Gender Differences in Computer Attitudes, Literacy, Locus of Control and Commitment

Robin H. Kay
University of Toronto

Abstract

This study explored differences in computer attitudes, computer literacy, computer locus of control and commitment to computers between males and females. Three hundred and eighty-three education students at the University of Toronto completed a survey about computer attitudes (affective and cognitive), computer literacy (experience, basic skills, awareness, application software, programming), locus of control (specific to the use of computers), and commitment to computers (actual use, interest, promotion). Males and females did not differ in either their affective or cognitive attitudes toward computers. Males had significantly higher scores on all subscales of computer literacy and commitment to computers. Males also showed more internal locus of control with respect to computers. It is recommended that increased effort be made to impart computer literacy skills to female student teachers. (Keywords: Computers, Literacy, Attitudes, Locus of Control.)

Intrinsically, the computer is nondiscriminatory. It does not pass judgement on its users; it does not select those who instruct and learn from it; its language is symbolic; and it is not culturally or sex biased” (Schubert & Bakke, 1984: p. 28). Yet, the results of several studies investigating gender differences in computer attitudes and literacy, suggest that previous male dominance in various scientific and technical fields, (Fennema & Sherman, 1980; Key & Ormerod, 1976) may extend to the use of computers. These findings, though, should be interpreted with caution, for the theoretical relevance, and to some extent, the statistical merit of many of the measurement devices is noticeably absent.

ATTITUDES TOWARD COMPUTERS

Although several studies have noted that males have more positive attitudes toward computers (Collis, 1985a, 1985b; Vreudentburg, 1984), a number of investigators have found that sex was not a significant predictor of computer attitudes when combined with a variety of other variables (Baylor, 1985; Griswold, 1985; Loyd & Gressard, 1984).

Collis (1985a, 1988b) reported clearly established sex differences in attitudes toward computers. Both younger and older males were more interested in computers than females, and less likely to assume stereotypes about the computer of to be concerned about the impact of the computer on society. As well, female undergraduate students were reportedly more fearful of computers than male undergraduates (Vreudentburg, 1984).

Baylor (1985), on the other hand, examined 22 teachers and found that although sex was not a significant predictor of attitudes toward computers, females felt somewhat more favorable to computer-assisted instruction and males were more positive about programming. Griswold (1985) also reported that sex was not a significant predictor of computer attitudes combined with age, locus of control and mathematical ability; when nonetheless, females tended to have
less positive attitudes than males. Finally, Loyd & Gressard (1984) found that sex was not a significant predictor of computer attitudes in high school and college students. Furthermore, there were no significant differences between males and females on the three indices of computer attitudes assessed.

The consensus seems to be that sex is not a significant predictor of computer attitudes when other variables such as experience and age are included in the equation. There is some evidence, though, that males may have more positive attitudes toward computers.

These results have to be taken with the proverbial ‘grain of salt’. Conscientious attempts to develop statistically robust attitude measures have been overshadowed by an absence of theoretical discourse, thereby reducing the import of any conclusions drawn. A number of attitude scales, for example, are composed of an indiscriminate mix of affective, cognitive and behavioral items (Pakula, 1984). Even the most extensive statistical test can not sort out this ideological muddle.

COMPUTER LITERACY

Aside from focusing on attitudes, investigators have also looked at the relationship between computer literacy and gender. A majority of studies reported males have a higher degree of computer literacy than females. Fetter (1985) noted significant, but not large, computer literacy differences in favor of male students, grades 6 and 12. Lockheed, Nielsen and Stone (1985) saw greater gains in computer literacy for third year male college students than for their female counterparts. Furthermore, fewer females reported taking “advanced” computer courses (Fisher, 1984’ Linn & Ficsher, 1983; Miura & Hess, 1984; Watt, 1980) or using the computer voluntarily (Sanders, 1984). These results should also be interpreted cautiously because the theoretical relevance of literacy measures is rarely mentioned. Several computer literacy measures have been found to be statistically sound, yet are centered almost exclusively on programming and technology (Cheng, Plake, & Stevens, 1985; Gabrield, 1985). Little explanation is offered to substantiate these technology-focused examinations. In fact, with the widespread introduction of the microcomputer and use-friendly application software, it has increasingly become easier to use computers, often requiring only the ability to read and write to perform highly sophisticated maneuvers. Expertise in technology and programming is no longer essential, making a number of previous computer literacy measures somewhat outdated.

