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ABSTRACT

As computers proliferate on college campuses across the world, it becomes very important to examine college students' attitudes toward computers from a cross-cultural perspective. The purpose of this study was to examine the relationships among gender, computer experiences, and attitudes toward computers in Korea. Three hundred three (303) Korean undergraduate students completed a questionnaire packet which contained a personal information form, a Computer Attitude Scale, and a Computer Experience Questionnaire. Results show that gender was found to be significant only on the computer confidence scale, with male students significantly more confident about computers than female students. Students who had more computer experience expressed more positive attitudes towards computers in general, and number of computer courses completed contributed to this confidence. Students who had more experience with computer programming languages scored significantly higher on all computer attitude subscales. Word processing experience, knowledge of multiple word processing packages, and data entry skills contributed to higher confidence levels and more positive attitudes toward computers. Finally, it was discovered that attitudes toward computers and computer experiences were culture-free constructs. Seven tables illustrate results, and an appendix contains the computer experience questionnaire. (Contains 33 references.) (MAS)

THE RELATIONSHIPS AMONG GENDER, COMPUTER EXPERIENCE, AND ATTITUDES TOWARD COMPUTERS

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THE RELATIONSHIPS AMONG GENDER, COMPUTER EXPERIENCE, AND ATTITUDES TOWARD COMPUTERS

Computers have been used increasingly in classrooms across the world. The presence of computers in schools suggests several research questions when considered in terms of psychological issues. Researchers have focused on attitudes toward computers, computer aptitude, and computer use in a variety of sub-populations (Kay, 1992a). Although the results have been conflicting and confusing, such computer-related behaviors have been considered important factors that influence successful usage of computers in the classroom. Most studies on these issues have been performed in western cultures with far fewer cross-cultural studies on attitude (Moon, Kim, & McLean, 1993). During the 1970s, early computer attitude studies focused on the fears and negative attitudes of adults toward computers (Martin, Heller, & Mahmoud, 1992), but only a few studies investigated attitudes toward computers cross-culturally (Collis & Williams, 1987; Martin, Heller, & Mahmoud, 1992; Miller & Varma, 1994). As computers proliferate on college campuses across the world, it becomes even more important to examine attitudes toward computers for college students cross-culturally. The purpose of this study was to examine the relationships among gender, computer experience, and attitudes toward computers in Korea. In the following sections, we discuss gender differences, computer experience, and cultural differences that have been associated with computer attitudes.

Background

Gender Differences

One of factors that has been associated with computer attitudes is gender. It is a widely expressed concern that females are more technophobic (Miller & Varma, 1994), have more negative attitudes toward computers (Dambrot, Watkins-Malek, Silling, Marshall, & Garver, 1985), and are less confident in their use of computers (Culley, 1988; Hawkins, 1985). According to a comprehensive review of the literature on gender differences in computer-related behavior (Kay, 1992a), previous studies have reported not only mixed and conflicting results but also equally positive and negative computer attitudes in both males and

females. Kay's summaries (1992a, 1992b) reveal that out of 98 instances of attitude measurement (two or more attitude measures sometimes occur in a single study), males had more positive attitudes on 48 occasions, females had more positive attitudes on 14 occasions, and males and females had similar attitudes on 36 occasions.

There are two major issues related to gender differences in attitudes toward computers. First, computer attitudes have been defined by investigators in a variety of ways. Kay (1992a) has summarized the definition of computer attitudes in at least 14 different ways, including acceptance, affect, cognition, comfort, confidence, courses, interest, liking, locus of control, motivation, programming, training, case scenarios, and stereotypes.

Second, a number of causes have been proposed for these gender differences. The main causes can be summarized as follows; interest toward computers (Hawkins, 1985), prior computer experience (Dyck, & Smither, 1994; Koohang, 1986; Liu, Reed, & Phillips, 1992), having taken computer courses (Hawkins, 1985; Lockheed, 1985), having a home computer (Sanders, 1984), male-oriented culture (Lepper, 1985), and gender role-typing (Miller & Varma, 1994; Colley, Gale, & Harris, 1994).

