

A CROSS-CULTURAL COMPARISON OF COMPUTER ATTITUDES AMONG PRESERVICE TEACHERS

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Abstract

The study was conducted to compare the attitudes toward computers between preservice teachers in America ($n = 116$) and Taiwan ($n = 303$). The results indicate that there were no significant differences between these two samples on three computer attitude subscales (i.e., computer anxiety, computer confidence, and computer liking). However, two significant interactions, country by gender, and country by computer experience, suggest some interesting educational differences between these two countries.

Keywords: cross-cultural comparison, computer attitudes, teacher training.



A Cross-cultural Comparison of Computer Attitudes among Preservice Teachers

As microcomputers have been widely used in educational settings, it is important to address the possible attitudes toward computers that students are emerging, especially for students who are preparing to be teachers. One factor in the successful implementation of computers in educational setting is student acceptance of the new technology, which is assumed to be affected greatly by teachers' attitudes toward computers (Koohang, 1987). Therefore, the study of preservice teachers' attitudes toward computers may provide some useful information for their later effective implementation of computers in their classrooms.

Many studies examined students' attitudes toward computers at varied school levels (e.g., Campbell, 1989; Campbell & Perry, 1989; Chen, 1986; Collis & Williams, 1987; Loyd & Gressard, 1984; 1986; Loyd & Loyd, 1988) and reported that factors such as gender and prior computer experience may have some influence on students' liking of, anxiety about, and confidence in using computers.

Gender differences in attitudes toward computers may result from cultural bias that is, society's reinforcement of sexual stereotypes (Sander, 1984). Teachers seem to have unintended expectations favoring boys' use of computers (Patterson, 1984). For example, a teacher gave more complicated computer applications to boys than to girls. Then, the teacher worked with the boys in solving problems, but told the girls to work on their own since their exercises were easier (Levin & Gordon, 1989).

Gender differences in computer attitudes may also result from the association of achievement in computers and mathematics (Munger & Loyd, 1989). People believe that computers relate to mathematics and science, and in most case are incorporated into these areas of the curriculum. Studies have reported that gender differences in mathematics achievement tend to favor males (Hawkins, 1985; Martin & Hoover, 1987), though the conclusion has not been definitive.

Computer experience was found to be a significant variable related to students' computer attitudes. Many studies have suggested with more computer experience corresponding to more positive attitudes toward computers (Koohang, 1987; Loyd & Gressard, 1984; 1986; Loyd & Loyd, 1988; Mercoulides, 1988). However, what these researchers have not come to an agreement is the typical type and amount of computer experiences that can significantly increase

students' positive attitudes toward computers.

Recently, there are a few studies that examined computer attitudes for preservice teachers. One study conducted by Koohang (1987) used 60 college students who were training to be teachers as subjects, and found that the amount of computer experiences and the nature of computer experiences were two major factors that influenced preservice teachers' attitudes toward computers. An important limitation of the Koohang study, however, was its relatively small size of subjects ($n = 60$). This limitation yields the results of the study potentially unstable. Liao (1993) conducted a study to examine the effects of computer experience on computer attitudes among preservice, inservice and postulant teachers. The results of his study indicated that in general, the longer exposure of computers and the more types of computers that education majors experienced, the more positive attitudes they established.

Cross-cultural comparison of attitudes toward computers is an area that has recently been noticed by a few researchers; but not much is known to date. A study conducted by Collis and Williams (1987) found that Chinese high school students were more positive in their attitudes toward computers when compared to Canadian students. Also, there were fewer gender differences among Chinese students in attitudes toward computers. Marcoulides and Wang (1990) used two samples of college students from Los Angeles, California, and Hunan, People's Republic of China to examine attitudes toward computers. They reported that computer anxiety was present to a similar degree for both samples. A comparative study of subjects from different cultures can supply valuable information, not only about the specific groups selected whose reactions toward computers, but also examine and compare the presence of computer in the context of two different cultures (Collis & Williams, 1987). However, very little research has specifically compared the possible differences on computer attitudes among preservice teachers in America and Taiwan.

The major purpose of the present study was to examine the effects of different cultural backgrounds on preservice teachers' attitudes toward computers. More specifically, the study attempted to examine the effects of (a) country (i.e., America and Taiwan), (b) gender (male and female), (c) amount of computer experience (i.e., 0-6 months, 6-24 months, and more than 2 years) on preservice teachers' attitudes toward computers.



