to successfully accomplish their academic goals.

In fact, in addition to experience, attitudes toward computers may be associated with a variety of personal characteristics such as age and gender. So, the current study will focus on the three variables considered important by the researcher: the amount of experience of the Chinese students with computers and the difference of their age, and the difference of gender.

II. PURPOSE OF THE STUDY

The purpose of the current study is to investigate the attitudes of Chinese students at The University of Tennessee, Knoxville toward computers and to explore the possible effects of gender, age and computer experience on these students' attitudes toward computers.

III. RESEARCH QUESTIONS

Answers to the following four research questions will sought in the current study:

1. What are the attitudes of the Chinese students on campus of The University of Tennessee toward computers in general?
2. What are the differences among different age groups of the Chinese students on their attitudes toward computers?

3. What are the differences among the groups of Chinese students with different levels of computer experience on their attitudes toward computers?
4. What are the differences between male and female Chinese students on their attitudes toward computers ?

IV. SIGNIFICANCE OF THE STUDY

Issues of computer attitudes of students are of great interest and concern of many educators and researchers in this country since attitudes of students at the start of the computer instruction/training may very well affect their success in future computer learning. It is therefore essential to determine these attitudes prior to computer instruction/learning so that steps can be taken to counteract negative attitudes toward the important medium.

There has been a great deal of research done related to attitudes toward the computer. However, most of the studies have targeted Americans, including teachers and students in educational settings. The current study involves a specific population, a group of Chinese students, which is ethnically, culturally, and linguistically different from other targeted populations selected for the previous studies of the similar nature.

Variables investigated in previous studies concerning attitudes towards computers include gender, age, computer experience, level of education, specialized fields, ownership of computers and others. However, the current study will investigate only three factors, the differences of gender , age and the amount

of experience with the computer of the subjects. There are the most frequently investigated variables in the studies concerning computer attitudes. These three factors will be carefully examined in the study as to their effect on students' attitudes toward computers in the current study. The findings of the current study will hopefully add to the existing knowledge of students' attitudes towards computers.

The current study may help those from less developed countries, such as China, better prepare themselves for an academic environment characteristic of modern technology. Usually, Chinese students who are prepared to come to the United States to study are better informed of the possible adjustment they have to make in order to overcome the "cultural shock," "language barrier," and even climate adaptation. They may be less prepared for the possible "technology shock." The current study may serve to make those who are interested in studying in the United States aware of the fact that there may be a possible "technology adaptation" they might have to make in order to succeed in their academic life in this country.

Furthermore, the current study may also provide useful information for those who are concerned with international education at high educational institutions in this country. Theories and curriculum may be developed to help international students from developing countries in general, Chinese students in particular, better adapt themselves to the technological-oriented society. The current study focuses only on a small number of international students who come from only one developing nation, in this case, China. Hopefully, similar future studies can be carried out among a larger population so that descriptive data can

be gathered in regards to the attitudes toward computer of international students, regardless of their nationalities.

V. DELIMITATIONS/LIMITATIONS OF THE STUDY

Delimitation

1. The participants of the current study will be delimited to Chinese students who are currently studying on campus at The University of Tennessee, Knoxville.

2. All these Chinese students are from mainland China.

Limitations

1. Since the population of the study is limited to only Chinese students currently studying at The University of Tennessee, generalization of the results of the study to the whole population of Chinese students currently studying in the United States should be made cautiously.

2. The accuracy of data collected will be limited by the honesty and willingness of the participants in the current study.

3. Students' attitudes toward computers could be influenced by many factors, so caution should be taken in interpreting the results of the study.

VI. ASSUMPTIONS

1. The Computer Attitudes Scale (Brenda H. Loyd & Clarice P. Gressard, 1984b) was appropriate for measuring the attitudes of the Chinese students at The University of Tennessee, Knoxville.

2. The translation of The Computer Attitude Scale was true to the original version. The directions and statements on the questionnaire in Chinese helped students to understand the concept of each statement easily and correctly.

3. Participants in the research responded to the Computer Attitudes Scale based on their real attitudes toward computers.

VII. DEFINITION OF TERMS

1. Computer experience refers to the experience of using or learning to use computers. The experience of using computer includes using computers in various academic activities or using computer in the respondents' work environment. The computer learning experience includes taking any kind of computer courses, attending computer training sessions, and self-learning computer experience.

2. Computer Attitude Scale: A specially constructed scale containing statements relating to computers to determine the direction and intensity of attitudes toward computers

3. Likert-type Scale refers to a scale for measuring attitudes based on the research of Ensis Likert (1932). The individual checks one of five possible

responses to each statement: strongly agree, agree, undecided, disagree, strongly disagree.

4. Attitude: An internal state which affects an individual's choice of action toward some object, person, or event

5. Computer anxiety: Threat or fear of computers, and hostile thoughts toward computers

6. Computer confidence: Confidence in the ability to learn about or use computers

7. Computer liking: One's enjoyment and appreciation of computers

8. Computer Attitude Scale: An instrument which measures attitudes toward learning about and using computers

VIII. METHODOLOGY

The subjects for the study were drawn from The University of Tennessee, Knoxville, Tennessee. The target population was the whole population of Chinese students from mainland China who are currently enrolled at The University of Tennessee, Knoxville. The subjects of the study were drawn from this population.

The instrument of the study was a survey questionnaire, which includes a Computer Attitude Scale with some demographic questions attached to it and a cover letter providing information about the study and seeking consent from the Chinese students who were interested in the study.

The primary instrument used in the study was Dr. Loyd and Gressard's Computer Attitude Scale (1984b). The survey instrument is the most frequently used instrument to measure attitudes toward computers. The Computer Attitude Scale is a Likert-type instrument which consists of 40 items, divided into four 10-item subclasses: computer anxiety, computer confidence, computer liking, and computer usefulness. Items in the questionnaire presented positively and negatively-worded statements. Examples are: "Computers do not scare me at all," "Working on a computer would make me very nervous," and "Once I start working on the computer, I find it hard to stop." In response to the statements, participants indicated which one of four ordered responses from "strongly agree" to "strongly disagree" most closely represents the extent to which they agree or disagree with the ideas expressed. The scoring strategy results in higher scores on the computer anxiety subscale corresponding to lower anxiety, and higher scores on the confidence and computer liking subscale corresponding to higher confidence and liking. In general, a higher score corresponds to a more positive attitude toward computers.

The demographic questions in the survey were expected to provide information regarding subjects' gender, age, and their experience with computers. All these three factors will be used in the study as dependent variables.

IX. ORGANIZATION OF THE STUDY

The study include an abstract, five chapters, a list of references, and appendices.

Chapter One is an overview for the study, which presents the background of the study, purpose of the study, questions of the study, significance of the study, delimitations and limitations of the study, definitions of the terms to be used in the study, methodology of the study, and organization of the study. Chapter Two reviews the literature that is relevant to the current study, which includes a review of the previous studies concerning students' attitudes towards computers, and factors that influence students' attitudes toward computers. Chapter Three describes the methods and procedures in collecting the data for the current study. Chapter Four includes the description of how the data were analyzed. The instrument is introduced. The statistical method used in data analysis is described. The findings are presented with charts and tables, and conclusions are drawn from the findings. Chapter Five gives a summary of the current study, and recommendations for further research are discussed.

CHAPTER II

REVIEW OF RELATED LITERATURE

I. INTRODUCTION

This chapter presents a review of the literature related to the current study. It includes students' attitude towards computers, and factors that influence students' attitudes toward computers. In the process of searching and reviewing the relevant literature, the following facilities and services have been utilized: Hodges Library on line catalogue of The University of Tennessee, Knoxville; Educational Resources Information Center (ERIC); Dissertation Abstracts On-line Database; and the University of Tennessee, Knoxville library Inter-Library Loan Service.

Selected periodicals, journals, dissertations, newspapers were reviewed, and the reviewed literature covers the time period from 1973 to present. The review of the literature consists of two main sections: 1. Attitudes Toward Computers; 2. Factors that may have effects on attitudes toward computers. The first section consists of four sub-sections: (1) Attitudes and Learning; (2) Computer Attitudes; (3) Students' Attitudes Toward Computers, and (4) Computer Anxiety and Its Effect on Learning. The second section consists of four sub-sections: (1) Age; (2) Gender; (3) Experience; and (4) Other.

To set the stage for the current study, representative studies have been selected to demonstrate the findings from the literature concerning the students'

attitudes toward computers and selected factors. However, studies reviewed go beyond those only involving college students.

II. ATTITUDES TOWARD COMPUTERS

Attitudes and Learning

Attitudes are regarded to be important in students' learning process because researchers think they have a great influence on the learning results. In discussing the affective factors in computer-based education, Clement (1981) mentioned that the attitudes of participants in any activity were important to its success. He gave the following description:

> An attempt at a serious bridge game is hopeless if just one of the players prefers a gab session. A canoe trip with someone not doing his or her share becomes a frustrating, tiring, and perhaps circular adventure. In a learning environment, unmotivated students are difficult to teach regardless of subject matter or teaching style. (Clement, 1981, pp. 28)

This belief in the importance of attitudes in learning process is supported by other researchers who believe that positive attitudes will increase the prospect for achievement in any academic endeavor, and negative attitudes make achievement of competency less likely (Loyd & Gressard, 1984a).

Computer Attitudes

There are three types of attitudes toward computers that are considered to be important by researchers (Loyd & Gressard, 1984b), which, some researchers believe, have a significant effect on student achievement in grasping computer knowledge and skills. These are: computer anxiety, consisting of anxiety toward or fear of computers or learning to use computers, computer confidence, related to confidence in the ability to learn about or use computers, and computer liking, meaning enjoyment or liking of computers and using computers. As computer literacy and computer use become more and more important in the educational environment, researchers feel these attitudes may play an important role in student success in computer-related components of the curriculum.

In investigating the knowledge about and attitudes toward computer use held by residents in a large urban teaching hospital, Whiteside, Lang, and Whiteside (1989) stated that factors that are both internal and external to an individual could influence the extent to which the individual will use computers. They defined "external factors" as those such as computer availability, compatibility, training, and the ability to apply learning in a job-related context. They also pointed out that "internal factors" play a very important role in affecting a person's willingness to use computers. The "internal factors" they refereed to were attitudes toward computers.

Students' Attitudes Toward Computers

Many researchers have investigated students' attitudes toward computers because of the important role that attitudes play in their learning process.

However, the review of literature has revealed that both positive and negative attitudes have been expressed by students investigated.

In a article dealing with the problem of attitudes from the viewpoint of four distinct populations--student, instructor, lesson author, and administrator, Clement (1981) reported that attitudes toward computer-based courses were positive in general among students in junior high school, high school, community college, and college. In 1991, using a computer survey to assess the attitudes and knowledge of 252 adult basic students in Texas, Massoud (1991) found that adult basic education students as a whole had fairly positive attitudes toward computers.

On the other hand, many investigation results suggest that students may have rather negative attitudes toward computers. Students in Jay's (1981) study developed a degree of anxiety which influenced the learning process negatively. A survey of third-year medical students' attitudes about computers found that 85% believed microcomputers were too complicated for them to use, and 75% said they felt apprehensive about learning to use a microcomputer (Whiteside, Lang, & Whiteside, 1989). Marcoulides and Wang (1990) used a 20-item Computer Anxiety Scale (Marcoulides, 1988) to study a total of 437 college students' (225 American and 212 Mainland Chinese) attitudes and actions toward computers. The results showed that computer anxiety is present to a similar degree for both samples of American and Chinese students.

Computer Anxiety and Its Effect on Learning

The effects of positive and negative attitudes of students toward computers in students' learning process have been investigated and results of these studies have suggested that negative attitudes toward computers influence the learning process in such a way that students, when required to master computer skills, develop a degree of anxiety, thus acquiring negative attitudes. However, students that show favorable or positive attitudes toward computers seem to master skills in a pleasant and rewarding way (Koohang, 1986).

Some researchers label the negative attitudes toward computers as computer anxiety. It is described as a form of resistance to thinking about computer technology, fear of computers, and hostile or aggressive thoughts toward computers. Attitudes such as these may inhibit successful mastery of computer skills in much the same way that math anxiety inhibits math achievements (Fennema & Sherman, 1978).

Jay (1981) discussed the topic of negative attitudes toward computers in a pioneering work. He termed the negative attitudes toward computers as computerphobia. Symptoms of computerphobia listed by Jay (1981) include: resistance to talking or even thinking about computer technology, fear or anxiety, which may even create physiological consequences; and hostile or aggressive thoughts and acts, indicative of some underlying frustrations.

According to Jay (1981), the causes of computerphobia are diverse and may vary from individual to individual. The possible causes he mentioned include the failure on the part of the phobic to "keep up" with technological advances, the institution or organization for which a person works may have failed to take

his job into consideration when planning to use this new technology, and a failure of institutions to provide incentive to educators to keep up with technology.

Some researchers related this negative attitude toward computers to the negative attitude some people may have toward mathematics (Marcoulides, 1988), because they believe that historically, computers have been associated with mathematics courses, and learning about and working with computers is considered by may students a mathematical skill. As has been found from previous studies, mathematics anxiety have detrimental effects on mathematics achievement (Fennema & Sherman, 1978).

> To the extent, therefore, that the consequences of mathematics anxiety may be generalized to computer anxiety, it is important to consider the relationship between computer anxiety and computer achievement and, of course, the relationship between computer anxiety and mathematics anxiety. (Marcoulides, 1988, p.152)

The conclusion as to the cause of computer anxiety may not be easily reached, but detrimental effects of the negative attitudes toward computers seem to be quite certain. In investigating the possible effects of computer anxiety on students achievement in computer skills, Marcoulides (1988) reported that computer anxiety was a significant variable in predicting computer achievement.

> As expected, experience was also an important factor in predicting achievement but not as important as computer anxiety. Computer achievement is more a function of computer anxiety than

computer experience. It appears that the degree to which computers can be effectively utilized is influenced by computer anxiety. (Marcoulides, 1988, p. 156)

In another study, taking 225 American college students and 212 Chinese college students as samples in a study examining cross-cultural comparison of computer anxiety, Marchoulides (1991) found that the construct of computer anxiety, as measured by the computer Anxiety Scale, remained invariant when assessed over the two samples of college students. The results of the cross-culture study implies that educators in China, as in America, need to be sensitive to the presence of computer anxiety and its impact on the potential use of computer technology.

With the results of many studies concerning computer anxiety, researchers claim that nearly every segment of American society is at risk for computerphobia. They believe computerphobic students include those old and young, regardless of race and college majors. They claimed that these students were less interested than nonphobic students in any form of computer interaction, both in their personal lives and in their academic careers (Rosen, Sears, & Weil, 1987).

Positive attitudes will increase the prospect for achievement in any academic activity, and negative attitudes make achievement of competency less likely. This phenomenon is applicable to the process of computer learning. Students may have both positive and negative attitudes toward computers. Three types of attitudes toward computers are summarized by researchers: computer anxiety, computer confidence, and computer liking. For those students with

positive attitudes, learning how to use computers is a rewarding and pleasant experience, and for those with negative attitudes, or with high level of anxiety, learning how to use computer can be a very frustrating experience.

III. FACTORS THAT MAY INFLUENCE THE ATTITUDES TOWARD COMPUTERS

Interested in students' attitudes toward computer, researchers have been fascinated by the factors that are possibly correlated to students' attitudes toward computers. It's obvious that more understanding of the factors that influence students' attitudes toward computers could help students' endeavors in learning how to use computers. As the results of many studies show, many factors may have a effect on one's attitudes toward computers, among which, age, gender, and experience with computers are frequently mentioned.

Age

Questions about the relationship between age and computer technology have been asked by many researchers in this country because the rapid change of computer technology has been taking place in a society in which a larger number and percentage of the population is at or above that arbitrary chronological point of 65 years of age. If, as reported by some researchers, computer anxiety is related to age, a fairly large group of people in this country would at the risk of being "condemned to a new form of functional illiteracy" (Morris, 1988, p. 74).

Some studies found that younger people have more positive attitudes toward computer. Baack, Brown, and Brown (1991) used 20-item Attitudes Toward Computer Usage Scale (ATCUS) to measure feelings or behaviors toward a variety of computer usage situation. Subjects were 184 older adults and 235 young adults. The young adult sample was selected from college students enrolled in several business and recreation classes at a large midwestern university. The older adult sample consisted of members of retirement groups from churches in several large and small midwestern cities. The results of the study indicated significant differences on 17 of the 20 ATCUS items, with the older adults indicating a less favorable attitude toward computers. The researcher pointed out that young college students had grown up with computers and apparently saw computers as a necessary and familiar part of their environment while "older people were less eager to involve themselves with computers in a hands-on, interactional way " (Baack, Brown, & Brown, 1991, p. 431).

Morris's study (1988) targeted a population with a wide age range. Sample age ranges from 17 to 90, with a mean of about 44 and a standard deviation of approximate 18. An eight-item Likert-like scale, COS (Computer Orientation Scale), was developed to measure the attitudes of the subjects, which covered a variety of topics, including eight items which focused on the respondents' attitudes regarding computers. The results of the study show that both age and education had direct effects on the COS. However, the age factor was indirectly related to COS through education, since, as a group, those who are older tend to have less formal education. Thus, the researcher suggested that

education was more likely to have an effect on attitudes toward computers, regardless of age.