Computer Experience

Computer experience refers to computer familiarity (Dimock & Cormier, 1991; Johnson & White, 1980), computer use (Kay, 1992a, 1992b), and previous exposure to computers (Levin & Gordon, 1989). Kay (1992a) has reviewed the previous definitions of computer use: computer camp participation, computer course enrollment, games, playing with graphs, ownership of computer, style, word processing, and general extra-curricular activities.

Recent empirical studies have reported that previous computer experience is significandy related to more positive attitudes toward computers (Bear, Richards, & Lancaster, 1987; Chen, 1986; Koohang, 1986, 1989; Koohang & Byrd, 1987; Loyd & Gressard, 1984b; Loyd, Loyd, & Gressard, 1987). Computer experience is one of the significant factors in predicting computer attitudes (Miller & Varma, 1994), and has a stronger effect on attitudes toward computers than gender (Levin & Gordon, 1989). Only

a few studies have found a significant interaction between computer experience and gender (Loyd, Loyd, & Gressard, 1987), but differential effects of both gender and experience have been found on measures of interest, confidence, and anxiety (Chen, 1986). In other words, when the effect of experience is controlled, the gender difference in interest disappears, while gender differences in confidence and anxiety remain. Moreover, when the effects of prior experience and gender stereotyping are removed, the gender differences found for the three attitude measures are no longer present (Colley, Gale, & Harris, 1994).

Cross-Cultural Studies on Attitudes toward Computers

A cross-cultural perspective can be one of the important approaches which explains the nature of attitudes toward computers. For example, it is worthwhile to explore whether or not attitudes toward computers is a cultural-independent psychological construct (Miller & Varma, 1994). It is necessary to examine whether or not a cross-cultural validation study on a computer attitude scale can measure the same constructs for the samples from different cultural backgrounds (Marcoulides & Wang, 1990). Recent studies have examined the relationships between several variables and computer attitudes with British college students (Colley, Gale, & Harris, 1994), Chinese and Canadian secondary school students (Collis & Williams, 1987), Indian children (Miller & Varma, 1994), Israeli students (Levin & Gordon, 1989), American and Soviet children (Martin, Heller, and Mahmoud, 1992). These studies also have investigated a variety of psychosocial variables such as gender (Colley, Gale, & Harris, 1994; Collis & Williams, 1987; Martin, Heller, and Mahmoud, 1992; Miller & Varma, 1994), computer experience (Colley, Gale, & Harris, 1994; Levin & Gordon, 1989; Miller & Varma, 1994), stereotypes about computer users and self-confidence about computer use (Collis & Williams, 1987), and computer usage, future plans regarding computers and various types of anxiety (Miller & Varma, 1994).

Although a few studies have shown some significant differences by country and gender (Collis & Williams, 1987; Martin, Heller, and Mahmoud, 1992), most of the previous studies have reported very similar and mostly positive attitudes toward computers. The inconclusive results of the cross-cultural

studies suggest that the effects of culture would be minimal, or that attitudes toward computers and its covariates are cultural-independent constructs (Miller & Varma, 1994).

Based on the previous research findings, the relationships among gender, computer experience, and attitudes toward computers should be investigated further to ascertain a cross-cultural perspective on computer attitudes in Korea.

Method

Subjects

The subjects in this study included 303 Korean undergraduate students enrolled in test and measurement, curriculum evaluation, and educational psychology courses for the spring semester of 1994 at the Kyungpook National University, Taegu, Korea. There were 182 females and 121 males.

Instrumentation

The students completed a questionnaire packet that contained a personal information form, a Computer Attitude Scale (Loyd & Gressard, 1984a), and a Computer Experience Questionnaire (Mazzeo, Druesne, Checketts, & Muhlstein, 1991). The personal information form is designed to obtain information about the students' grade, gender, and major.

The Computer Attitude Scale (Loyd & Gressard, 1984a) consists of 30 items, divided into three 10-item subscales: computer anxiety, computer confidence, and computer liking. The items include positively and negatively worded statements. The instrument employs a four-point Likert scale in which the students indicate their feelings by selecting exactly one of four choices; it does not include a neutral choice. The alpha reliability coefficients for computer anxiety, computer confidence, computer liking, and total scores were .87, .91, .91, and .95, respectively (Loyd & Gressard, 1984a). Their counterparts for this study were .82, .80, .84, and .92, for computer anxiety, computer confidence, computer liking, and total scores, respectively.