Method

Subjects

A total of 419 education majors participated in the present study. Two samples were identified. The first sample contained 116 American undergraduate students, about 59% of them between the age of 18-25, from two state-supported public universities located in a major metropolitan city in the Southwest. The second sample contained 303 Taiwan college students, all of them were between 18-25 years old, from a national teachers college located in Taipei, Taiwan, Republic of China. The subjects in both countries were from various fields in education, including elementary, mathematics and science, social study, language arts, and special education. Table 1 presents the demographic data of the subjects.

Table 1. Demographics of Samples

Computer Experience	Male	Female	Total
American Samples: Number (percent)			
0-6 months	4 (3.5)	37 (31.9)	41 (35.4)
6-24 months	1 (0.9)	22 (19.0)	23 (19.8)
more than 2 years	6 (5.2)	46 (39.7)	52 (44.8)
total	11 (9.5)	105 (90.5)	116 (100)
Taiwan Sample: Number (percent)			
0-6 months	57 (18.9)	49 (16.2)	106 (35.0)
6-24 months	62 (20.5)	74 (24.4)	136 (44.9)
more than 2 years	27 (8.9)	34 (11.2)	61 (20.1)
total	146 (48.2)	157 (51.8)	303 (100)

Instrument

The instrument used for the present study was the Computer Attitude Scale (Loyd & Gressard, 1984), which consists of 30 Likert-scale type of questions divided into three ten-item subscales: computer anxiety, computer confidence, and computer liking. As stated by Loyd and Gressard (1984), computer anxiety was interpreted as anxiety toward or fear of computers;

computer confidence related to confidence in the ability to learn about or use computers; and computer liking meant enjoying or liking of computers and using computers. Each item presented a positive or negative worded statement such as "I would like working with computers," or "I'm no good with computers." Students responded to the statements by selecting one of four responses as strongly agree, somewhat agree, somewhat disagree, strongly disagree, and recorded as 4, 3, 2, 1, respectively. The scores were computed for each student; one score for each of the three subscales. This scoring system results in higher scores on the computer anxiety subscale corresponding to lower anxiety, while higher scores on the computer confidence and liking corresponding to higher confidence and liking. In general, a higher score corresponds to a more positive attitude toward computers. Alpha reliability coefficients of the computer anxiety, computer confidence, and computer liking were .87, .91, .91, respectively. The results of the factor analysis for this instrument also showed high intercorrelation among the subscales (Loyd & Gressard, 1984). In addition, The instrument has been previously used with students at varied school levels (Loyd & Gressard, 1984; Loyd & Gressard, 1986; Loyd & Loyd, 1988; Massoud, 1990; Massoud, 1991).

For administering the Computer Attitude Scale to subjects in Taiwan, the instrument was translated into Chinese by a Chinese colleague from the Department of Language Arts Education and the author. Every attempt was made to provided a Chinese version that was as faithful a representation of the English as possible. Once the Chinese version was prepared, two other Chinese colleagues, both from the English Department, were requested to verify the instrument and compare it to the English version. A few minor changes in the Chinese wording resulted in the final version of the Chinese instrument. Appendices A and B present the English and Chinese version of the instrument.

Procedures

The subjects participated in the present study were administered the Computer Attitude Scale separately. The instrument was explained to the subjects before it was administered, and they were assured that their responses would be both anonymous and confidential. Near the end of the Fall academic semester, 1990, all American participants completed the Computer Attitude Scale. The subjects in Taiwan were administered the Chinese version instrument at the beginning of the Spring academic semester, 1992. The data were collected and coded.



Data Analysis

To examine the nature of these computer attitudes, means and standard deviations were computed for each of the three scores. In addition, the 2 x 2 x 3 factorial analysis of variance (ANOVA) procedures were performed to investigate if there were any statistically significant ($p < .05$) differences on each subscale among: (a) students in different country (i.e., America and Taiwan), (b) students with different gender (i.e., male and female), (c) students who had different levels of prior computer experiences (i.e., 0-6 months, 6-24 months, and more than 2 years), and (d) interactions among these three factors (i.e., country, gender, and length of computer experiences). Three 2 X 2 X 3 factorial ANOVA procedures were completed which corresponded to the three subscales of the Computer Attitude Scale: computer anxiety, computer confidence, and computer liking.