However, contradictory researches have also been reported. In some studies, findings indicated that older adults were less computer anxious, had more positive attitudes toward computers, and had more liking for computers than younger adults (Dyck & Smither, 1994). This study, however, with its large sample size and age range, revealed consistent age effects on all the scales and subscales. Overall, except for computer confidence, older adults were more positive about computers (i.e. better attitude, less anxiety, and more liking).

Massoud (1991) suggested that one possible reason for adults to have positive attitudes toward computers was that the computer offered adult literacy students privacy that was not available in a classroom setting.

> The computer can provide a degree of patience unavailable from a tutor or teacher, and it affords the learner control of the learning environment through flexible scheduling. The computer seems to have great potential for opening up learning experiences and for achieving any of the generally accepted goals of adult education. (p. 270)

In a study to evaluate the degree to which college major or student individual differences were related to favorable attitudes about computers, Griswold (1985) found that age seems to be the best predictor of university students' attitudes, followed by their major. Two hundred and seven college students participated in the study, and attitudes toward computers were operationalized by a 20-item questionnaire addressing applications and social

implications of computer technology. The descriptive statistics for the variables in the study show that older students tended to have more favorable attitudes about computers. According to the researcher, the possible reason for this age difference in attitude was that younger students, with little or no college math, were likely to have the most fear of computers.

There are still some studies that have found no significant relationships between age and levels of computer anxiety. Two studies involved primarily college age students with small age ranges were conducted by Powers (1973) and Raub (1984); and both articles reported the need for further study with regards to the relationship between attitudes toward computers and age.

Massoud (1991) investigated the relationship between computer attitudes and the selected variables of age, gender and computer knowledge among a sample of 252 adult basic education students. A difference in computer attitudes of males and females is shown to be statistically significant in his study. Males are found to have more positive attitudes than females. However, data analyses indicated no significant differences between Computer Attitudes Scale (Anxiety, Confidence, Liking) and age.

Honeyman and White (1987) targeted the population made up by teachers and school administrators in their investigation of the effect of such factors as age, sex, previous experience with computers, and time in contact with a computer on the levels of compeer anxiety. The data for the study were collected over a two-year period from the participants. The results of the study showed that factors of gender and age did not have an effect on the levels of anxiety. However, the variable indicating previous level of experience was shown to have

a significant relationship with initial levels of anxiety level. Furthermore, changes in those levels of anxiety were reported during the course of the study, which indicated that the lowering of an individual's state anxiety level occurred over time, and the timing of such change differed with the level of previous experience of the participant.

Age effect was one of the factors in Todman and Dick's study (1993), although they found evidence that boys were more favorably disposed to computers than girls at the primary level; age was not reported to have any effect on the children's attitudes toward computers. Since all samples were primary school children when the issue of age difference was examined, the age range was quite narrow.

In a study conducted by Koohang (1986) the effect of variables such as gender, age, college status, and computer experience on attitudes toward computers were examined. The study used population with a quite narrow age range. The subjects involved in the study were 60 college students who were using Library Computer System (LCS). In this study, age was not found to have a significant effect on any of the subscale factors although computer experience did make a significant difference on computer anxiety and computer liking.

Similarly, in a correlational study of computer anxiety, computer experience, trait anxiety, and mathematics anxiety, Raub (1981) found that experience, academic major, and gender were correlates of computer anxiety. Age was not related to computer anxiety, although the limited age range in her sample may have been responsible for this finding. In a study examining attitudes of primary age boys and girls toward computers, Todman and Dick (1993) found

that there was no overall age effect , except on the fun-scale (one of the subscales of the instrument used in the study) on which scores decreased over primary levels.

Findings reported in a study done by Loyd and Gressard (1984a) suggest a relationship, albeit weak, between age and attitudes toward computers. The study focused on the variables of age and gender in relationship with attitudes toward computers. Subjects involved in the study were 354 students, with 186 high school students and 168 community college students. Their sample was divided into four age groups: 1) 13-15; 2) 16-18; 3) 19-20; and 4) 21 and over. The results of the study shows that the attitudes toward computers, in general, were positive. The main effect of age was statistically significant only computer liking, students thirteen to fifteen years old had significantly higher scores on the Computer Liking subscale than students twenty-one or older. However, according to the researchers, the data " did not suggest a clear trend of increase or decrease in computer liking with age." (Loyd and Gressard, 1984a, p. 76)

The study of Dyck and Smither (1994) shows that age has an effects on the attitudes toward computers. The study had a large sample size and age range: a total of 219 young subjects (30 years and under) from universities and community colleges and 203 older subjects (50 years and older) from senior citizens centers and continuing education courses. Computer attitude and anxiety were examined for age effects, differences were found for all scales and subscales. Except for computer confidence, older adults were more positive about computers (better attitudes, less anxiety, and more liking). However, the researcher suggested that the reasons for the findings need further investigation.

The relationship between age and attitudes toward computers is not straightforward as it has been shown from the results of the studies reviewed above. Although many researchers agree that anxiety has a negative effect on acquisition of computer skills, the views as to what age group is more anxious toward computers vary. However, as some researchers have suggested, there seems to be a need for older adults to have opportunities for learning computer skills in non-threatening ways so they can take every opportunity "to learn the skills that will enable them to live independent, fulfilled lives" (Baack et al., 1991, p. 431).

Gender

Much of the literature on computing reveals that there are gender differences in attitudes toward computers, which means that although computers are becoming increasingly a part of modern life, it does not ensure that everyone will participate equally in the benefits of computer technology. Based on the observations, Kiesler, Sproul, and Eccles (1985) found that usage and access to computers had shown that males dominate enrollment of elective computer classes and camps, and have more opportunities in informal social situations to receive more encouragement for computer usage at home. They described the reality for females, in terms of computing as unfair and unpleasant:

> It is a world of electronic pool halls and sports fields, of circuits and machines, of street-corner society transmuted to a terminal room. This is hardly the kind of world girls find enticing. It

is a world that many girls will not enter or, if they do, it is a world in which many girls will get "turned off." (Kiesler et al., 1985, p. 459)

Unfortunately, results of many studies seem to support the theory that the culture of computing is preponderantly male and that males have more positive general attitudes than females toward computers. In as early as 1982, Jordan and Stroup (1982) conducted a pre-course and post-course survey of student fearfulness and perception of computer use. In this particular study "of the five independent variables in the analysis, sex was found to have the strongest discriminating influence on computer fearfulness" (Jordan & Stroup, 1982, p.7).

Hess and Miura (1985), in a study of 23 computer camps with 5,533 students, found that boys attended the computer classes three times more frequently than girls, and this gap increased as the cost and the level of class rose. In a study of 6th and 12th-grade pupils in California, Fetler (1985) found that boys in both grades showed a more positive attitude toward computers, had more exposure to computers at home and in school, and had superior performances compared with those of the girls.

Wilder, Mackie, and Cooper (1985) conducted two surveys to provide an empirical base of the anecdotal evidence that technology is a male domain and examine the differences between males and females in attitudes toward computing among a highly achievement-oriented group of college freshmen. They claim that the research had added to the growing body of evidence that boys and girls, men and women, react differently to computers. They found that university women felt less skilled with computers than men did even though they had an equal amount of computer experience. This male confidence in computing

is also reflected in an article by Richards, Johnson, & Johnson (1986) describing the development and preliminary validation of a Computer Attitudes Scale (CAS). The subjects were 192 female and 178 male seventh-grade students at a junior high school. The students were required to take the CAS and several other attitude measures before participating in a computer class being taught by the school. In analyzing the collected data, the researchers found that males were more likely than females to perceive computers to be worthwhile, relevant, and necessary for future success. Male subjects also frequently expressed the view that they were more capable of and suited to the use of computers than females.

In examining the extent to which gender and prior computer exposure affect students' attitudes toward computers prior to computer instruction in school, Levin and Gordon (1989) found that boys had significantly more positive affective attitudes toward computers than girls. They perceived computers as being more "enjoyable," "special," "important," "friendly," and "cheaper" than girls. The study results also show that boys tended to hold more stereotyped attitudes about who is capable of using computers and had more positive attitudes toward the computer as a medium of instruction than girls.

Martin (1991) investigated affective reactions towards working with computers among 328 fourteen and fifteen-year-old fourth year pupils from a comprehensive school in North Debyshire in England. Gender, courses studied, and availability of a home computers were the factors taken into account in the study. One of the findings of the study was that male had more favorable attitudes towards working with computers.

In a study investigating the effect of gender and computer experience on attitudes toward the computer, Loyd and Gressard (1987) found that in the initial period of computer experience, girls' responses indicated that they "like" computers more than boys. However, it was observed that after a period of six months, boys became significantly more positive in their attitude toward working with computers than girls which is consistent with the general pattern of gender-related differences in attitudes reported in earlier studies.

Massoud (1991) investigated the relationship between computer attitudes and the selected variables of age, gender and computer knowledge among a sample of 252 adult basic education students. Although no statistically significant difference was found in Computer Attitudes within the age groups, males are found to have more positive attitudes than females.

In a survey study conducted by Morahan-Martin, Olinsky, Alan, and Schumacher (1992), the gender difference in computing is confirmed. The survey was administered to business college students. The researchers found that male students had more experience and skills than females in specific types of computer usage, particularly programming and games. There also were gender differences in the students' attitudes towards computers. Females students were more likely to believe that computer skills would be useful for their careers than males, who were more likely than females to believe that computer skills were important only for careers in computer-related areas. Moreover, male students were found to be more likely to purchase a computer than females students. According to the researchers, the relationship of attitudes to performance is not

certain, but it is possible that these differences in attitudes may affect both motivational achievement in computer-related courses.

In a study of examining the gender differences in attitudes towards computers among high school students, Shashaani (1993) found that although both males and females alike were aware of the value and benefits of computers in daily life, girls showed less interest in learning about and using computers. The survey was conducted in five suburban public schools in Pittsburgh, Pennsylvania. The schools were selected to represent different geographic locations and socio-economic groups. A total of 1,754 students participated in the study. The researcher concluded in her research:

> The results of this study proved our hypothesis that sex differences in attitudes toward computers among high school students still persist. The data obtained clearly indicate that boys more than girls are interested in computing, have high self-confidence in their ability to use computers, and tend to see the computer more as a masculine technology. (Shashaani, 1993, p. 177)

A pioneering comparative study was conducted to investigate the attitudes of Chinese students and Canadian adolescents toward computers by Collis and Williams (1987) in the mid 80s not long after China had opened its contact with western cultures. The gender bias has also been investigated in a cross-culture setting. The researchers of the study found that in both cultures boys, in general, were significantly more positive than girls in their attitudes toward computers and showed higher self-confidence about working with computers.

Makrakis (1992) carried out another cross-cultural study related to attitude toward computers. The subjects involved were 773 Japanese and Swedish ninth-grade school students. The study revealed Swedish students were less agreeable about the belief that computers belong to the male domain and they were more positive towards gender equality in computer competence. In analysis of overall gender effects, the researcher found a homogeneity of the Japanese sample compared to the heterogeneity of the corresponding Swedish sample, supporting the findings in Collis and Williams's study (1987). The research has provided some valuable insights into the relationship between gender and attitudes toward computers with different cultural perspectives. However, the researcher suggests that, due to the limited number of studies and the inconsistencies in the findings, further research is needed.

Although women were widely believed to have more computer anxiety than men, some research results inconsistent with this premise do exist. For example, in a study to develop and validate the Computer Anxiety Rating Scale and evaluate the role of gender in computer anxiety, (Heinssen, Glass, & Knight, 1987) found a weak support for the concern that women are more computer anxious than men. Although the analysis of CARS (Computer Anxiety Rating Scale) scores found that women reported higher levels of computer anxiety, this difference was not significant.

In another study, Morris (1988) used an 8-item Likert-type Computer Orientation Scales (COS) to examine the relationships between age, education, sex, and household income, and attitudes toward computers to assess 380 citizens, aged from 17 to 90, in Indiana. The results showed that sex and

household income had no effect on computer attitudes. Age and education however, showed direct effects on computer attitudes.

With some researchers, studies done at different times and with different populations showed different results with regard to the effect of gender difference on attitudes toward computers. In a study of examining the effects of gender and amount of computer experience on the attitudes of high school and college students, Loyd and Gressard (1984a) found no evidence to indicate differences between gender groups in computer attitudes. Statistical analysis of the study reveals little to suggest that computer attitudes of males and females are different in any respect. However, a study of the similar nature done later by the same researchers (Loyd & Gressard, 1986) produced different results: there was a significant difference in computer attitudes of males and female. However, they contributed the inconsistency to the difference of populations for their studies. In another study done by Loyd, Loyd, and Gressard (1987), gender was also found to be a statistically significant effect, with female students exhibiting more positive attitudes than male students toward the use of computers. The researchers were glad to see the findings opposite to the findings from some earlier studies. They commented:

> Within this population of middle school students, it could be extremely valuable to be aware of this difference in attitudes which seems in the case of computer attitudes to favor females. This is in direct contrast to the tendency of math attitudes to favor males, and it may, therefore, be possible to compensate for the latter by using

computers even more extensively in mathematics curricula at the middle school level. (Loyd et al., 1987, p. 18)

Using 160 undergraduate students as subjects, Colley, Gale, and Harris (1994) conducted a study to investigate effects of gender role identity and experience on computer attitude components. Although the results of the study confirm those of other studies that have found that males had lower computer anxiety, higher confidence and greater liking of computers than females. However, when the effects of prior experience and gender stereotyping were removed , no significant sex difference on these measures remained. The results of this study are supportive of the explanations of some other researchers for the gender discrepancy in attitudes toward computers. The stereotype of male superiority in the computing world is further challenged by study findings from Minnesota Computer Literacy Assessment conducted by the Minnesota Education Computing Consortium (Anderson, 1987). The findings show that high school females performed better than males in some specific areas of programming. For the outstanding computer performance of these females, two possible explanations are offered:

> One is that the Minnesota educational system may offer an advantage for women, and the other is that women in general may acquire special skills with words and structured thinking that provide an advantage for doing in formation systems analysis. (Anderson, 1987, p. 48)

Sanders (1984) suggests that the gender difference of attitudes toward computer stems from stereotypes perpetuated by a socialization process which

motivates boys rather than girls to work with the computer. Some of the social factors Sanders views as being responsible are: (1) computer advertisements and software, which appeal mostly to male audiences; (2) parental attitudes; (3) school logistics, in which computer programs are associated with math class, math teachers and male role models; (4) developmental and behavioral factors that lead boys, being more aggressive, to capture more time in the computer room and girls to view computers as inhuman and computer activities as solitary, and (5) attitudes that associate computers with male activities and therefore, unfeminine. Furthermore, this sex inequity in computer use is not necessarily a result of boys being more successful in computer courses. In two studies conducted by Webb (1985), girls were found to perform as well as boys in computer programming courses.

Gender difference is one of the main focuses in studies that investigate use of and attitudes toward computers. Despite some inconsistencies of findings, many researchers have found that males are more likely to use computers than females and males have lower computer anxiety and higher confidence in using and learning to use computers than females. In fear of females being relegated to the status of second-class citizens in the world of computing (Kiesler et al., 1985) and man-controlling information technology (Hess & Miura, 1985), researchers suggest further studies should be conducted to determine the reasons for these gender differences so that appropriate measures can be taken to ensure that girls can successfully negotiate the culture of computing (Morahan-Martin et al., 1992).

Experience

Studies have suggested that with the exposure to the computer, there is a decrease of computer anxiety. In other words, people's attitudes toward computers become less negative with more experience with computer. Jordan and Stroup (1982) reported a 10% decrease in the number of college students expressing fear about the use of computer after the completion of an introductory data analysis course. In examining age difference in computer anxiety, Dyck and Smither (1994) found that for both young and older age groups, higher levels of computer experience were associated with lower levels of computer anxiety.

Powers (1973) noted a similar significant decrease in anxiety as a function of continued exposure to computer use. The subjects used in his studies are male volunteer subjects who were selected and assigned to three categories: (1) no previous computer exposure; (2) minimal computer exposure; and (3) advance computer exposure. The research investigated (1) the relation between user anxiety and the utilization of computer facilities; (2) the effect of "hands on" computer experience on anxiety levels of operators; and (3) the effect of prior computer exposure on anxiety levels. Results indicated that regardless of previous exposure, subjects experienced anxiety, but that continued "hands on" manipulation reduced anxiety below the pre-exposure level. Similarly, Morrow, Prell, and McElroy (1986) concluded in their study that familiarization and experience with computers facilitates behavioral changes and may reduce levels of computer anxiety.

Massoud (1991) used a survey to asses the attitudes and knowledge of 252 adult basic students in his study. Although no significant differences

between age and the attitudes toward computers were found in the study, significant differences between computer knowledge and attitude toward computer were obtained. However, the researcher mentioned in the study that more attention and further research was needed to explore whether the positive attitudes result in successful computer use.

In a study on attitudes toward computers, Loyd & Gressard (1984a) found that the amount of computer experience was related to computer attitudes, with more computer experience corresponding to more positive computer attitudes. In a later study, computer experience was found to be significantly related to only two of the attitudes studied: anxiety and usefulness.