The Computer Experience Questionnaire developed by Lee (1986) and modified by Mazzeo, Druesne, Raffeld, Checketts, and Muhlstein (1991) was used to measure test-takers' computer experience

and familiarity. Response options "a" through "e" were recorded as 1 through 5, and the first six items were used in this study. The six items were completed computer courses, computer programming languages, word processing experience, word processing packages, other software packages, and data entry experience (Appendix).

The instruments were translated into Korean by the second author. Every attempt was made to provide a Korean version that was as faithful a representation of the English as possible. Once the Korean version was prepared, two other Korean colleagues, one the first author and one a Korean linguist, were asked to check the instrument and compare it to the English version. A few minor changes in the Korean wording resulted in the final version of the instruments. Efforts were made to maintain the measuring of the items over syntactic structure.

Procedures

Data collection for this study was conducted at the end of the spring semester of 1994. The Korean versions of the Computer Attitudes Scale and the Computer Experience Questionnaire were administered by course instructors with the first author's cooperation. All subjects were asked to respond to all the items in the booklet without using answer sheets. The first author supervised the keying of data into a computer file that was uploaded into The University of Alabama's mainframe computer for analysis.

Data Analysis

Three scores of the Computer Attitudes Scale were computed for each student, one score for each of the three subscales. Higher scores on the Computer Anxiety subscale correspond to lower anxiety, while higher scores on the Computer Confidence and Computer Liking subscales correspond to greater degrees of confidence and liking, respectively (Loyd & Gressard, 1984a). The independent variables were gender and six computer experience indicators (completed computer courses, computer programming languages, word processing experience, word processing packages, other software packages, and data entry experience). The dependent variables were the three subscales of the computer attitudes scale: computer anxiety, computer confidence, and computer liking. Each computer experience indicator was

divided into three categories (none experience, some experience, and more experience). Differences in computer attitudes were analyzed using six separate 2 (sex) x 3 (computer experience) multivariate analysis of variance (MANOVA) procedures. Significant multivariate effects were followed by univariate analyses. Post hoc comparisons were conducted for the independent variables of more than two levels. The level of significance chosen for this study was .05.

Results

Overall Gender Differences

Results indicated significant MANOVA effects for gender in all six computer experience indicators, but no significant interactions between gender and computer experience indicators. We performed another one-way MANOVA on three computer attitudes subscales to assess the overall gender difference. The main effect of gender was significant, Wilks' Lambda = .8589, $F(3, 299) = 16.38$, $p < .0001$. The results of the univariate analyses of variance for gender indicated no significant differences on two of the computer subscales: computer anxiety ($F(1, 301) = 2.65$; $p = .1048$) and computer liking ($F(1, 301) = 1.42$; $p = .2337$). Gender was a significant factor on the computer confidence subscale ($F(1, 301) = 29.71$; $p = .0001$). Male students had significantly greater confidence toward computers than did female students. Table 1 provides the means and standard deviations of computer attitudes subscales with gender.

Table 1

Means and Standard Deviations of Computer

Attitudes Subscales with Gender

Computer	Females	(N=182)	Males	(N=121)
Subscales	M	SD	M	SD
Anxiety	26.05	5.65	27.03	4.31
Confidence	21.85	4.91	24.91	4.59
Liking	26.82	5.48	27.56	4.94

Completed Computer Courses

The MANOVA indicated a significant main effect for gender (Wilks' Lambda = .9593, F(3, 295) = 4.17, P < .0065), a main significant effect for completed computer courses (Wilks' Lambda = .9282, F(6, 590) = 3.73, p < .0012), and a nonsignificant interaction between gender and completed computer courses (Wilks' Lambda = .9677, F(6, 590) = 1.63, p < .1376).

Results of the univariate analyses of variance for completed computer courses indicated a significant difference for computer confidence (F(2, 297) = 6.93, p = .0011). Computer anxiety (F(2, 297) = 1.27, p = .2823) and computer liking (F(2, 297) = 1.18, p = .3082) were not significant factors based on completed computer courses.

Results of multiple comparisons showed that students who took one or two computer courses and more than three courses had significantly greater confidence than students who did not. The means and standard deviations of computer attitudes subscales with completed computer courses are presented in Table 2.