Results

Table 2 shows the means and standard deviations for country, gender, and computer experience. American subjects obtained slightly higher mean scores than Taiwan subjects for all three subscales. Male subjects achieved slightly higher scores than female subjects on computer anxiety and confidence. Subjects who had more computer experience showed greater positive attitudes toward using computers. The total scores were ranging from 26.3 to 29.1 on a 40-point scale.



Table 2. Means and Standard Deviations of Anxiety, Confidence, and Liking by Country, Gender, and Computer Experience

Variables	Anxiety	Confidence	Liking	Total	
Country					
American	X	27.345 ^a	28.888	27.793	28.009
(N = 116)	SD	6.054	4.512	5.565	4.746
Taiwan	X	26.970	26.673	26.756	26.800
(N = 303)	SD	4.770	4.007	3.149	3.472
Gender					
Male	X	27.580	27.516	27.025	27.374
(N = 157)	SD	5.307	4.272	3.835	3.853
Female	X	26.771	27.149	27.053	26.991
(N = 262)	SD	5.043	4.262	4.083	3.926
Computer Experience					
0-6 months	X	25.571	26.503	26.810	26.295
(N = 147)	SD	5.349	3.925	4.607	4.053
6-24 months	X	26.623	26.497	26.528	26.549
(N = 159)	SD	4.096	3.747	2.899	3.028
more than	X	29.664	29.416	28.071	29.050
2 years	SD	5.299	4.661	4.278	4.156
(N = 113)					

Note. a. The possible maximum score for each subscale is 40.



Summaries of the three 2 X 2 X 3 ANOVA procedures are presented in Table 3. The results of the ANOVA procedures indicate a significant main effect for computer experience on all three subscales. The main effect of gender was statistically significant only for computer liking. Statistically significant interactions were found on country by gender for computer confidence and liking. A statistically significant interaction was also obtained on country by computer experience for computer liking. No other statistically significant main effects or interactions were found.

Table 3. Summaries of Three-way ANOVAs for Anxiety, Confidence, and Liking

Source	df	MS	F
Anxiety			
Country (C)	1	17.714	.722
Gender (G)	1	.763	.033
Computer Experience (E)	2	375.516	16.374***
C x G	1	70.103	3.057
C x E	2	61.531	2.683
G x E	2	22.365	.975
C x G x E	2	6.492	
Error	407	22.934	
Confidence			
Country	1	2.493	.166
Gender	1	8.019	.534
Computer Experience	2	86.64	5.771**
C x G	1	165.35	11.013**
C x E	2	1.252	.083
G x E	2	24.718	1.646
C x G x E	2	41.266	2.749
Error	407	15.014	
Liking			
Country	1	19.112	1.315
Gender	1	62.119	4.273*
Computer Experience	2	75.009	5.16**
C x G	1	171.135	11.772***
C x E	2	64.866	4.462*
G x E	2	10.341	.711
C x G x E	2	6.324	.435
Error	407	14.537	

* P < .05

** P < .01

*** P < .001

The results of the first ANOVA, using computer anxiety as the dependent variable, indicated that only the main effect for computer experience was statistically significant. The results of the post hoc (Scheffe's F) test showed that subjects who had more than 2 years of computer experience scored significantly higher than subjects with 0-6 and 6-24 months of computer experience. The results suggest that students with less than 2 years of computer experience were significantly more anxious about computers than those who had more than 2 years of computer experience.

The results of the second factorial ANOVA, using computer confidence as the dependent variable, indicated a significant main effect for computer experience and a significant interaction for country by gender. The results of the post hoc (Scheffe's F) test showed again that subjects who had more than 2 years of computer experience scored significantly higher than subjects with 0-6 and 6-24 months of computer experience, suggesting that students with more than 2 years of computer experience were more confident than those with less than 2 years of computer experience. The Follow-up analysis for the significant interaction effect (see Table 4) indicated that female American subjects scored significantly higher than all subjects in Taiwan; also male Taiwan subjects had significantly higher scores than female Taiwan subjects.