> In the present study, no statistically significant relationship between experience and confidence or between experience and liking was found. However, this lack of a significant finding does not represent a direct contradiction of what earlier studies have shown, because the trends of the means (although not statistically significant) do show an increase in positive attitudes for confidence and liking with an increase in amount of experience. (Loyd and Gressard, 1986, p. 309)

In 1986, Koohang (1986) investigated the effects of age, gender, college status, and computer experience on three attitude subscales toward Library Computer Systems (LCS). The subjects were 60 students who were using LCS in Morris Library at Southern Illinois University, Carbondale, during the fall semester of 1985. The instrument used in the study was the CAS designed by Loyd and Gressard (1984a). Analysis of variance was performed to determine significant

differences between the dependent and independent variables. Computer experience was found to be significantly related to computer anxiety and computer liking, although he suggested that the amount of computer experience should be given a special attention for further study, so that it would be possible to determine the amount of computer experience that leads to more positive computer attitudes.

Later in a similar study, Koohang and Byrd (1987) found the level of enthusiasm about computer use increases with the individual teacher level of computer experience in a study involving 51 students who were enrolled in a library course in Southern Illinois University at Carbondale. The students were from various fields in education, including elementary or secondary education, special education, and agricultural education. The study divided prior computer experiences into five levels. The finding of the study was in agreement with the results reported by Loyd and Gressard (1984a) and his own earlier studies (Koohang, 1986).

In another study, Koohang (1987) also found that computer experience was significantly related to more positive attitudes toward the perceived usefulness of computers. In this study, attention was also paid to the nature of the experience with computers. The study divided the nature of the computer experience into four levels:

Level 1: observations only, and/or computer games

Level 2: experience with word processing and data entry

Level 3: workshop an/or an introduction to software evaluation

Level 4: programming and/or instructional applications taken as credit hours at the university level. (Koohang, 1987, p. 146)

The results for nature of the computer experience showed a significant difference on overall subscales, which indicated that the nature of computer experience was significantly related to more positive attitudes. Subjects who were exposed to computer programming and/or instructional applications of computers had more positive attitudes toward the use of computers" (Koohang, 1987). However, this seems to be somewhat contradictory to Giolroy and Desai's (1986) observation which indicates that for persons with high anxiety, a word-processing course was more effective in reducing their anxiety, than a course in computer programming.

Levin and Gordon (1989) investigated 222 middle class pupils in grades eight through ten in a Tel Aviv high school prior to computer instruction in school. The instrument used in this study was an attitude questionnaire designed to measure affective and cognitive attitudes toward computers. The results showed that prior computer exposure (in particular, having a computer at home), had a strong impact on attitudes toward computers. They reported in the study:

> From the distinguishing variables in the first function, we see that pupils who own computers feel a strong need for computers in their lives: perceive computers as being capable of performing cognitive/creative activities: and are more motivated to become familiar with computers than are pupils who do not have computers. They are less inclined to view the computer as a medium of instruction, and are more stereotyped in their views about who is

capable of working with computers. (Levin & Gordon, 1989, p. 81-82)

However, the researchers pointed out that they did not suggest that positive attitudes toward computers was caused by simply owning a computer. The possible cause of their positive attitudes toward computers, according to them, could be the positive attitudes of their parents.

Seventy-four undergraduates students voluntarily participated in a study conducted by Harrington, McElroy, and Morrow (1990). The study explored the nature of the relationship between computer anxiety and computer use within a training context. Computer anxiety was measured using a 26-item, six-point Likert-like computer anxiety index. In the study, according to the researchers, "The only non-personality correlate typically viewed as an antecedent of computer anxiety is previous experience with, or knowledge of computers." (Harrington, McElroy, & Morrow, 1990, p. 355) The study also found that, in addition to previous experience with computers, the type of training had an effect on computer anxiety.

Honeyman and White (1987) targeted the population made up by teachers and school administrators in their investigation of the effect of such factors as age, gender, previous experience with computers, and time in contact with a computer on the levels of computer anxiety. The data for the study were collected over a two-year period from the participants. The results of the study showed that factors of gender and age did not have an effect on the levels of anxiety. However, the variable indicating previous level of experience was shown to have a significant relationship with initial levels of anxiety level.

Furthermore, changes in those levels of anxiety were reported during the course of the study, which indicated that the lowering of an individual's state of anxiety level occurred over time, and the timing of such change differed with the level of previous experience of the participant.

The fact of taking some kind of courses related to computer have been found to be related to one's attitudes toward computers by some studies. For example, Savenye's (1993) study investigated how attitudes among preservice teachers were influenced by participation in a computer literacy course. In the study, the researcher found that participation in the course appeared to have improved students' attitudes. The researcher observed:

> Students' responses indicated that they like computers more at the end of the course, had less anxiety about using computers, had more confidence in their ability to learn about and use computers, and generally valued computers more for education and for society in general. (Savenye, 1993, p 7)

In Jordan and Stroup's study (1982), females were found to be more likely to be fearful of computers than males. The study showed that there was a drop in the percentage of students who reported being afraid to use the computer before the course and after the course, from 22% to 12%. The researchers concluded:

> The most obvious conclusion from the present study was that exposure to computer terminal use is initially an anxiety producing situation that reflects itself in changes in basic physiologic activity. In addition, continued exposure, in

conjunction with terminal manipulation, reduces anxiety below the pre-exposure level. (Jordan & Stroup, 1982, p. 5)

Okebukola, Sumanpouw, and Jegede (1992) examined how experience in computer usage influenced the manifestation of computer anxiety and computer interest in high school students. Data for the study were collected fro 426 students in Western Australia. Students were put into four groups according to their experience with computers: a group of students had never used a computer; the first group of students had just finished their first class in computer studies, the second group was a class of high school computing students that had two years of computing experience, and the last group had three years of computing experience. The results of the study showed that "the mean anxiety scores of the four groups of students was fond to differ significantly with a clear gradation in the decline of anxiety level with increase in the number of years of experience." (Okebukola, Sumampouw, & Jegede, p. 225)

In the study of Colley et. al. (1994), the effects of prior experience and gender stereotyping upon the computer anxiety, confidence and liking of 144 students who had just started their studies at university were examined. Having taken a course and the number of years of computer experience were the factors being investigated so as to find their effects on the students' attitudes toward computers. The results from this study showed that experience showed difference patterns of association with the three computer attitude components. However, the researchers also found that experience was heavily influenced by gender stereotyping.

Some researchers have found that the fact of owning a computer at home has an influence on students' attitudes toward computers. Levin and Gordon's (1989) study examines sex differences in computer exposure and attitudes toward the computer among junior and senior high school students prior to computer instruction in school. The major finding of the study suggests that prior computer exposure (in particular, having a computer at home) has a stronger influence on attitudes than does gender. Girls who own computers are closer to boys who own computers in their perceptions of the computer's functional capabilities; regardless of sex, pupils who have computers are more inclined to view them as capable of performing cognitive/creative activities than are pupils who do not own computers. They are also more motivated to become familiar with computers, and feel a stronger need for computers in their lives than those who don't won computers.

Geissler and Horridge (1993) surveyed 790 university students with respect to their current knowledge of computers and the level of knowledge the students would like to have. The researchers found in the study that computer familiarity and use indicated a higher level of current knowledge and commitment to learning more about computers. The researchers concluded that:

> It is clear from the results of this study that having taken a high school or university computer class or owning a computer strongly influences a student's self-perceived level of current knowledge about computers and the student's commitment to learning more about them. (Geissler & Horridge, 1993, p. 363)

The attitudes of 328 British Secondary School children towards computers were examined in a cross-sectional survey (Martin, 1991). Factors were investigated in the study included gender of the subjects, courses studied (computer related/non-computer related), and availability of a home computer. The researcher found, contrary to their expectations, no relationship between attitudes and who owned the computer, length of time having the computer and average use per week. " Instead of the results show that those who had had a previous computer held more favorable attitudes. This may relate to a motivational factor, in that those who have had previous computers may be more interested in computing" (Martin, 1991, p. 193).

However, the influence of owning a home computer on students' attitudes toward computer was absent in a study by Underwood, Billingham, & Underwood, (1994). In this study, the researchers investigated the relationship between the exposure to electronic technologies and classroom disposition and performance. Although the students' successful performance at school was found to be correlated with the out-of-school computer use, no evidence was found to support the development of a more positive attitude to school IT (Information Technology) by more experienced users.

Hignite and Echternacht (1992) investigated the relationships between the computer attitudes and computer literacy levels of some prospective teachers. The Computer Attitudes Scales (CAS) was used to assess four factors associated with attitudes toward computers, and the Standardized Test of Computer Literacy (STCL) was used to assess the level of computer literacy of the participants of the study. According to the researcher, the results of the study showed that the

relationship between computer attitudes and computer literacy was neither direct nor simple. They concluded in the study that knowledge of a prospective teachers' level of computer literacy provided no evidence of that person's corresponding attitudes toward computers, and conversely, computer attitudes could not be used to predict the existence of corresponding levels of computer literacy.

It seems less controversial as to the effect of experience with and exposure to computer on the attitudes toward computer. Results of many studies show that factors such as the experience of taking some kind of courses related to computer, having learned or used computers, even owning a computer at home have been found by many researchers to have an effect on people's attitudes toward computers, either their computer anxiety being reduced, or taking a more positive attitudes about computers.

Other Factors

In addition to factors listed above, other factors have also been investigated by researchers in order to determine their possible effects on the attitudes toward computers. Koohang (1986) has investigated college status as a possible factor affecting attitudes toward computers. The subjects were undergraduate and graduate students majoring in various subjects. He used the Computer Attitude Scale designed by Loyd and Gressard (1984b) to measure the students' attitudes toward computers in the study. As a result of the study, the researcher found that college status did not make a significant difference on the computer subscales. However, in a study Koohang conducted with Byrd

(Koohang & Byrd, 1987) that examined the levels of the independent variables of gender, college level, prior computer experience, and familiarity with computer keyboarding on attitudes toward the usefulness of the Library Computer System (LCS), a significant difference was reported for college level. Seniors tended to have more positive attitudes toward the usefulness of the LCS. Moreover, the study found that familiarity with computer keyboarding made a significant difference on attitudes toward the usefulness of the LCS. The more highly students rated their keyboarding skills, the higher their perceived attitudes toward the usefulness of the LCS.

Griswald (1985) examined the relationship between academic major and computer attitude. The study found that education majors were less positive about computers than were business majors when he used a 20-item questionnaire to investigate college students' (207 majoring in education and 210 majoring in business) attitudes about computers. For 18 of 20 items focusing on areas such impact on society, health care, and educational applications, business majors attributed greater value to computers in providing beneficial effects than did education majors. Interestingly, 85.5% of education majors believed that computers will improve education, yet only 53% believed a computer would make them a better teacher. According to the researcher, this suggests that many teachers may assert that computers are generally useful but fewer are willing to use computers in their own classrooms.

Boone and Gabel (1994) conducted a study with the tracking of computer attitudes of 150 undergraduates over along period of time. The results of the study show that these students exhibited a wide range of attitudinal change, and

the kind of courses taken by the students, in addition to other factors, were found to be correlated with attitudes towards computers. They reported that:

> The analysis of the data indicates significant differences among the surveyed students' attitudes toward computers as a function of a few of the variables. Significant differences were noted as a function of future teaching specialization, completing high school algebra, high school calculus, and a college physics class. (Boone & Grabel, 1994, p. 37)

Class size was the factor that Gunter (1994) examined in his study to investigate students' computer attitudes. Sample for the study consisted of 317 students enrolled in 15 sections of computer literacy courses at a southern university in the Fall of 1993. Students were administered the CAS (Loyd & Gressard, 1985) as a pretest at the beginning and as a posttest at the end of a 16-week semester. The dependent variables were the four scores on the subscales for the posttest on computer anxiety, computer confidence, computer liking, and computer usefulness. The independent variable was class size. Classes with fewer than 45 students were considered small and classes with 45 or more students were considered large. The result of the study shows that there was a statistically significant difference between class size and student attitudes on the computer usefulness subscale. However, there was no statistically significant difference between class size and student attitudes on computer anxiety, computer confidence, and computer liking subclass. Students in small classes did not have lower anxiety, higher confidence, or like computers more than students in larger classes after completion of a computer literacy course.

Todman and Dick (1993) conducted a study to investigate the relationship between pupils and teacher attitudes to computers within the primary school. A questionnaire, which included three sub-scales (fun, ease of use, usefulness), was distributed to 721 children in different levels of classes of some randomly selected primary schools. The results of the study show that at the P3 level, the children's attitudes appeared to be independent of those of their teachers. However, at the P5 and P7 levels, children's attitudes was related to teachers' attitudes.

Morris's study (1988) examined the relationship between age, education, sex, and household income, and attitudes toward computers. However, the results of the study show that household income demonstrated virtually no direct effect on the COS (Computer Orientation Scale), a instrument used in the study to measure the attitudes toward computers.

Summary

Attitudes toward computers will affect the acceptance and learning of computers. Many researchers agree that computer anxiety will negatively influence students' computer learning process. Experience, age and gender are main factors that are related to attitudes toward computers. These factors were most frequently investigated by researchers, but there are still some other factors that can have an influence on the attitudes toward computers. Although there are some studies that have investigated students' attitudes toward computers, there is a lack of research that investigates international students' attitude toward computers.

Several cross-cultural studies have been done to investigate the attitudes of students toward computers. Martin and Heller (1992) studied the attitudes toward computers of two samples of 8-12 year old American and Soviet children. Makrakis's (1992) cross-cultural study looked at Japanese and Swedish ninth-grade students from two different cultures. Collis and Williams (1987) investigated the attitudes of adolescents from Canada and China. Although these studies have examined the attitudes of students other than those of American students, the focus of the studies were on the comparison and contrast between the computer attitudes of students from different cultures. Unlike those foreign students, who were studying in their native counties, the Chinese students involved in the study are currently studying in the United States.

With a review of the related literature, there is an apparent lack of studies investigating the attitudes toward computers of international students here in the United States. Therefore, the current study will provide valuable information in the related field of research. As shown from the literature review, attitudes toward computers may also be associated with various kinds of factors, both external and internal. However, the current study will focuses on only three factors, the difference of gender, the difference of age, and the amount of the Chinese students' experience the Chinese students have had with computers.

CHAPTER III

METHODOLOGY AND PROCEDURES

I. INTRODUCTION

The purpose of the current study was to investigate the attitudes of Chinese students at The University of Tennessee, Knoxville toward computers and to explore the possible effects of gender, age and computer experience on these students' attitudes toward computers. The following four questions were examined by the current study.

1. What are the attitudes of the Chinese students on campus of The University of Tennessee toward computers in general?
2. What are the differences among different age groups of the Chinese students on their attitudes toward computers?
3. What are the differences among the groups of Chinese students with different levels of computer experience on their attitudes toward computers?
4. What are the differences between male and female Chinese students on their attitudes toward computers ?

This chapter is a description of the methodology and procedures utilized in the current study. It consists of three parts: 1. A description of the study population; 2. A description of the survey instrument; 3. A description of the procedures of gathering data and data analysis; and 4. Summery.

II. POPULATION

The participants of the study consisted of Chinese students studying at The University of Tennessee, Knoxville. These Chinese students were from mainland China, excluding those Chinese students from Hong Kong, Taiwan, and any other places in the world. According to the latest information from the Center for International Education, there were 98 Chinese students from mainland China, excluding visiting scholars and post doctoral students, enrolled at The University of Tennessee, Knoxville. For all these students, their native language was Chinese and English was their second language.

Permission to conduct the research was obtained from the University of Tennessee's Committee for Protection of Human Subjects.

III. INSTRUMENTATION

The research design used for the current study was a survey research. The survey used for the study consists of two parts: 1. Computer Attitude Scale; 2. Demographic questionnaire

Computer Attitude Scale

The Computer Attitude Scale was the main instrument (Appendix F) used in the current study. The Computer Attitude Scale was designed by Drs. Loyd and Gressard (1984b). The instrument has been the most widely used survey

instrument in many studies in which the computer attitudes were measured. It was utilized in the study to measure Chinese students' attitudes toward the computer.

The Computer Attitude Scale is a Likert-type instrument which consists of 40 items, divided into four 10-item sub-scales: computer anxiety, computer confidence, computer liking, and computer usefulness. Positively and negatively worded statements are presented in the survey. Examples are: "Computers do not scare me at all," "Working on a computer would make me very nervous," and "Once I start working on the computer. I find it hard to stop." In response to the statements, participants were required to indicate which one of the four ordered responses (Strongly agree, Agree, Disagree, Strongly disagree) with most closely represented their attitudes toward the computer.

The reliability and validity of the subscales of the instrument was determined by internal consistency measures (coefficient alpha) and factor analysis. The coefficient alpha reliability of the four subscales (computer anxiety, computer confidence, computer liking, computer usefulness) are .90, .89, .89, and .82, respectively (Loyd and Gressard, 1986).

Permission for using the Computer Attitude Scale as the instrument of the current study was granted by Drs. Loyd and Gressard, the authors who developed the instrument. The authors of the instrument also sent to the researcher a copy of the latest version of The Computer Attitude Scale and explained the scoring and coding methods in the return letter.