LOCUS OF CONTROL

Locus of control, or the pattern of reinforcements contingent upon a certain set of behaviors, also has been investigated in an effort to understand attitudes toward computers. Presumably, those individuals who perceive that computer-related events are contingent upon their own behavior (“Internals”) will have more positive attitudes toward computers than those individuals who feel these events are a result of luck, chance or some powerful other “Externals”). Arndt, Feltes, and Hanak (1983), employing Nowicki and Duke’s (1974) general locus of control battery, reported that Internals were more accepting of computer technology. Coover and Goldstein (1980), using both a general (Rotter, 1966) and a more criterion specific locus of control measure, noted that Internals had more positive attitudes than Externals toward com-
puters. Kerber (1983), on the other hand, found no relation between locus of control and attitudes.

None of these studies examined differences in locus of control between males and females. Furthermore, the locus of control measures employed did not focus on computer use. Instead, statistically reliable instruments based on social-political issues were used (Coover & Goldstein, 1980; Griswold, 1985; Kerber, 1983). The direct relation between social-political and computer domains was not explained.

It is important when measuring locus of control with respect to computers to incorporate direct references to situations involving computer use. General locus of control measures may predict general patterns of behavior, but probably will not account for a substantial amount of variance with respect to predicting computer related behavior (Lefcourt, 1976).

COMMITMENT TO THE USE OF COMPUTERS

A number of authors have looked at gender differences in computer-related behaviors. They have noted that males enroll in more computer courses and computer camps, are more willing to stay after school and play with computers, and own more home computers than females (Lockheed, & Frakt, 1984; Miura & Hess, 1984; Sanders, 1984; Schubert & Bakke, 1984). Overall, there is a general feeling that males are more enthusiastic about and more committed to the use of computers than females. Measures of computer attitude and literacy can help quantify this commitment; in this study it is argued that an additional scale is required to capture the behavioral component. In other words, we need a scale to assess the impact that computer attitudes and literacy have on our behavior. It is tempting to assume, for example, that negative attitudes precipitate infrequent computer use, or that a computer novice might be less enthusiastic about computers than an expert. Attitude and competency, though, are only indirect indices of our actions. A more direct approach would assess actual behaviors or intentions with respect to computer use. To date, a measure of computer-related behaviors, or overt commitment to computers, has not been developed.

CURRENT STUDY

The current study compares the attitudes, degree of computer literacy, locus of control and commitment to computers between male and female student teachers. In order to maximize the accuracy of these comparisons, statistically reliable and theoretically relevant measures are used.

METHOD

The sample consisted of 383 students (33% male, 67% female), ranging in age from 22 to 51 years (M=27.2 years), enrolled in the Faculty of Education at the University of Toronto. The majority of students had obtained their Bachelor’s degree (79%), although 20% had acquired their Master’s degree and 15% had their Doctoral degree. Of the 383 subjects, 18% (6 males, 64 females) intended to teach primary/junior pupils (junior kindergarten to grade 6), 21% (17 males, 63 females) intended to teach junior/intermediate pupils (grades 4 to 10) and 61% (104 males, 128 females) intended to teach intermediate/senior pupils (grades 7 to 12). Regarding subject area to be taught, 25% (50 males, 45 females) of students were planning to teach math-science-business oriented
courses, 49% (54 males, 133 females) to teach the humanities, and the remaining 26% (23 males, 77 females) to teach a general curriculum.

**Description of Instruments Used**

All measures used were based on a seven point Likert scale except the affective attitude measure which was based on a seven point semantic differential scale.

**Attitudes.** Attitudes toward computers were measured using a variation of Ajzen and Fishbein’s (1980) theory of reasoned action. Both affective and cognitive dimensions of attitudes were examined. In accordance with the theory of reasoned action, the target (the computer) and the action (using the computer) were maintained constant for all items on the attitude scale. The attitude measure was divided into two subscales, one measuring cognitive attitude (14 questions), the other measuring affective attitude (20 questions).

**Literacy.** The computer literacy battery was comprised of five subscales including computer experience, basic skills, application software ability, awareness and programming. Computer experience was determined from number of computer-related courses taken, number of years using any kind of a computer, and typical weekly use of a computer, determined by the average number of days and hours that a subject used a computer. The remaining subscales consisted of six questions each. Note that this was a self-report measure asking the subject about how confident he/she is in his/her ability to do a particular computer-related task. This wording was used in an attempt to control for extraneous factors such as availability of computers, computer experience and time.