Table 4. Means of Confidence Scores by Country and Gender

Gender	Country		
	American	Taiwan	Total
Male	26.727 ^a (N = 11)	27.575 (N = 146)	27.516 (N = 157)
Female	29.114 (N = 105)	25.834 (N = 157)	27.149 (N = 262)
Total	28.888 (N = 116)	26.673 (N = 303)	27.286 (N = 419)

Note. a. The possible maximum score is 40.

The results of the third ANOVA, using computer liking as the dependent variable, indicated two significant main effects (one for gender and the other for computer experience) and two significant interactions (one for country by gender and the other for country by computer experience). The results of the significant main effect for gender showed that female subjects scored significantly higher than male subjects. However, because the means for male and female subjects were quite close (male = 27.025 and female = 27.053) one-way ANOVA using gender as an independent variable was performed. The results showed that there were no significant differences between female and male subjects ($F(1,418) = .005, p > .05$). Therefore, the significant main effect for gender showed in the three-way ANOVA may result from the significant interaction between country and gender (discussed below). The results of the post hoc (Scheffe's F) test for computer experience showed that subjects who had more than 2 years of computer experience scored significantly higher than subjects with 0-6 and 6-24 months of computer experience. The follow-up analysis for the significant interaction between country and gender (see Table 5) showed that Female American and male Taiwan subjects had significantly higher scores than male American subjects; in addition, female American subjects scored significantly higher than female Taiwan female subjects.

Table 5. Means of Liking Scores by Country and Gender

Gender	Country		Total
	American	Taiwan	
Male	23.818 ^a (N = 11)	27.267 (N = 146)	27.025 (N = 157)
Female	28.21 (N = 105)	26.28 (N = 157)	27.053 (N = 262)
Total	27.793 (N = 116)	26.756 (N = 303)	27.043 (N = 419)

Note. a. The possible maximum score is 40.

For the significant interaction between country and computer experience, the follow-up analysis (see Table 6) showed that American subjects with more than 2 years of computer experience had significantly higher scores than American subjects who had 0-6 months computer experience; also American subjects with more than 2 years of computer experience scored significantly higher than Taiwan subjects who had 6-24 months of computer experience. All significant interactions are presented in Figure 1.

Table 6. Means of Liking Scores by Country and Computer Experience

Computer Experience	Country		
	American	Taiwan	Total
0-6 months	25.829 ^a (N = 41)	27.189 (N = 106)	26.81 (N = 147)
6-24 months	28.826 (N = 23)	26.14 (N = 136)	26.528 (N = 159)
more than 2 years	28.885 (N = 52)	27.377 (N = 61)	28.071 (N = 113)
Total	27.793 (N = 116)	26.756 (N = 303)	27.043 (N = 419)

Note. a. The possible maximum score is 40.