The scoring strategy results in higher scores on the computer anxiety subscale corresponding to lower anxiety, and higher scores on the confidence, computer liking, and computer usefulness subscale corresponding to higher

confidence, liking, and computer usefulness. For questions 1, 3, 4, 6, 9, 11, 12, 14, 16, 17, 19, 22, 25, 27, 28, 30, 33, 35, 36, 38, the responses were coded as: Strongly Agree = 4, Agree = 3, Disagree = 2, and Strongly Disagree = 1. For questions 2, 5, 7, 8, 10, 13, 15, 18, 20, 21, 23, 24, 26, 29, 31, 32, 34, 37, 39, 40, the responses were coded as : Strongly Agree = 1, Agree = 2, Disagree = 3, and Strongly Disagree = 4. In general, a higher score corresponds to a more positive attitude toward computers. For each subscale, the maximum score was 40 points, and the minimum score was 10 points. For the whole scale, the maximum score was 160 points and the minimum was 40 points.

Demographic Questionnaire

A demographic questionnaire was added to the Computer Attitude Scale by the researcher, which contains only three questions. These questions were expected to provide information regarding subjects' gender, age, and their experience with computers. All these factors were examined in the study as to their effects on the students' attitudes toward computers. In the questionnaire, participants were first required to provide the information on their gender. Then, they were required to fill in a blank with the information on their age. Finally, they were required to choose one of the five pre-defined categories describing their experience with computers. The five pre-defined categories include: No computer experience, less than one year's computer experience, one year's computer experience, two year's computer experience, and three or more than three years' computer experience.

To ensure the complete comprehension of the instrument used in the study, the researcher translated the questionnaire , including Computer Attitude Scale and the demographic question items, into Chinese (Appendix G). Although the cover letter (Appendix F) was written in English, the survey questions were entirely in Chinese.

IV. PROCEDURES

Distribution of Survey

The researcher obtained the information on the number of Chinese students from the Center for International Education (CIE) at The University of Tennessee. The researcher was told that the mailing addresses of the Chinese students enrolled at The University of Tennessee could not be provided. However, CIE agreed to send out the letters to all the Chinese students for the researcher without disclosing the students' mailing addresses.

With the help of the Center for International Education, survey forms were sent out by mail to all the Chinese students who did not live at the Laurel Married Student Housing where the researcher lived. With the survey questionnaire, a cover letter (Appendix F) was included to explain briefly the purpose of the study and how they should work on the questionnaire. It also informed the respondents that their participation of the study was voluntary and their responses would be kept confidential. According to CIE, a note from CIE was also included in the letter, explaining that the students' addresses were not disclosed to the researcher. A return envelope and a unused stamp were also

provided with the questionnaire. The researcher distributed the survey forms, in person, to those Chinese students who lived at the Laurel Married Student Housing. The researcher explained to the Chinese students the nature of the study and that they could participate in the study on voluntary basis.

Within three weeks after the questionnaires were sent out to the Chinese students by the Center for International Education, 68 questionnaires were returned, both from the Chinese who received the mailed survey forms and those who received survey forms distributed by the researcher. The return rate of the questionnaire was 69.38 %. However, one returned questionnaire was not filled out, and the other questionnaires had too much data missing. These two questionnaires were not considered to be useful for the current research, so they were discarded by the researcher. Therefore, the valid survey return rate of the study was 67.35 %. The researcher considered this as adequate for the data analysis and report, so he decided not to do a follow-up mailing.

Procedures of Data Analysis

1. First Data Entry

From 66 returned questionnaires, the demographic information of the respondents such as gender, age, and their experience with computers were entered into a statistics computer program, SPSS. The information was used for the description of the participants of the study. It was expected that data analysis would yield such results as the mean scores of every subscale for each individual Chinese students, the frequency distribution of the participants' gender, age, and

computer experience. The descriptive charts and tables are presented in Chapter Four.

In the first data entry, the score of every individual question from every respondent was entered into the program. The items of the survey was scored according to the following:

For questions 1,3,4,6,9,11,12,14,16,17,19,22,25,27,28,30,33,35,36,38, "Strongly Agree = 4", "Agree = 3", "Disagree = 2", and "Strongly Disagree = 1". These were positively worded questions, so the higher point corresponds to more positive attitudes.

For questions 2,5,7,8,10,13,15,18,20,21,23,24,26,29,31,32,34,37,39,40, "Strongly Agree =1", "Agree = 2", "Disagree = 3", "Strongly Disagree = 4". These were negatively worded statements, and the score was coded inversely, so the higher point also corresponds to more positive attitudes. In general, the questions were coded this way so that the higher score represented more positive computer attitudes.

Since The Computer Attitude Scale consists of four sub-scales, (i.e. computer anxiety, computer confidence, computer liking, and computer usefulness), the questions belonging to these four sub-scales were labeled differently so that the total score of each sub-scale for every participant could be summed and their mean scores could be calculated. The table of output of the SPSS statistics program is presented in Chapter Four. Four subscores for each respondent were obtained from the following questions:

Anxiety: 1,5,9,13,21,25,29,33,37

Confidence: 2,6,10,14,18,22,26,30,34,38

Liking: 3,7,11,15,19,23,27,31,35,39

Usefulness: 4,8,12,16,20,24,28,32,36,40

2. Second Data Entry

In addition to the demographic data, the results of the first data entry, including mean scores of subscales and the total score of the Computer Attitude Scale for each respondent, were entered into the SPSS computer program. With the second data entry, part of the demographic data of the respondents was entered differently as compared with the first entry. The age information provided by the respondents was now grouped into three categories. The groups were organized in the following way: Group One (19 years old to 30 years old); Group Two (31 years old to 35 years old); and Group Three (36 years old to 41 years old). The age intervals were selected for dividing age groups so that there would be no great discrepancy in terms of the number of participants among the groups.

The data were organized in a way that all four research questions could be answered. Four separate analyses of variance (ANOVA) were conducted so that the differences of means between groups could be investigated. The dependent variables were computer attitude subscales (computer anxiety, computer confidence, computer liking, and computer usefulness). Gender, age, and the Chinese students' prior computer experience were the independent variables. When a significant difference was found among groups of more than two, as was the case with computer experience groups, a follow-up procedure was conducted so as to find out where the significant differences were among the groups. However, when no significant difference was found among groups, as was the case with age groups, no further analysis was pursued. In addition to the possible

effect of each independent variable (gender or computer experience) on the dependent variables (computer attitudes), a two-way ANOVA was conducted to examine the interaction of two independent variables. The results of the data analysis appear in Chapter Four.

Follow-up Data Analysis

In order to find out where the significant differences were among the groups divided by the independent variables experience, a follow-up analysis of variance was conducted. The analysis of variance was conducted between pairs of computer experience groups on four computer attitude subscales (computer anxiety, computer confidence, computer liking, and computer usefulness).

In order to rule out the possible interfering effects of computer experience when gender difference was examined, and the possible interfering effects of gender when computer experience difference were examined, a set of follow-up analysis of variance were also run to test the effects of these interfering factors. To make sure there were enough respondents in each experience group, the respondents were divided into two groups, those who had no or less than three years' computer experience and those who had three or more than three years' computer experience. First, a set of analysis of variance was run among male and female groups on four computer attitude subscales ,and then a set of analysis of variance was run among less experienced and most experienced groups on four computer attitude subscales.

Summary

The research design used for the current study was a survey research. The primary part of the survey was the Computer Attitude Scale designed by Drs. Loyd and Gressard. Survey questionnaires were distributed to the Chinese students at the University of Tennessee, Knoxville in order to get information on their attitudes toward the computer and the demographic data. Sixty-eight out of 98 distributed survey questionnaires were returned by the participants of the study with a valid return rate of 67.35%. Data were processed and analyzed with a SPSS statistics computer program so that the questions raised by the current study could be answered.

CHAPTER IV

DATA ANALYSIS

I. INTRODUCTION

This chapter presents the results from the analysis of data based on the information that was collected from the 66 out of 68 returned questionnaires. The purpose of the current study was to investigate the attitudes of Chinese students at The University of Tennessee, Knoxville toward computers and to explore the possible effects of gender, age and computer experience on these students' attitudes toward computers. The data were analyzed using a SPSS computer statistics program. Two returned surveys were discarded because one questionnaire was not filled out and the other had too much missing data. All the returned surveys came from the subjects of the study, who were Chinese students currently enrolled at The University of Tennessee, Knoxville.

The chapter is organized into three sections: Introduction; Results of Data Analysis, which includes four subsections: (1) Description of the respondents, (2) Means of Computer Attitude Scale and subscales, (3) Comparison of Means among Subgroups of Respondents, (4) Summaries of the three analysis of variance procedures, and (5) Analysis of variance between particular Computer Experience Groups; Discussions and Conclusion.

II. RESULTS OF DATA ANALYSIS

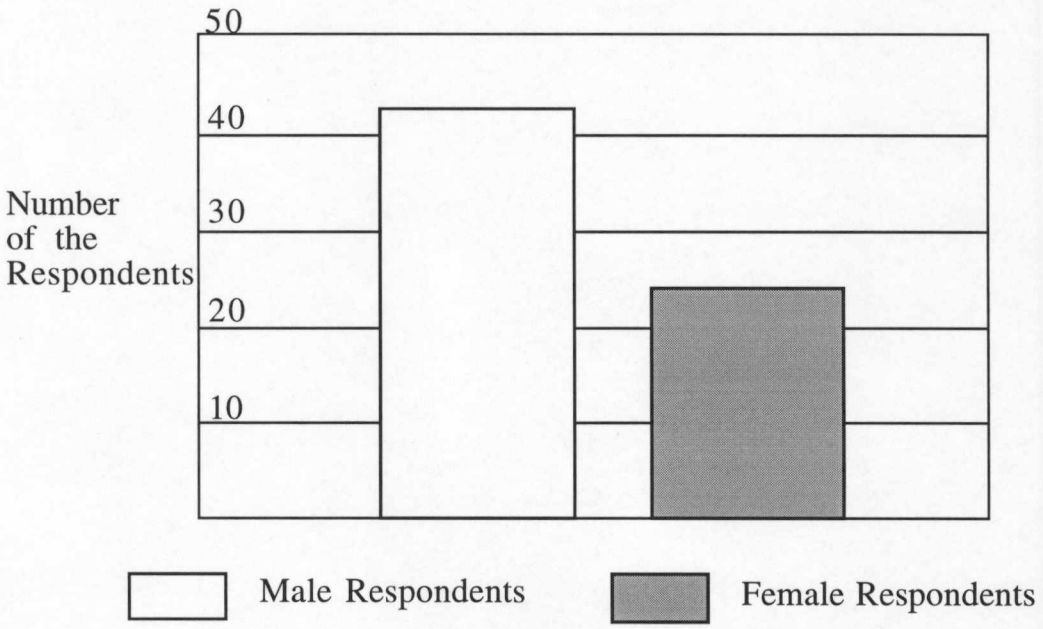
(1) Description of the Respondents

Gender : According to the demographic information from the returned surveys, there were 42 male respondents (approximately 63.63 % of the total number of respondents) and there were 24 female respondents (approximately 36.36 % of the total number of respondents). The majority of the respondents were male Chinese students who were studying at The University of Tennessee. The frequency distribution of the respondents by gender is presented by Figure 1.

Age : Collected data on the age distribution showed that the youngest participant was 19 years old, and the oldest participant was 41 years old. The

Figure 1

Frequency Distribution of the Respondents by Gender

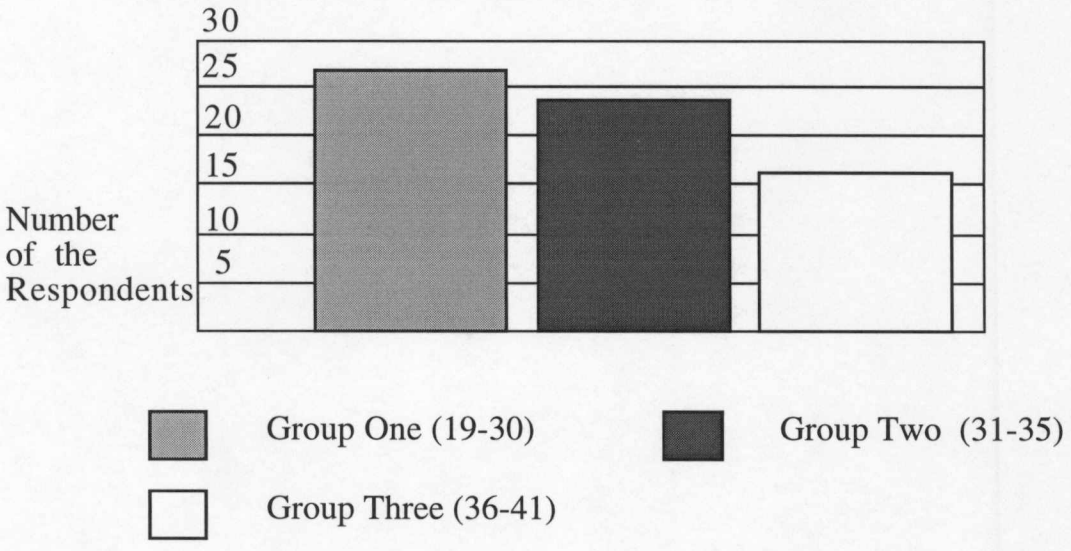


average age of the participants was 32. The mode of the distribution was 30. Figure 2 shows the results of the second data entry, when the participants' information on age was put into three groups. Group One consists of those who were from 19 years old to 30 years old (27 respondents, approximately 40.9 % of the total number of respondents). Group Two consists of those who were from 31 years old to 35 years old (23 respondents, approximately 34.8 % of the total number of respondents). Group Three consists of those who were from 36 years old to 41 years old (16 respondents, approximately 24.24 % of the total number of respondents). Figure 2 shows the age groups of participants organized by the researcher for further data analysis.

Computer Experience : On the questionnaire, the years of computer experience of the respondents were divided into five categories: (1) none, (2) less

Figure 2

Three Groups Divided by Age of the Participants



than one year, (3) one year, (4) two years, (5) three years or more. The results of the first entry of the collected data show that the group of respondents were relatively experienced computer users, since the overwhelming majority of the participants had three or more than three years of computer experience. There were only two out of 66 participants who reported having no previous computer experience (approximately 3 % of the total number of respondents). Five participants had less than one year's computer experience (approximately 7.57 % of the total number of respondents). There were eight participants who had only one year's computer experience (approximately 12.12 % of the total number of respondents). Ten participants reported that they had two years' computer experience (approximately 15 % of the total number of respondents). Finally, a total of 41 participants had three or more than three years' computer experience (approximately 62.12 of the total number of respondents). Figure 3 reflects the participants' experience with computer.

Computer Experience by Gender : The percentage of the most experienced computer users was higher among male respondents than among female respondents. Nine out of 24 (37.5%) female respondents had three or more years' computer and 32 out of 42 male participants (78%) had three or more years' computer experience. Figure 4 presents a cross-reference frequency distribution of gender and computer experience among the participants of the Chinese students.