Table 2

Means and Standard Deviations of Computer Subscales

with Completed Computer Courses

Computer	None	(N=130)	1 - 2	(N=124)	3 +	(N=49)
Subscales	M	SD	M	SD	M	SD
Anxiety	25.68	5.77	27.44	4.88	25.94	3.65
Confidence	21.37	5.56	24.25	4.42	24.61	3.26
Liking	26.67	6.09	27.77	4.83	26.65	3.74

Computer Programming Languages

The MANOVA indicated a significant main effect for gender (Wilks' Lambda = .9439, F(3, 295) = 5.84, P < .0007), a significant main effect for computer programming languages (Wilks' Lambda = .7990, F(6, 590) = 11.67, p < .0001), and a nonsignificant interaction between gender and computer programming languages (Wilks' Lambda = .9717, F(6, 590) = 1.42, p < .2037).

Results of the univariate analyses of variance for computer programming languages indicated a significant difference on all three computer subscales: computer anxiety (F(2, 297) = 5.67, p = .0038); computer confidence (F(2, 297) = 28.85, p = .0001); and computer liking (F(2, 297) = 7.47, p = .0007).

The results of multiple comparisons showed the same pattern on all three computer subscales that students who used one or two programming languages and students who used more than three programming languages had higher scores than did non-experienced students. Table 3 shows the means and standard deviations of computer attitudes subscales with computer programming languages.

Table 3

Means and Standard Deviations of Computer Subscales

with Computer Programming Languages

Computer	None	(N=123)	1 - 2	(N=141)	3 +	(N=39)
Subscales	M	SD	M	SD	M	SD
Anxiety	24.93	5.73	27.41	4.66	27.72	3.75
Confidence	20.24	4.96	25.07	4.22	24.79	3.21
Liking	25.52	5.88	28.10	4.66	28.61	4.00

Word Processing Experience

The MANOVA indicated a significant main effect for gender (Wilks' Lambda = .9480, F(3, 295) = 5.40, P < .0013), a significant main effect for word processing experience (Wilks' Lambda = .8244,

F(6, 590) = 9.97, p < .0001), and a nonsignificant interaction between gender and word processing experience (Wilks' Lambda = .9699, F(6, 590) = 1.51, p < .1713).

Univariate follow-up analyses indicated that the word processing experience effects were significant across all three computer subscales: computer anxiety (F(2, 297) = 21.87, p = .0001); computer confidence (F(2, 297) = 23.93, p = .0001); and computer liking (F(2, 297) = 15.43, p = .0001).

Table 4

Means and Standard Deviations of Computer Subscales

with Word Processing Experience

Computer	None	(N=59)	1 - 6	(N=148)	7 +	(N=96)
Subscales	M	SD	M	SD	M	SD
Anxiety	22.81	5.57	26.07	4.33	29.25	4.54
Confidence	19.36	5.14	22.68	4.16	25.97	4.41
Liking	24.78	6.13	26.34	4.55	29.76	4.70

Results of multiple comparisons were summarized as follows: computer anxiety, Group 1 < Group 2, Group1 < Group 3, and Group 2 < Group 3; computer confidence, Group 1 < Group 2, Group 1 < Group 3, and Group 2 < Group 3; computer liking, Group 1 < Group 3 and Group 2 < Group 3. Group 1 consisted of students who had no experience on the word processor. Group 2 consisted of students who had some experience (1 or 6 letters or reports) on word processor. Group 3 consisted of students who had more word processing experience. The means and standard deviations of computer attitudes subscales with word processing experience are presented in Table 4.

Word Processing Packages

The MANOVA indicated a significant main effect for gender (Wilks' Lambda = .9213, F(3, 295) = 8.39, P < .0001), a significant main effect for word processing packages (Wilks' Lambda = .8703,

F(6, 590) = 7.08, p < .0001), and a nonsignificant interaction between gender and word processing packages (Wilks' Lambda = .9780, F(6, 590) = 1.10, p < .3613).

Results of the univariate analyses of variance indicated that word processing packages made a significant difference on all three computer subscales: computer anxiety (F(2, 297) = 14.27, p = .0001); computer confidence (F(2, 297) = 17.80, p = .0001); and computer liking (F(2, 297) = 9.01, p = .0002).