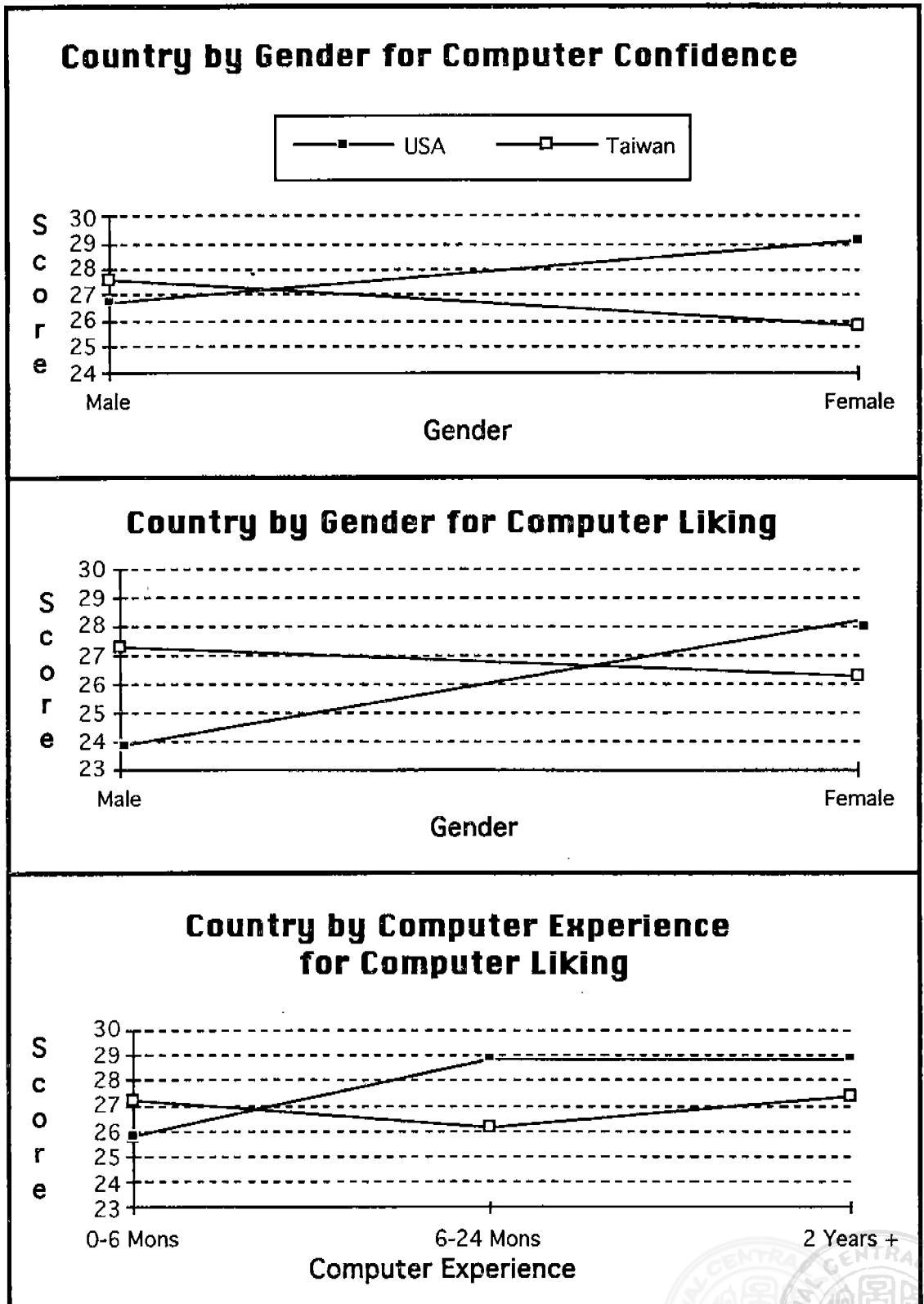


Figure 1. Significant Interactions between Variables

Discussion

The major purpose of the present study was to examine the effects of different cultural backgrounds on preservice teachers' attitudes toward computers. The results of the present study suggest that, in general, the students as a whole had slightly positive attitudes toward computers. On all three subscales of the Computer Attitude Scale, the average scores were around 27 on a 40-point scale where a score of 25 would indicate a neutral attitude toward computers.

Computer experience was observed to be a major factor in all three computer attitude subscales, with more computer experience corresponding to more positive attitudes toward computers. The findings were consistent with previous research (Koohang, 1987; Liao, 1993; Loyd & Gressard, 1984; Loyd & Loyd, 1988; Mercoulides, 1988). The significant interaction between computer experience and country for computer liking suggests that there were some degrees of variance between preservice teachers in America and Taiwan for this trend. However, without any control of what exactly the nature of these computer experiences was, it is not possible to determine whether longer exposures of computers directly cause more positive attitudes toward computers.

The findings of significant interactions between country and gender for computer confidence and liking indicate that gender differences in attitudes toward computers exist only for Taiwan preservice teachers, in which male subjects showed higher confidence and liking in use of computers than females. Collis and Williams (1987) in a study reported that there were fewer gender differences among Chinese students in attitudes toward their computers (Collis & Williams, 1987). Obviously, the results of the present study do not agree with their findings. A possible explanation for this is that students in Taiwan are strongly affected by society's reinforcement of sexual stereotypes. Most people in Taiwan view technology/science types of majors in colleges (e.g., electronic engineering, physics, chemistry) as a male domain while literature/art types of majors (e.g., Chinese literature, English literature, and arts) are seen as a female domain. Students may be influenced subconsciously by this society's reinforcement of sexual stereotypes while they are choosing their majors in colleges. As a result, a typical phenomenon in a comprehensive university in Taiwan is that the number of male students at a technology/science department is several times more than females, and it is opposite in a literature/art department. Yang (1993) explored sex difference in science education for universities in Taiwan in the last 20 years, and reported that for the latest 20 years the percentages

of female students with a science major were from 11.08 to 21.40 while the percentage of male students were from 78.60 to 88.92. This cultural bias may therefore result in gender differences in attitudes toward computers when the computer has been viewed as a type of technology. The study by Collis and Williams (1987) did not use subjects in Taiwan and may therefore result in different outcomes.