Computer Experience by Age : There were only two participants who belonged to Computer Experience Group One (those who did not have any

Figure 3

Respondents' Experience with Computers

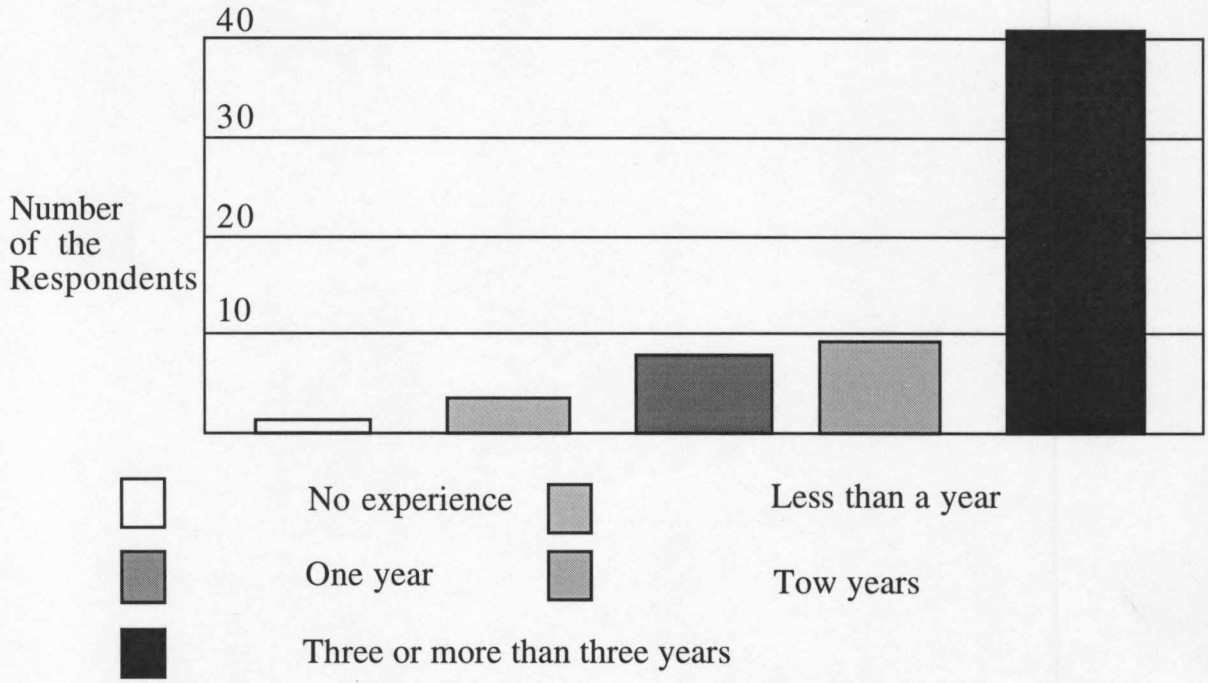
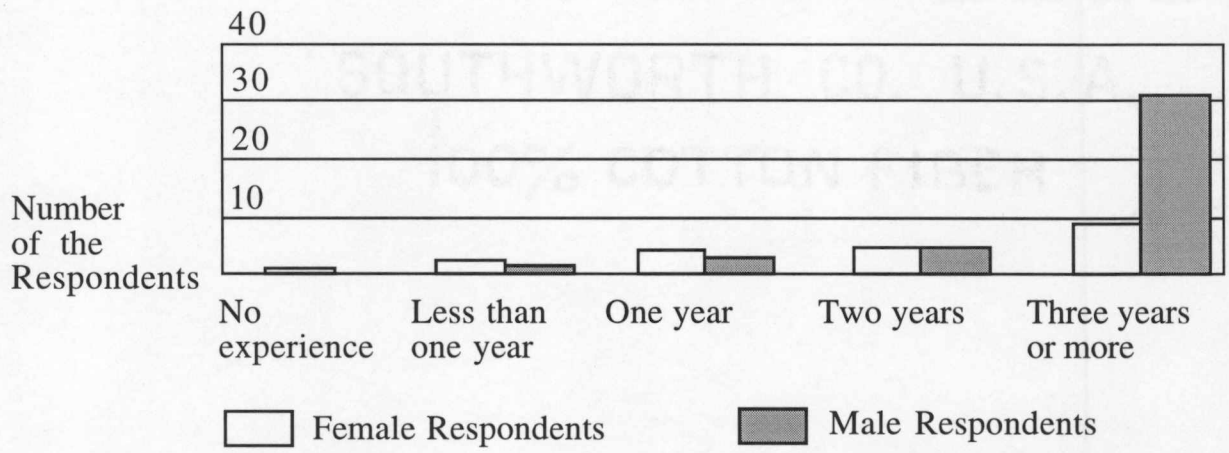


Figure 4

A Cross-Reference Frequency Distribution of Computer Experience by Gender



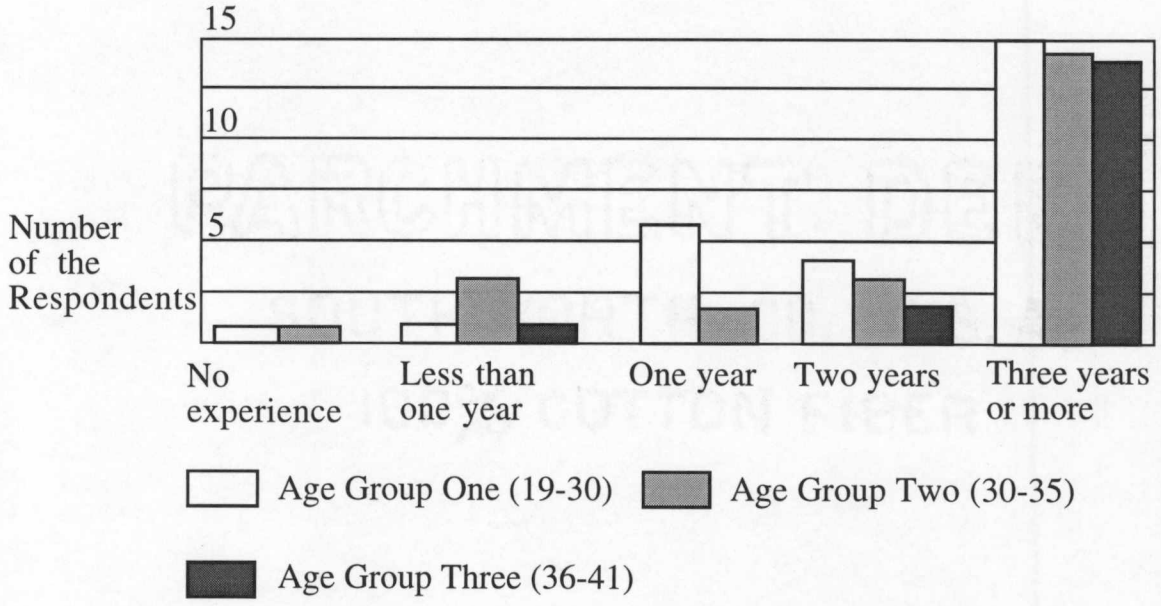
computer experience), one from Age Group One (19 - 30 years old) and the other from Age Group Two (31 - 35 years old). Four respondents fell into Computer Experience Group Two (those who had less than one year's computer experience), one from Age Group One, three from Age Group Two, and one from Age Group Three (36-41 years old). Out of eight respondents in Computer Experience Group Three (those who had one year's computer experience) , six of them were from Age Group One and two of them from Age Group Two. Respondents in Computer Experience Group Four had two years' computer experience. In this category, four participants were from Age Group One, three from Age Group Two, and two from Age Group Three. Students with three or more than three years' computer experience were in Computer Experience Group Five. Fifteen of the participants with the most computer experience were from Age Group One, 14 from Age Group Two, and 13 from Age Group Three. Fifty-five percent of the participants from Age Group One were in the most experienced computer users, while 60.9 % of the participants from Age Group Two, and 81.3 % from Age Group Three, respectively. Figure 5 shows a cross-reference distribution of computer experience by age groups.

(2) Computer Attitudes in General

This study considered Chinese students' computer attitudes as measured by the survey instrument developed by Drs. Loyd and Gressard (1984b). The scoring strategy of the instrument results in higher scores on the computer anxiety subscale corresponding to lower anxiety, and higher scores on the

Figure 5

A Cross-Reference Frequency Distribution of Computer Experience by Age Groups



computer confidence, computer liking, and computer usefulness subscales corresponding to higher confidence, liking, and usefulness. Thus, a higher total score reflects more positive computer attitudes.

With the second data entry, the output reveals the means of each subscales of computer attitude scale and total mean score of computer attitudes for the entire respondent group. Table 1 shows the result of the data analysis.

Table 1. shows that the mean of total scores for the entire group is 33.96. With the maximum score of 40 points for the Computer Attitude Scale, the mean score of 33.96 for the entire group of respondents is rather high, which means that the Chinese students' attitudes toward computers were fairly positive. The

Table 1

Means of Computer Attitude Scale and four subscales for the Entire Group

	M	SD
Computer Anxiety	31.76	4.70
Computer Confidence	30.50	4.68
Computer Liking	29.97	5.04
Computer Usefulness	33.95	4.22
Total Scores	33.96	4.22

highest mean score is in the area of Computer Usefulness subscale, and the lowest mean score is in the area of Computer Liking subscale. Among the four subscales, the relatively high mean score for the area of Computer Usefulness shows that most of the respondents had more positive attitudes toward the computer in terms of its usefulness. With the narrowest range between two extreme scores (21), compared with the score ranges in other areas (24 for Computer Anxiety, 25 for Computer Confidence, and 24 for Computer Liking), the opinions of respondents toward the computer as to its usefulness vary relatively less compared with those in other areas.

3) Means of Subscales by Gender, Age, and Computer Experience

The analysis of the collected data yielded the means of the subscales (Computer Anxiety, Computer Confidence, Computer Liking, and Computer Usefulness) specified by each independent variable (gender, age, and computer

(experience), which is presented in Table 2, Table 3, and Table 4. Table 2 shows the means of the computer attitude subscales (Computer Anxiety, Computer Confidence, Computer Liking, and Computer Usefulness) for two gender groups.

In Table 2 on each subscale, scores range from 10 to 40. For the Computer Anxiety subscale, the mean scores in every subscale obtained by male respondents were higher than those obtained by female respondents. Male respondents showed a lesser degree of anxiety (with a mean score of 32.61 compared with 30.25 achieved by female respondents), a higher confidence (with a mean score of 31.69 compared with 28.41 achieved by female respondents), and higher degree of liking (with a mean score of 31.21 compared with 27.79 achieved by female respondents). In the subscale of Computer Usefulness, there was only approximately one point difference between the means of male and female groups with a higher mean score for male respondents, which means there

Table 2

Means of Computer Attitude subscale by Gender

	Male		Female	
	M	SD	M	SD
Computer Anxiety	32.61	3.81	30.25	5.74
Computer Confidence	31.69	3.48	28.41	5.76
Computer Liking	31.21	4.04	27.79	5.93
Computer Usefulness	34.26	3.64	33.42	5.13

was not much gender difference in terms of the respondents' view on the usefulness of the computer.

Table 3. shows the means of the computer attitude subscales (Computer Anxiety, Computer Confidence, Computer Liking, and Computer Usefulness) for the three groups of respondents categorized by their age. Table 3 shows that the mean scores in every subscale obtained by different Age Groups are different, but the difference are not great. In the area of Computer Anxiety, the highest mean score was achieved by Age Group Three (36-41) years old) and the lowest mean score was achieved by Age Group Two (31-35) years old). In the area of Computer Confidence, the highest mean score was achieved by Age Group Three and the lowest mean score was achieved by Age Group Two. In the area of Computer Liking, the highest mean score was achieved by Age Group Three and the lowest mean score was achieved by Age Group One (19-30). In the area of Computer Usefulness, the highest mean score was achieved by Age Group Two and the lowest mean score was achieved by Age Group Three.

Table 4. shows the means of the computer attitude subscales (Computer Anxiety, Computer Confidence, Computer Liking, and Computer Usefulness) for the five groups of respondents categorized by their computer experience. Table 4 shows that the mean scores in every subscale obtained by different Computer Experience Groups. In the area of Computer Anxiety, the highest mean score was achieved by Experience Group Five (three or more than three years' computer experience) and the lowest mean score was achieved by Experience Group One (no computer experience) In the area of Computer Confidence, the highest mean

Table 3

Means of Computer Attitude Scale Scores by Age

	Group One (19-30)		Group Two (31-35)		Group Three (36-41)	
	M	SD	M	SD	M	SD
Computer Anxiety	32.04	5.1	30.61	5.16	32.94	2.82
Computer Confidence	30.63	4.90	29.35	5.21	31.94	3.02
Computer Liking	29.85	5.59	28.87	5.13	31.75	3.53
Computer Usefulness	34.70	4.44	33.52	3.94	33.31	4.32

score was achieved by Experience Group Five and the lowest mean score was achieved by Experience Group One. In the area of Computer Liking, the highest mean score was achieved by Experience Group Five and the lowest mean score was achieved by Experience Group One. In the area of Computer Usefulness, the highest mean score was achieved by Experience Group Three and the lowest mean score was achieved by Experience Group One. With the exception of the subscale of Computer Usefulness, Experience Group Five obtained the highest mean scores in all the other subscales. However, respondents in Experience Group One obtained the lowest mean scores in every subscale of the Computer Attitude Scale.

Table 4

Means of Computer Attitude Scale Scores by Computer Experience

		None	Less than one year	One year	Two years	Three or more than three
Computer Anxiety	M	20.50	27.00	32.25	29.30	33.39
	S	6.36	6.67	5.70	2.70	3.11
Computer Confidence	M	18.50	25.00	30.00	28	32.43
	S	4.95	4.64	4.21	1.66	3.58
Computer Liking	M	20.00	25.40	27.63	27.60	32.05
	S	5.66	5.86	4.40	3.06	4.14
Computer Usefulness	M	26.00	33.40	35.75	32.80	34.34
	S	4.24	2.41	3.54	4.79	4.05

(4) Summaries of the Three Analysis of Variance Procedures

In order to answer the research questions raised in the study, four separate analyses of variance (ANOVA) were run using the SPSS computer statistics program. The dependent variables were Computer Anxiety, Computer Confidence, Computer Liking, and Computer Usefulness. Gender, age, and computer experience were the independent variables. The level of significance selected by the researcher in the current study was .05. The F statistic, based on the calculation of the analysis of variance, was used to determine a significant difference between the dependent variables and each independent variable

Table 5

Summary of Analysis of Variance on Gender

	Source	SS	d.f.	MS	F/P
Computer Anxiety	Bet. grps	85.72	1	85.72	4.06/0.48
	Wit. Grps	1350.40	64	21.10	
Computer Confidence	Bet. Grps	163.69	1	163.69	8.31/0.01*
	Wit. Grps	1260.81	64	19.7	
Computer Liking	Bet. Grps	178.91	1	178.91	7.75/0.01*
	Wit. Grps	1477.03	64	23.08	
Computer Usefulness	Bet. Grps	10.91	1	10.91	0.61/0.44
	Wit. Grps	1147.95	64	17.94	

*significant at the .05 level of significance

separately. Summaries of the three analysis of variance procedures, using gender, age, and computer experience as the dependent variables are displayed in Tables 5 through 7. Table 5. shows the summary of analysis of variance on gender difference. Gender makes a significant difference in three of the computer attitude subscales except in the area of the Computer Usefulness. The value of F were 4.06, 8.31, 7.75, and 0.61 for computer anxiety, computer confidence, computer liking, and computer usefulness.

Table 6. shows the summary of analysis of variance on age difference. According to the results of the computer calculation, age did not make a significant difference in any of the computer attitude subscales. The values of F were 1.25, 1.48, 1.58, 0.72 for computer anxiety, computer confidence, computer liking, and computer usefulness.

Table 6

Summary of Analysis of Variance on Age

	Source	SS	d.f.	MS	F/P
Computer Anxiety	Bet. grps	54.73	2	27.37	1.25/0.29
	Wit. Grps	1381.38	63	21.93	
Computer Confidence	Bet. Grps	64.05	2	32.02	1.48/0.24
	Wit. Grps	1360.45	63	21.59	
Computer Liking	Bet. Grps	78.92	2	39.46	1.58/0.22
	Wit. Grps	1577.02	63	25.03	
Computer Usefulness	Bet. Grps	26.06	2	13.03	0.72/0.49
	Wit. Grps	1132.81	63	17.98	

*significant at the .05 level of significance

Table 7 shows the summary of analysis of variance on the difference of computer experience level. According to the results of the computer calculations, the level of the computer experience only did not make a significant difference in the computer usefulness subscale while significant differences were found in all the other three computer attitude subscales. Values of F were 9.14, 12.9, 8.23, 2.68 for computer anxiety, computer confidence, computer liking, and computer usefulness.

5. Analysis of Variance between Particular Computer Experience Groups

Analysis of variance tests for the presence of differences in means in a total

Table 7

Summary of Analysis of Variance on Computer Experience

	Source	SS	d.f.	MS	F/P
Computer Anxiety	Bet. grps	538.27	4	134.57	9.14/0.00*
	Wit. Grps	897.86	61	14.72	
Computer Confidence	Bet. Grps	653.00	4	163.25	12.9/0.00*
	Wit. Grps	771.50	61	12.65	
Computer Liking	Bet. Grps	580.56	4	145.14	8.23/0.00*
	Wit. Grps	1075.38	61	17.63	
Computer Usefulness	Bet. Grps	173.34	4	42.34	2.68/0.04*
	Wit. Grps	985.52	61	16.16	

*significant at the .05 level of significance

set of data, but it is not able to answer questions about differences between particular means. A significant F-ratio indicates only that there are statistically significant differences among the groups contributing to the total set of data but it does not indicate where the significance lies. In order to find out where the significant differences were among the groups divided by the independent variables such as age and computer experience, further analysis of variance needed to be conducted. However, since the results of the analysis showed the significant differences of mean scores among different age groups were not significant (Table 6), The further analysis of variance among Age Groups was not needed. The analysis of variance was conducted on computer experience among different groups to further find out where the significant differences were. Table 8

through Table 16 shows the results of analysis of variance among groups by computer experience on the five dependent variables.

Table 8 reveals that differences of mean scores on computer anxiety were significant between Computer Experience Group One and Group Three, Group One and Group Four, Group One and Five, Group Two and Five, and Group Four and Five. As is shown in the Table 12, differences of mean scores on computer anxiety were not significant between Computer Experience Group One and Group Two, Group Two and Group Three, Group Two and Group Four, Group Three and Group Four, and Group Three and Group Five.

Table 8

Analysis of variance on Computer Anxiety Among Different Computer Experience Groups

	Group Two F/P	Group Three F/P	Group Four F/P	Group Five F/P
Group One	1.38/0.29	6.594/0.03*	12.16/0.00*	30.48/0.00*
Group Two		2.30/0.16	0.94/0.35	14.20/0.00*
Group Three			2.12/0.17	0.67/0.42
Group Four				14.59/0.00*

*Significant at the .05 level of significance

Table 9

Analysis of variance on Computer Confidence Among Different Computer Experience Groups

	Group Two F/P	Group Three F/P	Group Four F/P	Group Five F/P
Group One	2.73/0.159	11.40/0.01*	31.09/0.00*	28.31/0.00*
Group Two		4.03/0.07	3.76/0.08	18.14/0.00*
Group Three			1.72/0.21	2.94/0.09
Group Four				13.81/0.00*

*Significant at the .05 level of significance

Table 9 reveals that differences of mean scores on computer confidence were significant between Computer Experience Group One and Group Three, Group One and Group Four, Group One and Five, Group Two and Five, and Group Four and Five. As is shown in the Table 13, differences of mean scores on computer anxiety were not significant between Computer Experience Group One and Group Two, Group Two and Group Three, Group Two and Group Four, Group Three and Group Four, and Group Three and Group Five.