**Locus of Control.** The locus of control battery consisted of questions that focused exclusively on the use of computers. The measure consisted of 14 questions. A high score on this scale indicated a more internal locus of control with respect to computers.

**Commitment.** Commitment to computer was measured using a self-report device asking about intentions to carry out computer-related activities. Although the relation between behavioral intentions and actually carrying out a behavior is not perfect, it holds true most of the time (Ajzen & Fishbein, 1977, 1980). In an effort to control for extraneous factors such as availability of computers, experience and time, the phrase “if it WERE ONLY UP TO YOU” preceded the question “How likely is it that you would do each of the following activities in the next 6 months?” The scale was organized into three categories: 1) behaviors related to actual computer use, 2) behaviors indicating interest in computers, and 3) behaviors showing promotion of the use of computers. Each subscale consisted of eight questions.

**Reliability of Instruments Used**

The reliability coefficients of the measures used for the study are presented in Table 1. All internal reliability coefficients were statistically significant ($p<.001$). Overall, the internal reliability coefficients were excellent: measures of computer commitment ($r = .96$), attitudes ($r = .94$), literacy ($r = .97$) and locus of control ($r = .86$). Individual subscale coefficients for all variables ranged for .86 to .95.
### Table 1
Internal Reliability Coefficients and Test Means for Computer Attitudes, Literacy, Locus of Control and Commitment (n = 383)

<table>
<thead>
<tr>
<th></th>
<th>Reliability Coefficient</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest in Computers</td>
<td>.89</td>
<td>30.1</td>
<td>12.3</td>
</tr>
<tr>
<td>Promotion of Computers</td>
<td>.91</td>
<td>32.9</td>
<td>12.1</td>
</tr>
<tr>
<td>Use of Computers</td>
<td>.91</td>
<td>33.2</td>
<td>12.4</td>
</tr>
<tr>
<td>Total Commitment</td>
<td>.96</td>
<td>96.2</td>
<td>34.9</td>
</tr>
<tr>
<td>Cognitive Attitudes</td>
<td>.89</td>
<td>71.8</td>
<td>13.6</td>
</tr>
<tr>
<td>Affective Attitudes</td>
<td>.91</td>
<td>96.6</td>
<td>16.5</td>
</tr>
<tr>
<td>Total Attitudes</td>
<td>.94</td>
<td>168.4</td>
<td>27.6</td>
</tr>
<tr>
<td>Basic Skills</td>
<td>.93</td>
<td>26.4</td>
<td>12.2</td>
</tr>
<tr>
<td>Application Software</td>
<td>.91</td>
<td>22.7</td>
<td>10.3</td>
</tr>
<tr>
<td>Computer Awareness</td>
<td>.90</td>
<td>21.5</td>
<td>9.3</td>
</tr>
<tr>
<td>Programming</td>
<td>.95</td>
<td>13.5</td>
<td>10.3</td>
</tr>
<tr>
<td>Computer Experience*</td>
<td>—</td>
<td>6.1</td>
<td>2.6</td>
</tr>
<tr>
<td>Total Computer Literacy*</td>
<td>.97</td>
<td>90.3</td>
<td>39.5</td>
</tr>
<tr>
<td>Locus of Control</td>
<td>.86</td>
<td>62.0</td>
<td>14.5</td>
</tr>
</tbody>
</table>

*n = 379

**Procedure**

Professors from the Educational Psychology Department were asked to volunteer 15 minutes of class time to distribute the Student Teacher Computer Survey. Four out of seven professors agreed to have their students fill out the survey during class time. A fifth professor agreed to have the survey handed out, but not completed during class. Eighteen classes participated in the survey.

Before the surveys were handed out, it was stressed that participation was completely optional and that students electing not to do the survey could take a 15 minute coffee break. Students were told that the survey was being used to obtain information about the use of computers in education and that the data would be used for a Master’s thesis. The students were also encouraged to pick up a one page “debriefing” summary after they had filled out the survey.

The first page of each survey provided a brief explanation of why the survey was being done, a statement referring to the option of participating, a list of instructions, a reminder that the results would be anonymous, and an expression of appreciation for participating in the survey.

Of the 387 surveys handed out and completed in the classroom 372 (96%) were returned. Of the 78 surveys handed out but not filled in during class, 11 (14%) were returned. Overall 383 of 465 (82%) of the surveys handed out were completed.
Research Design and Method of Analysis

Descriptive statistics were generated for demographic, independent, and dependent variables for the total population. Independent t-tests were done to determine if any differences in attitudes, literacy, locus of control and commitment existed between males and females. A probability level of \( p < .001 \) was used to compensate for the number of t-tests done (see Kirk, 1982, p. 102).