The results of multiple comparisons showed the same pattern on all three computer subscales that students who used one word processing package and students who used more than two word processing packages had higher scores than did students who had no experience on word processing packages. Table 5 provides the means and standard deviations of computer attitudes subscales with word processing packages.

Table 5

Means and Standard Deviations of Computer Subscales

with Word Processing Packages

Computer	None	(N=68)	1	(N=119)	2 +	(N=116)
Subscales	M	SD	M	SD	M	SD
Anxiety	23.04	5.48	26.76	4.84	28.10	4.35
Confidence	19.71	5.11	22.56	4.43	25.57	4.14
Liking	24.43	5.83	27.20	4.87	28.61	4.74

Other Software Packages

The MANOVA indicated a significant main effect for gender (Wilks' Lambda = .9706, F(3, 295) = 2.98, P < .0318), a significant main effect for other software packages (Wilks' Lambda = .9436, F(6, 590) = 2.90, p < .0086), and a nonsignificant interaction between gender and other software packages (Wilks' Lambda = .9674, F(6, 590) = 1.64, p < .1327).

Univariate follow-up analyses indicated that the other software packages effects were significant on two of three computer subscales: computer confidence ($F(2, 297) = 5.96$, $p = .0029$); and computer liking ($F(2, 297) = 3.21$, $p = .0418$). Computer anxiety ($F(2, 297) = 1.27$, $p = .2823$) was not a significant factor based on other software packages as an indicator of computer experience.

Table 6

Means and Standard Deviations of Computer Subscales

with Other Software Packages

Computer	None	(N=191)	1 - 3	(N=44)	4 +	(N=68)
Subscales	M	SD	M	SD	M	SD
Anxiety	25.96	5.62	28.39	4.78	26.54	3.61
Confidence	21.80	5.08	24.59	4.19	25.66	3.94
Liking	26.55	5.61	28.95	4.62	27.51	4.38

Results of multiple comparisons were summarized as follows: computer anxiety, Group 1 < Group 2; computer confidence, Group 1 < Group 2 and Group 1 < Group 3; computer liking, Group 1 < Group 2. Group 1 consisted of students who had no experience on other software packages. Group 2 consisted of students who had used one or three software packages. Group 3 consisted of students who had used more than four software packages. The means and standard deviations of computer attitudes subscales with other software packages are presented in Table 6.

Data Entry Experience

The MANOVA indicated a significant main effect for gender (Wilks' Lambda = .9129, $F(3, 295) = 9.38$, $P < .0001$), a significant main effect for data entry experience (Wilks' Lambda = .9043, $F(6, 590) = 5.07$, $p < .0001$), and a nonsignificant interaction between gender and data entry experience (Wilks' Lambda = .9736, $F(6, 590) = 1.32$, $p < .2449$).

Univariate follow-up analyses indicated that the data entry experience effects were significant across all three computer subscales: computer anxiety ($F(2, 297) = 9.88$, $p = .0001$); computer confidence ($F(2, 297) = 14.34$, $p = .0001$); and computer liking ($F(2, 297) = 6.12$, $p = .0025$).

Table 7

Means and Standard Deviations of Computer Subscales

with Data Entry Experience

Computer	None	(N=104)	1 - 3	(N=85)	4 +	(N=114)
Subscales	M	SD	M	SD	M	SD
Anxiety	24.60	5.27	26.38	4.92	28.18	4.68
Confidence	20.88	5.38	22.60	4.09	25.43	4.23
Liking	25.82	5.36	26.71	5.57	28.61	4.60

The results of multiple comparisons showed the same pattern on all three computer subscales: Group 1 < Group 3 and Group 2 < Group 3. Group 1 consisted of students who had no data entry experience. Group 2 consisted of students who had some data entry experience (1 or 3 in the past year). Group 3 consisted of students who had more data entry experience. The highest data entry experience group had higher scores on all three subscales than did the other two groups. Table 7 provides the means and standard deviations of computer attitudes subscales with data entry experience.