Table 10 reveals that differences of mean scores on computer liking were significant between Computer Experience Group One and Group Three, Group One and Group Four, Group One and Five, Group Two and Five, Group Three and Group Five, and Group Four and Five. As is shown in the Table 12, differences of mean scores on computer anxiety were not significant between Computer Experience Group One and Group Two, Group One and Group Three,

Table 10

Analysis of variance on Computer Liking Among Different

Computer Experience Groups

	Group Two F/P	Group Three F/P	Group Four F/P	Group Five F/P
Group One	1.23/0.32	4.43/0.07	8.27/0.02*	15.81/0.00*
Group Two		0.61/0.45	0.95/0.35	10.53/0.00*
Group Three			0.00/0.99	7.49/0.01*
Group Four				10.12/0.00*

*Significant at the .05 level of significance

Table 11

Analysis of variance on Computer Usefulness Among Different

Computer Experience Groups

	Group Two F/P	Group Three F/P	Group Four F/P	Group Five F/P
Group One	9.49/0.03	11.53/0.01*	3.54/0.09	8.06/0.01*
Group Two		1.69/0.22	0.07/0.80	0.26/0.62
Group Three			2.16/0.16	0.84/0.37
Group Four				1.09/0.30

*Significant at the .05 level of significance

Group Two and Group Three, Group Two and Group Four, and Group Three and Group Four.

Table 11 reveals that differences of mean scores on Computer Usefulness were significant only between Computer Experience Group One and Group Three, and Group One and Five. As is shown in the Table 12, differences of mean scores on computer anxiety were not significant between all the other pairs of Computer Experience Groups.

The above tables of results of analysis of variance on four dependent variables and the total computer attitude score show that the significant differences are mainly between Computer Experience Group One (those who did not have any computer experience) and other groups. The tables also show that significant differences occur between Computer Experience Group Five (those who had most computer experiences) and other groups. In contrast, the tables show that there are fewer significant differences found between those groups made up by respondents who had somewhere between one half and three year's computer experience.

6. Analysis of Variance between Two Gender Groups of the Same Computer Experience

Previous researches have raised questions as to whether the students' exposure to computers should be taken into consideration when gender differences are examined in terms of computer attitudes (T. Levin, 1989). In order to find out the presence of the effect of experience when examining the gender difference in computer attitudes and vice versa, analyses of variance were run

between two experience groups within one gender group and between two gender groups within one experience group. To make sure the number of each respondent group was enough, the respondents were divided into two groups according to their computer experience, those who had less than three year's computer experience and those who had three and more years' computer experience. Table 12 shows the formation of the respondent groups.

Table 12 shows that within the male respondent group, there were 10 students who had less than three years computer experience and 32 students who had three or more than three years' computer experience. Within the female respondent group, 15 students had less than three years' computer experience while only nine students had three or more than three years' computer experience. At first, four sets of analysis of variance were run in the respondent group made up by those who had less than three years computer experience by levels of gender. Then, four sets of analysis of variance were run in the respondent group made up by those who had three or more than three years' computer experience by levels of gender. The results are displayed in Table 13 and Table 14.

Table 12. Respondent Groups according to Computer Experience and Gender

Computer Experience \ Gender	Male	Female
Less than three	10	15
Three and more than three	32	9

Table 13. Analysis of Variance on Gender in the Less Experienced Group

	Source	SS	d.f.	MS	F/P
Computer Anxiety	Bet. grps	11.21	1	11.21	0.34/0.56
	Wit. Grps	750.63	23	32.64	
Computer Confidence	Bet. Grps	36.51	1	36.51	1.79/0.19
	Wit. Grps	468.9	23	20.39	
Computer Liking	Bet. Grps	29.93	1	29.93	1.46/0.24
	Wit. Grps	472.23	23	20.53	
Computer Usefulness	Bet. Grps	1.31	1	1.31	0.06/0.81
	Wit. Grps	484.13	23	21.05	

*Significant at the .05 level of significance

Table 14. Analysis of Variance on Gender in the Most Experienced Group

	Source	SS	d.f.	MS	F/P
Computer Anxiety	Bet. grps	0.9	1	0.9	0.91/0.75
	Wit. Grps	384.86	39	9.87	
Computer Confidence	Bet. Grps	3.49	1	3.49	0.27/0.6
	Wit. Grps	508.61	39	13.04	
Computer Liking	Bet. Grps	5.9	1	5.9	0.34/0.56
	Wit. Grps	680	39	17.44	
Computer Usefulness	Bet. Grps	2.36	1	2.36	0.14/0.71
	Wit. Grps	654.86	39	16.79	

*Significant at the .05 level of significance

In both the inexperienced (made up by those who had less than three years' computer experience) and the experienced (made up by those who had three or more than three years' computer experience) respondent group, the gender differences on computer attitudes are not significant for all the subscales. The results of the test of analysis of variance shows that when the factor of computer experience was ruled out, gender did not make much difference on computer attitudes.

(7) Analysis of Variance between two Computer Experience Groups of the Same Gender

To further test out the presence of the effects of experience on the computer attitudes when gender factor was ruled out, analyses of variance were run within the group made up of respondents of the same gender at different experience level. At first, four sets of analysis of variance were run in the respondent group made up only by female respondents. Then, four sets of analysis of variance were run in the respondent group made up only by male respondents. The results are displayed in Table 15 and Table 16.

In both the group made up only by female respondents and the group made up only by male respondents, the computer experience differences on computer attitudes are significant on some of the subscales and not significant on some of the subscales. In the female respondent group, computer experience differences are significant on computer confidence and computer liking subscales, but differences are not significant on computer anxiety and computer usefulness subscales. In the male respondent group, computer experience differences are

Table 15. Analysis of Variance on Computer Experience in the Female Group

	Source	SS	d.f.	MS	F/P
Computer Anxiety	Bet. grps	117.88	1	117.88	4.06/0.056
	Wit. Grps	638.62	22	29.03	
Computer Confidence	Bet. Grps	173.61	1	173.61	6.47/0.019*
	Wit. Grps	590.22	22	26.83	
Computer Liking	Bet. Grps	180.63	1	180.63	6.33/0.02*
	Wit. Grps	627.33	22	28.52	
Computer Usefulness	Bet. Grps	3.21	1	3.21	0.12/0.735
	Wit. Grps	602.62	22	27.39	

*Significant at the .05 level of significance

Table 16. Analysis of Variance on Computer Experience in the Male Group

	Source	SS	d.f.	MS	F/P
Computer Anxiety	Bet. grps	97.04	1	97.04	4.06/0.056
	Wit. Grps	496.87	40	12.42	
Computer Confidence	Bet. Grps	109.66	1	109.66	11.32/0.002*
	Wit. Grps	387.32	40	9.68	
Computer Liking	Bet. Grps	144.17	1	144.17	10.99/0.02*
	Wit. Grps	13.12	40	13.13	
Computer Usefulness	Bet. Grps	5.75	1	5.75	0.43/0.52
	Wit. Grps	536.37	40	13.41	

*Significant at the .05 level of significance

significant on all subscales except the subscale of computer usefulness. The results of the test of analysis of variance show that when the factor of gender was ruled out, computer experience still has effects on computer attitudes on some of the subscales (Table 13, Table 14, Table 15, and Table 16).

III. DISCUSSIONS AND FINDINGS

The results of the data analysis revealed that the majority of the participants were male Chinese students, who were currently studying at The University of Tennessee, Knoxville. The subjects in the current study were relatively diversified in terms of age. The data analysis showed that the age range was more than 20 years. The youngest participant was 19 years old, and the oldest participant was 41 years old. Since 37 out of 66 respondents (60 % of the whole body of the respondents) fell into the range of 31 to 41, the majority of the Chinese student group may be seeking advanced degree at The University of Tennessee. Among these Chinese students, it is possible that some of them may have obtained their master's degrees before they came to this country and are in the United States to work on either their doctoral programs or a second master's degree.

The results of data analysis also showed that the respondents were composed of a group of students with a rather high level of computer literacy since some two thirds of the students had three or more than three years of computer experience (Figure 3). However, among those who had more years of computer experience, male students were in the majority while the numbers of

respondents of male and female who had less than three years' computer experience are very close(Figure 4). There is no clear evidence showing that there is a particular age group having longer or shorter period of computer experience (Figure 5).

The purpose of the current study was to investigate the attitudes of Chinese students at The University of Tennessee, Knoxville toward computers and to explore the possible effects of gender, age and computer experience on these students' attitudes toward computers. The study was conducted to answer the following questions:

1. What are the attitudes of the Chinese students on campus of The University of Tennessee toward computers in general?
2. What are the differences among different age groups of the Chinese students on their attitudes toward computers?
3. What are the differences among the groups of Chinese students with different levels of computer experience on their attitudes toward computers?
4. What are the differences between male and female Chinese students on their attitudes toward computers ?

The first research question was concerned with the general computer attitudes of Chinese students currently studying at The University of Tennessee. The students' attitudes were measured by the Computer Attitude Scale, an instrument developed by Drs. Loyd and Gressard (1984b). The results of the data analysis indicate that the respondents of the study had a relatively positive attitude toward computers. The mean total score of the Computer Attitudes Scale

for all the participants was 125.81. With the total possible score of 160, the mean score they obtained represent a rather positive attitude across groups of Chinese students. The maximum score for each subscale is 40. The means of subscores for four subscales were: 31.76 (computer anxiety), 30.5 (computer confidence), 29.97 (computer liking), and 33.95 (computer usefulness). Since the mean scores of three subscales are above 30 (computer anxiety, computer confidence, and computer usefulness) and the mean score of computer liking subscale is close to 30, the respondents' attitudes toward computers were also rather positive from the perspective of each individual subscale. Among the four mean subscores, the mean subscore for computer usefulness was the highest (33.67) and the mean subscore for computer liking was the lowest (29.97). This may suggest that even though respondents may not very enthusiastic about the computers, they still agreed that in one way or the other, computers were useful to them.

The second research question sought to find out whether difference on Chinese students' attitudes toward computers. According to the analysis of collected data, the age factor did not seem to make any significant difference on the computer attitudes, since the differences of mean scores among different age groups were not found to be significant (Table 6). The outcome of the current study agreed with the findings of some of the previous studies (Honeyman & White, 1987; Koohang, 1986; Koohang, 1987; Loyd & Gressard, 1984a; Massoud, 1991; Raub, 1981). However, the results of the current study were in conflict with the results of some of the other previous studies (Baack et al., 1991; Dyck et al, 1994; Griswold, 1985; Morris, 1988) that supported the existence of a relationship between age and computer attitudes. The mixed results

could be due to the factors of sample size and age range in different studies. In general, those studies which had a wider age range tended to report an age effect on the computer attitudes (Maurer, 1994, p. 371). For example, in Morris's study (Morris, 1988), sample age ranged from 17 to 90. In another study conducted by Baack et al. (1991), the average age of the young adults in the study was 22.4 while the average age for the older adults was 73.6. Compared with these studies, the age range of the current study was still relatively narrow, although a 20-year range of age seems to be quite wide with a typical student population. Furthermore, the population targeted in the current study is smaller than most of the other studies that examined age differences on computer attitudes (Baack et al., 1991; Dyck et al, 1994; Loyd & Gressard, 1984a; Morris, 1988)

Moreover, as some of the researchers suggested, if whatever role the computer experience or education level may play in students' attitudes toward the computer, results of the studies concerning the effect of age difference on computer attitudes could be distorted (Dyck et al, 1994, p. 246; Maurer, 1994, p. 371; Morris, 1988, p. 77). In the current study, according to the descriptive data analysis, the younger students of the current study did not necessarily have less computer experience than older students. Therefore, the lack of a relationship between age difference and computer attitudes could be a result of a similar amount of computer experience students in different age groups have had. With all these possibilities that could alter the study results, reasons for age differences appear to need further investigation, and conclusions concerning age difference should be drawn with great caution.

The F statistic, based on the analyses of the collected data by the computer statistic program, showed that a significant difference between the mean scores of Chinese students in different computer experience groups (Table 7). Thus, a relationship was found between the differences of computer experience the Chinese students had and their attitudes toward computers. With the subscales of computer anxiety, computer confidence, and computer liking, mean scores increased with the increase of years of computer experience, suggesting that as Chinese students had more computer experience, they had less computer anxiety, more confidence in learning and using computer, and liked the computer better. However, in order to find out where exactly the significant differences were, a follow-up data analysis was conducted. With a follow-up data analysis, it was found that significant differences lie mainly between Computer Experience Group One and other computer experience groups , and it was also found that the significant differences occur most frequently between Computer Experience Group Five and other groups (Table 8, Table 9, Table 10, Table 11). This suggests that the significant difference of computer attitudes mainly lie between those who either had no computer experience or a great deal of computer experience and those who were between these two groups.

The results of the current study agree well with the findings of many other previous studies (Honeyman & White, 1987; Koohang, 1986; Loyd & Gressard, 1984a; Marcoulides, 1988; Okebukola et al., 1991) which found computer experience was related to computer attitudes. However, unlike the outcome of the current study, the results of many previous studies provided evidence linking computer experience with only some of the computer attitudes. For example,

although Loyd and Gressard (1984a) found that the amount of computer experience was related to computer attitudes, with more computer experience corresponding to more positive computer attitudes, they later found that computer experience was significantly related to only two of the attitudes examined in their study: computer anxiety and computer usefulness. Koohang (1987) found that computer experience seemed to be associated with attitude scores that measure computer anxiety and computer liking, but it was not associated with confidence in using a computer. In comparison with the outcome of these studies, computer experience in the current study was found to be associated with all four computer attitudes: computer anxiety, computer confidence, computer liking, and computer usefulness.

The literature review of the current study showed that, in examining the effects of computer experience on computer attitudes, the experience variable was treated differently from study to study and researchers defined "computer experience" differently. In some studies, there was a narrow span between those who had more computer experience and whose who had less computer experience. Loyd and Gressard (1984a) examined computer attitudes of those students who had not been exposed to computer or less than a week (little or no experience with computers), those who had been exposed to computers for one to six weeks (some computer experience), and those who had been exposed to computers for only half a year (substantial experience with computers). On the other hand, in the study conducted by Okebukola et al. (1991), computer attitudes were compared between those who had as little as one year's computer experience and those who had as much as 12 years' computer experience. Other

studies have manipulated the experience variable by looking at the computer anxiety before and after some kind of computer literacy course (Honeyman & White, 1987; Koohang, 1987). As is shown in the results of the follow-up data analysis, the significant difference of computer experience is mainly between the extreme groups (either the most experienced or no experience at all); different result of the effects of computer experience on computer attitudes could be the results of different computer experience span used in these studies. Again, factors such as the definition of computer experience and the length of computer experience span in different studies should be taken into consideration when interpreting the study results concerning the effects of computer experience on computer attitudes.

The results of the data analysis show that gender difference of the Chinese students has an effect on their attitudes toward computers. The male respondents' mean score of computer attitudes in all four subscales were higher than that of female respondents (Table 2). However, not all differences of means in four subscales were significantly different. The differences of the mean scores between male and female students in computer anxiety, computer, confidence, computer liking, and total score were significant (F values were 4.06, 8.31, and 7,75), but the difference of means by gender was not significantly different for computer usefulness subscale (F value was 0.61).

As with the possible effects of computer experience on computer attitudes in investigation of the age factor, researchers also point out that the students' exposure to computers could have an influence on their computer attitudes when gender differences are examined (Levin, 1989). The attention was paid to this

concern in the current study. A follow-up data analysis of variance was conducted to make sure the results of gender difference was not affected by the computer experience factor. The results of follow-up data analysis revealed that when the factor of gender was ruled out, computer experience still had effects on computer attitudes on some of the subscales while when the factor of computer experience was ruled out, gender did not make much difference on computer attitudes. Therefore, the final data analysis of the current study shows that gender does not make a difference on the students' attitudes toward computers.

The findings of the current study do not support those of other studies which have found that females were more computer anxious than males, and males were more confident in learning and using computers (Gressard & Loyd, 1985; Koohang, 1987; Massoud, 1991; Raub, 1981). At the same time, the findings were consistent with those studies that reported that there were no gender differences in computer attitudes (Loyd & Gressard, 1984a; Heinssen et al., 1987; Honeyman & White, 1987).

As is shown in the literature review of the current study, the findings of some of the studies examining the gender difference on computer attitudes seem to be problematic because some researchers found that males were less anxious about computers and had more positive computer attitudes than females due to the fact that they had more prior experience with computers (Hess & Miura, 1985; Levin & Gordon, 1989). As the descriptive data on the respondents show in the current study, there seems to be a higher percentage of males in the most experienced computer user group, and when the factor of computer experience

was ruled out, the gender difference on computer attitudes disappeared in a follow-up data analysis. Therefore, great caution should be taken to interpret the results of the other studies that found gender did make some difference on the computer attitudes.