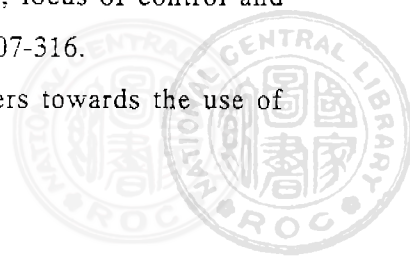
The significant differences observed in computer liking for American female subjects over male subjects were a great surprise. Some previous studies have found that males students scored significantly higher over females on some computer attitude scales (Griffin, Gillis, & Brown, 1986; Hattie & Fitzgerald, 1987; Martinez & Mead, 1988); other studies reported no significant differences (Colbourn & Light, 1987; Eastman & Krendl, 1987; Johnson, Johnson, & Stanne, 1985; Kay, 1989; Krendl, Broihier, & Fleetwood, 1989; Loyd & Loyd, 1988; Pulos & Fisher, 1985; Richard, Johnson, & Johnson, 1986; Smith, 1987; Swadener & Hannafin, 1987). Very few studies reported an opposite result, in which female subjects were superior to male subjects. However, given the limitations of uneven cell sizes (i.e., n of female = 105, n of male = 11), the result should not be overgeneralized.

Although the results from the present study might be limited by the size and representativeness of the samples with regard to the population of preservice teachers in America and Taiwan, the results are precisely valuable. Not only did the study examine and compare the presence of computer attitudes in the context of two different cultural backgrounds, it also provided useful information about the preservice teachers whose reactions toward computers in Taiwan. Since previous studies have identified significant relationships between computer attitudes and computer achievement (Dambrot, Watkins-Malek, Silling, Marshall, and Garver, 1985; Mercoulides, 1988; Wiggins, 1984), there is a reason to believe that to increase students' positive attitudes toward computers may help students in the learning process. As computers have become one of the most useful technology in educational settings in America, and are growing to be worldwide, the understanding of the presence of computer attitudes for peoples in different cultural backgrounds may serve as an invaluable resource for researchers and practitioners in America to conceive factors that may influence computer achievement for students in other countries.



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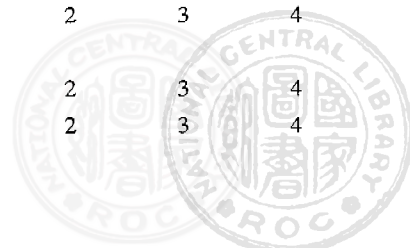
Appendix A

DIRECTIONS:

This is not a test. The questions inside are to find out what your attitude and learning in a computer class. Please answer all questions. Think about how well each statement describe your experience in the computer class. Then circle the number which BEST describe how well the statement fits.

1. If the statement is NOT AT ALL TRUE.
2. If the statement is NOT VERY TRUE.
3. If the statement is SORT OF TRUE.
4. If the statement is VERY TRUE.

	Not at All True	Not very True	Sort of True	Very True
1. Computers do not scare me at all .	1	2	3	4
2. Working with a computer would make me very nervous	1	2	3	4
3. I do not feel threatened when others talk about computers	1	2	3	4
4. I feel aggressive and hostile towards computers.	1	2	3	4
5. It wouldn't bother me at all to take computer course.	1	2	3	4
6. Computers make me feel uncomfortable.	1	2	3	4
7. I would feel at ease in a computer class	1	2	3	4
8. I get a sinking feeling when I think of trying to use a computer	1	2	3	4
9. I would feel comfortable working with a computer	1	2	3	4
10. Computers make me feel uneasy and confused	1	2	3	4
11. I'm no good with computers	1	2	3	4
12. Generally I would feel OK about trying a new problem on the computer	1	2	3	4
13. I don't think I would do advanced computer work	1	2	3	4
14. I am sure I could do work with computers	1	2	3	4
15. I'm not the type to do well with computers	1	2	3	4
16. I am sure I could learn a computer language	1	2	3	4
17. I think using a computer would be very hard for me	1	2	3	4
18. I could get good grades in a computer course	1	2	3	4
19. I do not think I could handle a computer course	1	2	3	4
20. I have a lot of self-confidence when it comes to working with computers	1	2	3	4
21. I would like working with computers.	1	2	3	4
22. The challenge of solving problems with computers does not appeal to me	1	2	3	4
23. I think working with computers would be enjoyable and stimulating	1	2	3	4
24. Figuring out computer problems does not appeal to me	1	2	3	4
25. 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	1	2	3	4
26. I don't understand how some people can spend so much time working with computers and seem to enjoy them	1	2	3	4
27. Once I start to work with the computer, I would find it hard to stop	1	2	3	4
28. I will do as little work with computer as possible	1	2	3	4
29. If a problem is left unsolved in a computer class, I would continue to think about it afterward	1	2	3	4
30. I do not enjoy talking with others about computers	1	2	3	4