Discussion

The present research examined the relationships among gender, computer experience, and attitudes toward computers. Gender differences in this study were significant on the overall MANOVA. Gender was found to be significant only on the computer confidence subscale by univariate follow-up analyses. Male students had significantly greater confidence about computers than did female students. Previous research had mixed results on gender differences in attitudes toward computers (Kay, 1992a), but

the present findings partially confirmed those of other studies that found that males had more positive attitudes toward computers than females (Chen, 1986; Clarke & Chambers, 1989; Collis & Williams, 1987; Kay, 1989; Koohang, 1989; Loyd & Gressard, 1986; Munger & Loyd, 1989). One possible explanation of these results is that cultural and environmental differences do exist between females and males in Korea (Koohang, 1989). In this study, Korean male college students had higher scores than did female students on six computer experience indicators. Perhaps more previous computer experience for male students could be fostering more positive computer attitudes, especially greater confidence.

Students who had more computer experience expressed more positive attitudes toward computers in general. More computer experience was found to have a statistically significant relationship to the development of more positive computer attitudes. Unlike a previous study (Loyd, Loyd, & Gressard, 1987), no statistically significant interactions between experience and gender were found.

Completed computer courses as an indicator of computer experience was a significant factor on the overall MANOVA. The results of the univariate follow-up analyses showed a significant difference on the computer confidence subscale. As the number of completed computer courses increased, the confidence felt with computers also increased.

Students who had more experience with computer programming languages scored significantly higher on all computer subscales. These findings were consistent with the previous research (Koohang, 1989). It is obvious that these students understand the logic of the computer and the basic operation system. They are less anxious, more confident, and more likely to work with and enjoy computers.

Both word processing experience and knowledge of multiple word processing packages made a significant difference on the overall MANOVA. The results of the ANOVAs also showed significant differences on all computer subscales for both computer experience indicators. Students who had more experience with word processors and word processing packages expressed more positive attitudes toward computers.

Students who had more experience with other software packages scored significantly higher on computer confidence and computer liking subscales. The experience with other commercially available software packages such as spread sheets (e.g., Lotus) or statistical packages (e.g., SPSS, SAS, and BMDP) could give students a feeling of control over computers, confidence about learning computers, and an appreciations for computers.

Data entry experience was a significant factor on the overall MANOVA. The results of the univariate follow-up analyses showed a significant difference on all three computer subscales. Subjects who had more data entry experience showed more positive attitudes toward computers. The findings suggest that typing data, either numerical or symbolic, into a computer could be a factor which facilitates more positive attitudes toward computers.

Finally, this study found that attitudes toward computers and computer experience were culture-free constructs. As the previous studies on Chinese (Collis & Williams, 1987), Israeli (Levin & Gordon, 1989), and Soviet (Martin, Heller, and Mahmoud, 1992) students have revealed inconclusive culture-dependent effects on computer attitudes, the results of this study support the hypothesis that attitudes toward computers is a psychological construct which is valid and reliable across diverse cultures. A cross-cultural study on computer attitudes will be an important area of research inquiry. Further research is needed to examine whether or not attitudes toward computers and computer experience are culture-independent constructs in different cultures. It is certain that these results will make a significant contribution to computer educators in both the United States and Korea.

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Appendix: Computer Experience Questionnaire

1. How many computer courses have you completed?
   (a) 0
   (b) 1
   (c) 2
   (d) 3
   (e) more than 3

2. How many computer languages (e.g., BASIC, PASCAL, FORTRAN) have you written programs in?
   (a) 0
   (b) 1
   (c) 2
   (d) 3
   (e) more than 3

3. In the past year, how many letters or reporters have you written using a word processor?
   (a) 0
   (b) 1 to 3
   (c) 4 to 6
   (d) 7 to 12
   (e) more than 12

4. How many word-processing packages (e.g., WordPerfect, Displaywrite, PCWrite, Microsoft Word) have you used to produce documents (such as letters or reports)?
   (a) 0
   (b) 1
   (c) 2
   (d) 3
   (e) more than 3

5. In the past year, how often have you used other commercially available software packages such as spreadsheets (e.g., Lotus) or statistical packages (e.g., SPSS, BMDP, SAS)?
   (a) 0
   (b) 1 to 3
   (c) 4 to 6
   (d) 7 to 12
   (e) more than 12

6. In the past year, how often have you been required to simply type data (either numerical or symbolic) into a computer?
   (a) 0
   (b) 1 to 3
   (c) 4 to 6
   (d) 7 to 12
   (e) more than 12