IV SUMMARY

The current study found that the general computer attitude of Chinese students currently studying at The University of Tennessee was positive. The study found that age and gender difference of Chinese students does not have any effects on their attitudes toward computers. It is suggested that caution should be taken when interpreting the results of studies examining the effect age and gender have on computer attitudes since computer experience could have influence on the results of these studies. The study found that the amount of computer experience of the Chinese students effected their attitudes toward computers, although the researcher suggests that the definition of computer experience may be different from one study to another, and a different definition of computer experience could have an effect on the results of the similar studies.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

I. SUMMARY

The purpose of the current study was to investigate the attitudes of Chinese students at The University of Tennessee, Knoxville toward computers and to explore the possible effects of gender, age and computer experience on these students' attitudes toward computers. The study was conducted to answer the following questions:

1. What are the attitudes of the Chinese students on campus of The University of Tennessee toward computers in general?
2. What are the differences among different age groups of the Chinese students on their attitudes toward computers?
3. What are the differences among the groups of Chinese students with different levels of computer experience on their attitudes toward computers?
4. What are the differences between male and female Chinese students on their attitudes toward computers ?

The current study involved a specific population, a group of Chinese students, which was ethnically, culturally, and linguistically different from other targeted populations in most of the previous studies of a similar nature.

The basic instrument used in the study was a survey questionnaire, which included a Computer Attitude Scale designed by Drs. Loyd and Gressard (1984b),

adapted by the principal investigator of the current study. This survey instrument is the most frequently used instrument to measure attitudes toward computers. The scoring strategy of the instrument results in higher scores on the computer anxiety subscale corresponding to lower anxiety, and higher scores on the confidence, computer liking, and computer usefulness subscales corresponding to higher computer confidence, and a more positive attitude on computer usefulness. In general, a higher score corresponds to a more positive attitude toward computers. The demographic questions in the survey were designed to collect information regarding subjects' gender, age, and their experience with computers. All these three factors will be used in the study as dependent variables.

With the help of the Center for International Education, survey forms were distributed to the subjects by mail. Within three weeks after the survey questionnaires were sent out, 69.39 % (68) of the survey 98 questionnaires were returned. Two returned questionnaires were discarded for lack of adequate information, thus, leaving 64 of the returned surveys which were used in the data analysis. Therefore, the valid return rate was 67.35% (64). The information collected from the questionnaires was processed with a SPSS computer statistics program, in order to answer the questions raised by the current study.

With the first data entry, information collected from the questionnaires was entered into the computer program. The raw data included the respondents' gender, age in years, their computer experience in years, and their scores on each of the 40 questions in the questionnaire. The results of the data analysis provided such descriptive information about the respondents as the frequency distributions

of gender, age, and computer experience and sums of the subscores of each respondent. The descriptive charts and tables are listed in Chapter Four.

With the second data entry, the information on participants' age was classified into three groups, so that means of the computer attitude scores could be compared with the age factor of the participants taken into consideration. The reorganized demographic information and subscores and total scores of computer attitudes for each participant were entered into the computer program. Separate analyses of variance (ANOVA) were conducted for subscores of computer attitudes on each of the factors examined in the current study (e.g. age, computer experience, and gender).

The results of the data analysis answered all the questions raised by the current study. The study found that the general computer attitudes of Chinese students currently studying at The University of Tennessee were positive. The study found that the age factor doesn't make any difference on the Chinese students' attitudes toward computers. The study found that gender does not have any effect on Chinese students' attitudes toward computers when the factor of computer experience was ruled out. However, the study found that there were significant differences among the groups of Chinese students with different levels of computer experience on their attitudes toward computers, and the differences were mainly between the two extreme groups (those who had no computer experience at all and those who had three or more years of computer experience) and other groups. The differences of computer attitudes between respondents with different computer experience were still significant, even when the gender factor was ruled out.

II. CONCLUSIONS

According to the findings of the current study, the researcher of the study concluded that: The age and gender differences of Chinese students did not have any effects on their attitudes toward computers; The only factor that made a difference among Chinese students was the amount of computer experience; Regardless of age, gender, the attitude of the Chinese students at The University of Tennessee was positive.

III. RECOMMENDATIONS

The current study has confirmed the results of many of the previous studies that claim computer experience is important in determining computer attitudes. The findings of the current study suggest that, just as their American counterparts, those Chinese students who were less exposed to computers tended to be more anxious about computers and had less confidence in learning and studying computers.

Students from developing countries who come to the United States to study may have to adapt themselves to the new environment, not only culturally, but also "technologically" as well. With the linguistic and cultural barriers they have to overcome when they first come to the United States, lack of computer literacy may pose a great obstacle in their effort to pursue academic success. Therefore, the researcher of the current study recommends that, along with varieties of English courses, some basic computer literacy courses, especially

designed for international students, could be a great help for them to quickly adapt to their new environment not only linguistically and culturally, but also "technologically" as well.

Unlike the case with the relationship between the amount of computer experience and the attitudes toward computers, researchers seem to have more disagreement on the issue of possible effects of age and gender on the attitudes toward computers. The results of the current study support those studies that found that age does not make any difference on computer attitudes. Since different results were obtained when testing the effects of gender on computer attitudes, with the factor of computer experience being ruled out, the results of the current study were consistent with those that found there was no gender difference on computer attitudes. The researcher of the current study suggests that caution should be taken to interpret the findings of gender differences on computer difference because, as is shown by the current study, the picture could be distorted by the factor of computer experience when examining computer attitudes. It is also important that stereotyping gender differences in computer use and learning should be avoided. The researcher of the current study suggests that female students should be encouraged to take computer literacy courses and workshops. The exposure to computers in a friendly learning environment may be the best way to change their attitudes toward computers.

The current study has provided information on the computer attitudes of Chinese students currently studying at The University of Tennessee. Since the study has targeted a unique population rarely investigated in terms of computer attitudes, the generalization of the results of the study is limited by the nature and

the uniqueness of the targeted population. To better understand the relationship between computer attitudes and varieties of factors among Chinese students and other international students, it is recommended that a larger population should be targeted for further studies. The current study only serves as an initial step toward understanding the issue of computer attitudes among Chinese students. The issue will be better understood, and more information can be obtained with further studies of similar nature.

REFERENCES

REFERENCES

Anderson, R. E. (1987). Females surpass males in computer problem solving: Findings from the Minnesota computer Literacy Assessment. Journal of Educational Computing Research, 3 (1), 39-51.

Baack, S. A., Brown, T. S., & Brown, J. T. (1991). Attitudes toward computers : Views of older adults compared with those of young adults. Journal of Research on Computing in Education, 23, 422-433.

Boone, W. J. & Gabel, D. (1994). Computers and preservice elementary science teacher education. Journal of Computers in Mathematics and Science teaching, 13 (1), 17-42.

Clement, F. J. (1981). Affective considerations in computer-based education. Educational Technology, 2 (4), 28-32.

Colley, A. M., Gale, M., & Harris, T. A.. (1994). Effects of gender role identity and experience on computer attitude components. Journal of Educational Computing Research, 10, 129-137.

Collis B. A., & Williams R. L. (1987). Cross-cultural comparison of gender differences in adolescents' attitudes toward computers and selected school subjects. Journal of Educational Research 81 (1), 17-27.

Dyck, J., L. & Smither, J., A. (1994). Age differences in computer anxiety: The role of computer experience, gender and education. Journal of Educational Computing Research, 10, 239-248.

Fennema, E.H., Sherman, J.A. (1978). Sex-related differences in mathematics achievement and related factors: A further study. Journal of Research in Mathematics Education, 9, 189-202.

Fetler, M. (1985). Sex differences on the California state-wide assessment of computer literacy. Sex Roles, 13, 193-203.

Geissler, J. E., & Horridge, P. (1993). University students' computer knowledge and commitment to learning. Journal of Research on Computing in Education, 25, 347-365.

Giolroy, R.D., & Desai, H.B. (1986). Computer anxiety: Sex, race and age. International Journal of Man-Machine Studies, 25, 711-719.

Griswold, P. A. (1985). Differences between education and business majors in their attitudes about computers. AEDS Journal, 18, 131-138.

Gunter, G. A. (1994). Attitudes of Mississippi State University education and business students toward learning and working with computers. Doctoral Dissertation, Mississippi State University.

Harrington, K.V., McElroy, J.C., & Morrow, P.C. (1990). Computer Anxiety and Computer-based Training: A Laboratory Experiment. Journal of Educational Computing Research, 6, 343-358.

Heinssen, R. K., Glass, C.R., & Knight, L. A. (1987). Assessing computer anxiety: Development and validation of the Computer Anxiety Rating Scale. Computers in Human Behavior, 3(1), 49-59.

Hignite, M.A., Echternacht, L.J. (1992). Assessment of the relationships between the computer attitudes and computer literacy levels of prospective educators. Journal of Research on Computing in Education, 24, 381-392.

Hess, R.D., & Miura, I.T. (1985). Gender differences in enrollment in computer camps and classes. Sex Roles, 13, 193-203.

Hignite, M. A., & Echternacht, L. J. (1992). Assessment of the relationships between the computer attitudes and computer literacy levels of prospective educators. Journal of Research on Computing in Education, 24, 381-392.

Honeyman, D. S., & White, W. J. (1987). Computer anxiety in educators learning to use the computer: A preliminary report. Journal of Research on Computing in Education, 20 , 129-138.

Jay, T.B. (1981). Computerphobia: What to do about it. Educational Technology, 21(1), 47-48.

Jordan, E. W., & Stroup, D. F. (1982). The behavioral antecedents of computer fear. Journal of Data Education, 22, 7-8.

Kiesler, S., Sproull, L., & Eccles, J. S. (1985). Pool halls, chips, and war games: Women in the culture of computing. Psychology of Women Quarterly, 9, 451-462.

Koohang, A. A. (1986). The effects of age, gender, college status, and computer experience on attitudes toward the Library Computer System. Library and Information Science Research, 8, 349-355.

Koohang, A. A., & Byrd, D. M. (1987a). A study of attitudes toward the usefulness of the library computer system and selected variables: A further study. Library and Information Science Research, 9, 105-111.

Koohang, A.A. (1987b). A study of the attitudes of pre-service teachers toward the use of computers. Educational Communication and Technology Journal, 35, 145-149.

Levin, T., & Gordon, C. (1989). Effect of gender and computer experience on attitudes toward computers. Journal of Educational Computing Research, 5(1), 69-88. Loyd, B.H., & Gressard, C. (1984a). The effects of sex, age, and computer experience on computer attitudes. AEDS Journal, 18(2), 67-77.

Loyd, B.H., & Gressard, C. (1984b). Reliability and factorial validity of the computer attitude scale. Educational and Psychological Measurement, 44, 501-505.

Loyd, B.H., & Gressard, C. (1986). Gender and amount of computer experience of teachers in staff development programs: Effects on computer attitudes and perceptions of the usefulness of computers. AEDS Journal, 19, 302-311.

Loyd, B.H., Loyd, D.E., & Gressard, C. (1987). Gender and computer experience as factors in the computer attitudes of middle school students. Journal of Early Adolescence, 7(1), 13-19.

Makrakis, V. (1992). Cross-cultural comparison of gender differences in attitude towards computers in Japan and Sweden. Scandinavian Journal of Educational Research, 36, 275-287.

Marcoulides, G.A. (1988). The Relationship between computer anxiety and computer achievement. Journal of Educational Computing Research, 4, 151-158.

Marchoulides, G.A., & Wang, X. B. (1990). A cross-cultural comparison of computer anxiety in college students. Journal of Educational Computing Research, 6, 251-264.

Martin, C. D., Heller, R. S., & Mahmoud, E. (1992). American and Soviet children's attitudes toward computers. Journal of Educational Computing Research, 8, 155-185.

Martin, R. (1991). School children's attitudes towards computers as a function of gender, course subjects and availability of home computers. Journal of Computers Assisted Learning, 7, 187-194.

Massoud, S. L. (1991). Computer attitudes and computer knowledge of adult students. Journal of Educational computing research, 7, 269-291.

Morahan-Martin, J., Olinsky, Alan, & Schumacher P. (1992). Gender differences in computer experience, skills, and attitudes among incoming college students. Collegiate Microcomputer, 10(1), 1-8.

Morris, D. C. (1988-89). A survey of age and attitudes toward computers. Journal of Educational Technology Systems, 17(1), 73-79.

Morrow, P., Prell, E., & McElroy, J. (1986). Attitudinal and behavioral correlates of computer anxiety. Psychological Reports, 59, 1199-1204.

Okebukola, P. A., Sumampouw, W., & Jegede, O. J. (1991-92). The experience factor in computer anxiety and interest. Journal of Educational Technology Systems. 20, 221-229.

Powers, W. G. and Others. (1973). The effects of prior computer exposure on man-machine computer anxiety. (ERIC Document Reproduction Service No. ED 089 763)

Raub, A. C. (1981). Correlates of computer anxiety in college students. Doctoral Dissertation, University of Pennsylvania.

Resta, Paul. (1992). Organizing education for minorities: Enhancing minority access and use of the new information technologies in higher education. Education and Computing, 8, 119-127.

Richards, P. J., Johnson, D. W., & D. & Johnson, R. T. (1986). A Scale for assessing student attitudes toward computers: Preliminary findings. Computer in Schools, 3(2), 31-38.

Rosen, L., Sears, D., & Weil, M. (1987). Computerphobia. Behavior Research Methods, Instruments, & Computers, 19, 167-179.

Sanders, J. S. (1984). The computer: male, female or androgynous. The Computing Teacher, 11(8), 31-34.

Savenye, W. C. (1993). Measuring teacher attitudes toward interactive computer technologies. (ERIC Document Reproduction Service No. ED 362 200)

Shashaani, L. (1993). Gender-based differences in attitudes toward computers. Computer and Education, 20, 169-81.

Todman, J., & Dick, G. (1993). Primary children and teachers' attitudes to computers. Computer and Education, 20, 199-203.

Underwood, J., Billingham, M., & Underwood, G. (1994). Predicting computer literacy: How do the technological experiences of schoolchildren predict their computer-based problem-solving skills? Journal of Information Technology for Teacher Education, 3, 115-126.

Webb, N.W. (1985). The role of gender in computer programming learning processes. Journal of Educational Computing Research, 1, 441-458.

Whiteside M.F., Lang N.P., & Whiteside, J.A. (1989). Medical students' attitudes toward the use of microcomputers as instructional tools. Journal of Computer-Based Instruction, 16(3), 90-94.

Wilder, G., Mackie, D., & Cooper, J. (1985). Gender and computers: Two surveys of computer-related attitudes. Sex Roles, 13, 215-228.

APPENDICES

APPENDIX A

Approval of Dissertation Prospectus

Approval of Dissertation Prospectus

Candidate Name	Gonghua Liu
Address	1611 Laurel Ave. Apt. 916
city, state, Zip	Knoxville, TN 37916

Tentative Title of Proposed Dissertation:

A Survey Study on the Computer Attitudes of the
Chinese Students at The University of Tennessee, Knoxville

We approved of the attached prospectus for a dissertation of the Ed.D or Ph. D Degree in the Department of Education Math, Science, Research, and Technology, College of Education, The University of Tennessee

March 15, 1996
Date

Member	Department
Member	Department
Member	Department
Member	Department

APPENDIX B

UTK Human Subject Committee Form A

IRB # 5041-A

APR 1 2 1996

FORM A

A) Principle Investigator and/or CO-PI(s): Gonghua Liu, Graduate Research Assistant

B) Department: Education in the Sciences, Mathematics, Research and Technology Unit

C) Complete Mailing Address:

1611 Laurel Ave. Apt. 916
Knoxville, TN 37916 673-3238

D) Title of Project: A Survey Study on the Computer Attitudes of the Chinese Students at The University of Tennessee, Knoxville

E) External Funding Agency and ID Number: not applicable

F) Grant Submission Deadline: not applicable

G) Starting Date: April 10, 1996

H) Estimated Completion Date: June 30, 1996

I.) Objective(s) of the Project: The objective of the current study is to investigate the attitudes toward computers, including computer anxiety, computer confidence, computer liking among Chinese students at The University of Tennessee, Knoxville and to explore the possible effects of computer experience and age on these students' attitudes toward computers.

II.) Subjects: The subjects of the study is comprised of mainland Chinese students currently studying at The University of Tennessee, Knoxville.

III.) Methods or Procedures:

A survey has been developed to obtain the desired data (see copy attached). Copies of the survey will be given to all the participants of the study. Participants will be informed of their option not to participate (see the attached cover letter).

IV.) CATEGORY(S) FOR EXEMPT RESEARCH PER 45 CFR 46: 1, #2
CERTIFICATION: The research described herein is in compliance with 45 CRF 46 101(b) and presents subjects with no more than minimal risk as defined by applicable regulations.

Principal Investigator: Gonghua Liu	Name	Gonghua Liu Signature	April 2th, 96 Date
Advisor: Dr. Dale Doak	Name	Signature	4-8-96 Date
Dept. Review Comm. Chair: D. DESSART	Name	Signature	4/10/96 Date
Dept. Head:	Name	M. Everett Myer Signature	4/10/96 Date

APPROVED: Coordinator of compliances
Office of Research Administration _____ 4-25-96
Signature Date

APPENDIX C

Approval Letter from Office of Research

THE UNIVERSITY OF TENNESSEE
KNOXVILLE

Office of Research
404 Andy Holt Tower
Knoxville, Tennessee 37996-0140
PHONE: (423) 974-3466
FAX: (423) 974-2805
URL: http://www.ra.utk.edu/ora

04/26/96

IRB # : 5041 A

Title : A Survey Study on the Computer Attitudes of the Chinese Students at The University of Tennessee, Knoxville

Liu, Gonghua
Educ in Sci/Math/Res/Tech
1611 Laurel Ave., Apt. 916
Knoxville, TN 37916

Doak, Dr. Dale
Educ in Sci/Math/Res/Tech
307 Claxton Addn.
Campus

The project listed above has been reviewed and has been certified as EXEMPT from review by the Institutional Review Board.