Appendix B

說明：這是問卷而非考試題目。主要目的是想了解學生上電腦課時的學習過程與態度。請回答下面所有的問題，並請仔細思考問卷中的每一陳述與你上電腦課時的經驗相吻合的程度。然後，圈選那最貼切的敘述的號碼。

- 1.十分不同意
- 2.不同意
- 3.同意
- 4.十分同意

	十分 不同意	不同意	同意	十分 同意
1. 電腦並未使我心生恐懼。	1	2	3	4
2. 使用電腦令我緊張。	1	2	3	4
3. 當別人談論電腦時，我並無壓迫感。	1	2	3	4
4. 我感到電腦令我產生挑釁和敵意。	1	2	3	4
5. 修電腦課並不困擾我。	1	2	3	4
6. 電腦令我覺得不自在。	1	2	3	4
7. 上電腦課讓我覺得很自在。	1	2	3	4
8. 一想到使用電腦，我的心就往下沈。	1	2	3	4
9. 當我使用電腦時，我覺得自在。	1	2	3	4
10. 電腦使我覺得不安和困惑。	1	2	3	4
11. 我對電腦不在行。	1	2	3	4
12. 大致來說，使用電腦來解決問題，我可以接受。	1	2	3	4
13. 我想以後，我不會再進一步修習電腦課程。	1	2	3	4
14. 我確信我能應用電腦得宜。	1	2	3	4
15. 我不是那種能電腦應用得宜的人。	1	2	3	4
16. 我確信我可以學會一種電腦語言。	1	2	3	4
17. 我認為使用電腦就我而言是相當困難的。	1	2	3	4
18. 我可以在電腦課中得到好的成績。	1	2	3	4
19. 我想我不能夠應付電腦課。	1	2	3	4
20. 使用電腦時我有極大的信心。	1	2	3	4
21. 我喜歡使用電腦。	1	2	3	4
22. 我不喜歡利用電腦來解決問題的挑戰。	1	2	3	4
23. 我認為使用電腦是件愉快且刺激的經驗。	1	2	3	4
24. 使用電腦解決問題並不吸引我。	1	2	3	4
25. 跑電腦軟體或程式遇到我無法即時解決的問題時， 我會堅持到找到答案為止。	1	2	3	4
26. 我不明白為什麼有些人花那麼多時間在電腦上， 而且似乎怡然自得。	1	2	3	4
27. 一旦我開始使用電腦，我就難以釋手。	1	2	3	4
28. 我儘可能少碰電腦。	1	2	3	4
29. 在電腦課中無法解決的問題，課後我會繼續思考。	1	2	3	4
30. 我無法從與他人談論有關電腦之事中得到樂趣。	1	2	3	4

中美師範生電腦態度之比較研究

廖遠光

初等教育系

摘要

本文旨在比較中、美兩國師範生對電腦之態度。研究樣本共419名，其中303名來自台灣，而116名來自美國。選用之研究工具為Loyd及Gressard(1984)所設計之「電腦態度量表」。本量表共分為三個項目：電腦焦慮、電腦信心、及電腦喜愛度。研究結果顯示，兩國師範生間在三個項目中皆無顯著差異。不過，在「國家」與「性別」，以及「國家」與「電腦經驗」等變項，卻發現有顯著的互動關係。

關鍵詞：電腦態度、師資訓練、跨文化比較。