Unless there are major changes in the experimental methods or project design, no further reporting to this office is required. The responsibility for oversight of this project becomes that of the Principal Investigator, Student Advisor (if any), and the Departmental Review Committee.

We wish you success in your research endeavors.

Sincerely,

Steven B. Pulik
Coordinator of Compliances

cc: Dr. M. Everett Myer

Attachment: Form A

APPENDIX D

Letter of Request for Permission

May 6th, 1996

Brenda H. Loyd
Clarice P. Gressard
275 Ruffner Hall
University of Virginia
Charlottesville, VA 22903

Dear Dr. Loyd & Dr. Gressard:

My name is Gonghua Liu. I am a doctoral candidate at The University of Tenneessee, Knoxville, Tennessee. I am conducting a research related to Chinese students' attitudes toward computers who are currently studying at the University of Tennessee. In the process of reading related literature, I found that your "Computer Attitudes Scale" have been used by many researcher and I think it is appropriate for my study. I'd like to ask you for your permission to use this instrument.

Please let me know if you agree to allow me to use your "Computer Attitudes Scale" for my study. Allow me to express my appreciation for your time and help.

Sincerely,

Gonghua Liu
doctoral student in educational technology
College of Ed. University of Tennessee

1611 Laurel Ave. Apt. 916
Knoxville, TN 37916
(Office) (615) 974-0918
(Home) (615) 673-3238

cc: Dr. Dale Doak
Dr. Patritia Wiley
Dr. John Ray
Dr. Pierce

p. s. An addressed and stamped envelope is enclosed for your convenience.

APPENDIX E

Letter of Permission from Drs. Loyd and Gressard



CURRY SCHOOL OF EDUCATION
DEPARTMENT OF EDUCATIONAL STUDIES

May 13, 1996

Gonghua Liu
1611 Laurel Ave. Apt. 916
Knoxville, TN 37916

Dear Mr. Liu:

In response to your inquiry, I am enclosing a copy of our survey of attitudes towards computers.

The survey is scored according to the following:

- **For questions** 1, 3, 4, 6, 9, 11, 12, 14, 16, 17, 19, 22, 25, 27, 28, 30, 33, 35, 36, 38 (Strongly Agree=4, Slightly Agree=3, Slightly Disagree=2, Strongly Disagree=1).
- **For questions** 2, 5, 7, 8, 10, 13, 15, 18, 20, 21, 23, 24, 26, 29, 31, 32, 34, 37, 39, 40 (Strongly Agree=1, Slightly Agree=2, Slightly Disagree=3, Strongly Disagree=4).

The questions are coded so that the higher the score, the more positive the attitude.

Four subscores can also be obtained from the questions.

- Anxiety: 1, 5, 9, 13, 17, 21, 25, 29, 33, 37
- Confidence: 2, 6, 10, 14, 18, 22, 26, 30, 34, 38
- Liking: 3, 7, 11, 15, 19, 23, 27, 31, 35, 39
- Usefulness: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40

EDUCATIONAL EVALUATION EDUCATION PSYCHOLOGY EDUCATIONAL RESEARCH
INSTRUCTIONAL TECHNOLOGY SOCIAL FOUNDATIONS OF EDUCATION
RUFFNER HALL, UNIVERSITY OF VIRGINIA, 405 EMMET STREET, CHARLOTTESVILLE, VA 22903-2495
(804) 924-7471

Again, higher scores correspond to more positive attitude, e.g., a higher confidence score means more confidence and a higher anxiety score means *less* anxiety.

Permission is granted for use of this scale.

Sincerely,

Sandra L. Davis
Assistant to Dr. Loyd

Enclosure

APPENDIX F

Cover Letter of the Survey

1611 Laurel Ave.
Apt. 916
Knoxville, TN 37916
(423) 673-3238

March 25, 1996

Dear Chinese student,

I'm glad that you can participate in a very interesting study, because this study is related to us, the Chinese students currently studying at The University of Tennessee, Knoxville.

My study investigates the attitudes of Chinese students and the relationship between their attitudes and age and experience with computers. Your participation only requires you to answer an included 30-item Computer Attitude Scale and a Demographic Information Questionnaire, and then return them with a pre-stamped, self-addressed return envelope.

The participation of the study is totally voluntary. Your return of the filled survey will be indicative of your consent to participate the study. All responses will be kept completely anonymous and confidential.

Please feel free to call or write me at the number or address above concerning any questions or comments you may have. Thank you in advance for your cooperation.

Cordially,

Gonghua Liu
Graduate Student

APPENDIX G

The Original Survey Used by Drs. Loyd and Gressard

SURVEY OF ATTITUDES TOWARD LEARNING ABOUT AND WORKING WITH COMPUTERS

Brenda H. Loyd and Clarice P. Gressard
University of Virginia

The purpose of this survey is to gather information concerning people's attitudes toward learning about and working with computers. It should take about five minutes to complete this survey. All responses are kept confidential. Please return the survey to your instructor when you are finished.

Please check the blank which applies to you.

1. Age: ( ) 22 or less ( ) 23-25 ( ) 26-30
( ) 31-35 ( ) 36-40 ( ) 41-45
( ) 46-50 ( ) 51-55 ( ) 55+

2. College level completed: ( ) 1st year ( ) 2nd year ( ) 3rd year ( ) 4th year
( ) Bachelors ( ) Masters ( ) Doctorate

3. Major area of study: _____

4. Sex: ( ) Male ( ) Female

5. Experience with learning about or working with computers:
( ) 1 week or less ( ) 6 months to 1 year
( ) 1 week to 1 month ( ) 1 year or more
( ) 1 month to 6 months

Briefly state the type of computer experience: _____

COMPUTER ATTITUDE SCALE

Below are a series of statements. There are no correct answers to these statements. They are designed to permit you to indicate the extent to which you agree or disagree with the ideas expressed. Place a check mark in the parentheses under the label which is closest to your agreement or disagreement with the statements.

	Strongly Agree	Slightly Agree	Slightly Disagree	Strongly Disagree
1. Computers do not scare me at all.	( )	( )	( )	( )
2. I'm no good with computers.	( )	( )	( )	( )
3. I would like working with computers.	( )	( )	( )	( )
4. I will use computers many ways in my life.	( )	( )	( )	( )
5. Working with a computer would make me very nervous.	( )	( )	( )	( )
6. Generally I would feel OK about trying a new problem on the computer.	( )	( )	( )	( )
7. The challenge of solving problems with computers does not appeal to me.	( )	( )	( )	( )
8. Learning about computers is a waste of time.	( )	( )	( )	( )
9. I do not feel threatened when others talk about computers.	( )	( )	( )	( )

		Strongly Agree	Slightly Agree	Slightly Disagree	Strongly Disagree
10.	I don't think I would do advanced computer work.	( )	( )	( )	( )
11.	I think working with computers would be enjoyable and stimulating.	( )	( )	( )	( )
12.	Learning about computers is worthwhile.	( )	( )	( )	( )
13.	I feel aggressive and hostile toward computers.	( )	( )	( )	( )
14.	I am sure I could do work with computers.	( )	( )	( )	( )
15.	Figuring out computer problems does not appeal to me.	( )	( )	( )	( )
16.	I'll need a firm mastery of computers for my future work.	( )	( )	( )	( )
17.	I wouldn't bother me at all to take computer courses.	( )	( )	( )	( )
18.	I'm not the type to do well with computers.	( )	( )	( )	( )
19.	When there is a problem with a computer run that I can't immediately solve, I would stick with it until I have the answer.	( )	( )	( )	( )
20.	I expect to have little use for computers in my daily life.	( )	( )	( )	( )
21.	Computers make me feel uncomfortable.	( )	( )	( )	( )
22.	I am sure I could learn a computer language.	( )	( )	( )	( )
23.	I don't understand how some people can spend so much time working with computers and seem to enjoy it.	( )	( )	( )	( )
24.	I can't think of any way that I will use computers in my career.	( )	( )	( )	( )
25.	I would feel at ease in a computer class.	( )	( )	( )	( )
26.	I think using a computer would be very hard for me.	( )	( )	( )	( )
27.	Once I start to work with the computer, I would find it hard to stop.	( )	( )	( )	( )
28.	Knowing how to work with computers will increase my job possibilities.	( )	( )	( )	( )
29.	I get a sinking feeling when I think of trying to use a computer.	( )	( )	( )	( )
30.	I could get good grades in computer courses.	( )	( )	( )	( )
31.	I will do as little work with computers as possible.	( )	( )	( )	( )
32.	Anything that a computer can be used for, I can do just as well some other way.	( )	( )	( )	( )

		Strongly Agree	Slightly Agree	Slightly Disagree	Strongly Disagree
33.	I would feel comfortable working with a computer.	( )	( )	( )	( )
34.	I do not think I could handle a computer course.	( )	( )	( )	( )
35.	If a problem is left unsolved in a computer class, I would continue to think about it afterward.	( )	( )	( )	( )
36.	It is important to me to do well in computer classes.	( )	( )	( )	( )
37.	Computers make me feel uneasy and confused.	( )	( )	( )	( )
38.	I have a lot of self-confidence when it comes to working with computers.	( )	( )	( )	( )
39.	I do not enjoy talking with others about computers.	( )	( )	( )	( )
40.	Working with computers will not be important to me in my life's work.	( )	( )	( )	( )

APPENDIX H
The Survey of the Study in English

Computer Attitude Scale (Survey)

Section One

Please circle the answer that most closely describe your feeling, using the scale:
SA = Strongly Disagree; D = Disagree; A = Agree; SA = Strongly Agree

1) Computers do not scare me at all.	SD	D	A	SA
2) I'm no good with computers.	SD	D	A	SA
3) I would like working with computers.	SD	D	A	SA
4) I will use computers many ways in my life.	SD	D	A	SA
5) Working with a computer would make me very nervous.	SD	D	A	SA
6) Generally I would feel OK about trying a new problem on the computer.	SD	D	A	SA
7) The challenge of solving problems with computers does not appeal to me.	SD	D	A	SA
8) Learning about computers is a waste of time.	SD	D	A	SA
9) I do not feel threatened when others talk about computers.	SD	D	A	SA
10) I don't think I would do advanced computer work.	SD	D	A	SA
11) I think working with computers would be enjoyable and stimulating.	SD	D	A	SA
12) Learning about computers is worthwhile.	SD	D	A	SA
13) I feel aggressive and hostile toward computers.	SD	D	A	SA
14) I am sure I could do work with computers.	SD	D	A	SA
15) Figuring out computer problems does not appeal to me.	SD	D	A	SA
16) I'll need a firm mastery of computers for my future work.	SD	D	A	SA
17) I wouldn't bother me at all to take computer courses.	SD	D	A	SA
18) I'm not the type to do well with computers.	SD	D	A	SA
19) When there is a problem with a computer run that I can't immediately solve, I would stick with it until I have the answer.	SD	D	A	SA
20) I expect to have little use for computers in my daily life.	SD	D	A	SA
21) Computers make me feel uncomfortable.	SD	D	A	SA
22) I'm sure I could learn a computer language.	SD	D	A	SA
23) I don't understand how some people can spend so much time working with computers and seem to enjoy it.	SD	D	A	SA
24) I can't think of any way that I will use computers in my career.	SD	D	A	SA
25) I would feel at ease in a computer class.	SD	D	A	SA
26) I think using a computer would be very hard for me.	SD	D	A	SA
27) Once I start to work with the computer, I would find it hard to stop.	SD	D	A	SA
28) Knowing how to work with computers will increase my job possibilities.	SD	D	A	SA
29) I get a sinking feeling when I think of trying to use a computer.	SD	D	A	SA

30) I could get good grades in computer courses.	SD	D	A	SA
31) I will do as little work with computers as possible.	SD	D	A	SA
32) Anything that a computer can be used for, I can do as well some other way.	SD	D	A	SA
33) I would feel comfortable working with a computer.	SD	D	A	SA
34) I do not think I could handle a computer course.	SD	D	A	SA
35) If a problem is left unsolved in a computer class, I would continue to think about it afterward.	SD	D	A	SA
36) It is important to me to do well in computer classes.	SD	D	A	SA
37) Computers make me feel uneasy and confused.	SD	D	A	SA
38) I have a lot of self-confidence when it comes to working with computers.	SD	D	A	SA
39) I do not enjoy talking with others about computers.	SD	D	A	SA
40) Working with computers will not be important to me in my life's work.	SD	D	A	SA

Section Two

Please fill in the blanks with appropriate information about you

1) Your gender: ( )Male ( )Female

2) Your age: ( ) years old

3) Experience with learning about or working with computers:
No experience ( ) Less than a year ( ) One year ( )
Two years ( ) Three years or more ( )

Thank you for your participation in this study.

APPENDIX I
The Survey of the Study in Chinese

计算机态度衡量尺度(调查表)

第一部分

请勾划最能表达你感受的英语缩写字母：

SD=极不同意； D=不同意； A=同意； SA=非常同意

1) 我对计算机没有恐惧感。	SD	D	A	SA
2) 我对计算机一窍不通。	SD	D	A	SA
3) 我喜欢用计算机来工作。	SD	D	A	SA
4) 在我的生活中，我将会在许多方面用到计算机。	SD	D	A	SA
5) 上机工作使我非常紧张。	SD	D	A	SA
6) 一般说来，我乐意用计算机解决新问题。	SD	D	A	SA
7) 我不大感兴趣用计算机解决疑难问题。	SD	D	A	SA
8) 学计算机是浪费时间。	SD	D	A	SA
9) 如果别人谈论计算机，我不会觉得对我有什麽威胁。	SD	D	A	SA
10) 我觉得我不会用计算机干非常复杂的工作。	SD	D	A	SA
11) 我觉得上机工作非常愉快和刺激。	SD	D	A	SA
12) 计算机值得一学。	SD	D	A	SA
13) 我觉得我对计算机有一种反感情绪。	SD	D	A	SA
14) 我对使用计算机很有把握。	SD	D	A	SA
15) 我没兴趣去解决计算机方面的问题。	SD	D	A	SA
16) 我需要坚实的计算机知识为将来的工作做准备。	SD	D	A	SA
17) 我不在乎选修有关计算机方面课程。	SD	D	A	SA
18) 我不是那种对计算机很在行的人。	SD	D	A	SA
19) 当我上机工作遇到我不能立刻解决的问题时，我会持续工作直到解决为止。	SD	D	A	SA
20) 我料想计算机在我日常生活中没什麽用处。	SD	D	A	SA
21) 计算机使我不舒服。	SD	D	A	SA
22) 我有把握能够学会一种计算机语言。	SD	D	A	SA

23) 我不理解为什麼有些人能在计算机上工作那麼久而且对他们来说似乎是一种享受。	SD D A SA
24) 我想不出计算机在我职业生涯中会有什麼用处。	SD D A SA
25) 在计算机课堂上，我会觉得很自在。	SD D A SA
26) 我觉得使用计算机对我来说会非常困难。	SD D A SA
27) 只要一上机工作，我就不想停下来。	SD D A SA
28) 计算机知识和技能会增加我的就业机会。	SD D A SA
29) 当我一想到要上机工作，我的心就沉了下来。	SD D A SA
30) 我能够在计算机的课程中取得好成绩。	SD D A SA
31) 如有　能，我尽量避免使用计算机。	SD D A SA
32) 所有计算机能做的事我都可以用其它方式代替，並且做得同样好。	SD D A SA
33) 上机工作我觉得很自在。	SD D A SA
34) 我想我应付不了一门计算机课程。	SD D A SA
35) 如果在计算机课堂上有遗留问题，下课后我还会继续思索解决的方法。	SD D A SA
36) 上好计算机课程对我来说很重要。	SD D A SA
37) 计算机使我感到即不自在又迷惑不解。	SD D A SA
38) 对上机工作我有充分的自信心。	SD D A SA
39) 我不喜欢和别人谈论有关计算机的事。	SD D A SA
40) 在我一生工作中，使用计算机不会很重要。	SD D A SA

第二部分

针对您的具体情况，请在下面括号里做记号。

1) 性别：(　)男　(　)女

2) 年龄：(　)岁

3) 学习计算机和使用计算机的经验和经历：

没有(　)　少于一年(　)　一年(　)
两年(　)　三年或三年以上(　)

衷心感谢您能参加这此调查。

VITA

Gonghua Liu was born in Lanzhou, the People's Republic of China, on February 14th, 1956. He graduated from Lanzhou University, Lanzhou, China in August, 1982 with a Bachelor of Arts degree in English. He earned a Master of Arts degree in English Language and British Literature in Lanzhou University in December, 1986. In the summer of 1990, he enrolled in the doctoral program in College of Education of the University of Tennessee, Knoxville. He received his Master of Science in Art Education in August, 1993 in The University of Tennessee. He received his Doctor of Philosophy in Instructional Technology in December, 1996 in The University of Tennessee.

He was married to Li-hua Meng in 1984 and they have one child.