RESULTS

The means and standard deviations for all dependent and independent variables are presented in Table 1. The means for all three commitment subscales were virtually identical. There were also located at roughly the mid-point of each respective range. Regarding computer literacy subscales, the mean scores for basic skills, application software aptitude and awareness were similar, whereas the programming mean was 7 to 12 points lower.

GENDER DIFFERENCES

There were no significant differences between males and females in either cognitive or affective attitudes toward computers (Table 2). Both males and females scored relatively high on both scales with average scores of approximately 72 on the cognitive attitude scale (out of a possible 98) and 96 on the affective attitude scale (out of a possible 140).

Males had significantly higher mean scores for all five areas of computer literacy, including computer experience. The basic skill subscale produced the highest mean score for both sexes followed by application software ability and computer awareness. Programming scores were relatively low for both males and females (Table 2). Note that male computer literacy subscale scores ranged for 18.3 to 29.8 (out of a possible 42) and that female scores ranged from 11.1 to 24.7.

Males scored significantly higher on the computer locus of control scale, indicating a more internal locus of control with respect to computers.

With respect to commitment to computers, males showed significantly more total commitment to computers than females on all three commitment subscales. Males showed relatively high interest, promotion and use of computers with average scores ranging from 34.3 to 36.8 out of a possible 56. Scores for females on the same scales ranged from 28.1 to 31.4.

DISCUSSION

The purpose of the study was to examine sex differences in attitudes toward computers, computer literacy, computer locus of control and commitment to the use of computers using statistically reliable and theoretically relevant measures.

It is reasonable to conclude that the measures used in this study are statistically reliable, although any conclusions must be limited to the population assessed, namely student teachers. All measures showed high estimates of internal reliability and produced responses that were normally distributed over the full range of possible values.

Male and female student teachers have similar cognitive and affective attitudes about computers and these attitudes are relatively positive. This is en-
### Table 2
Comparison of Mean Test Scores for Males and Females

<table>
<thead>
<tr>
<th>Variable</th>
<th>Males (n=127)</th>
<th>Females (n=255)</th>
<th>Two Tailed Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (S.D.)</td>
<td>Mean (S.D.)</td>
<td></td>
</tr>
<tr>
<td>Interest in Computers</td>
<td>34.3 (12.)</td>
<td>28.1 (11.9)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Promotion of Computers</td>
<td>36.2 (11.4)</td>
<td>31.3 (12.1)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Use of Computers</td>
<td>36.8 (11.1)</td>
<td>31.4 (12.6)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Total Commitment</td>
<td>107.2 (32.6)</td>
<td>90.8 (34.7)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Cognitive Attitudes</td>
<td>72.2 (12.0)</td>
<td>71.5 (14.3)</td>
<td>n.s.</td>
</tr>
<tr>
<td>Affective Attitudes</td>
<td>97.2 (15.7)</td>
<td>96.4 (16.9)</td>
<td>n.s.</td>
</tr>
<tr>
<td>Total Attitudes</td>
<td>169.4 (25.1)</td>
<td>167.9 (28.7)</td>
<td>n.s.</td>
</tr>
<tr>
<td>Basic Skills</td>
<td>29.8 (12.0)</td>
<td>24.7 (12.0)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Application Software</td>
<td>25.5 (10.9)</td>
<td>21.3 (9.7)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Computer Awareness</td>
<td>25.2 (9.4)</td>
<td>19.6 (8.7)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Programming</td>
<td>18.3 (13.0)</td>
<td>11.1 (7.6)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Computer Experience*</td>
<td>6.5 (2.8)</td>
<td>5.9 (2.5)</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Total Computer Literacy*</td>
<td>105.9 (43.3)</td>
<td>82.6 (35.0)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Locus of Control</td>
<td>65.4 (13.7)</td>
<td>60.3 (14.6)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*n = 125 for males, n = 254 for females

Encouraging for the future use of computers in education. Presumably if attitudes are positive, it will be easier to integrate the use of computers into the education system.

Males reported significantly higher computer literacy scores on all four subscales as well as computer experience. This disparity could present a problem for those students who have female student teachers. Even though attitudes toward computers are similar for males and females, a reduced computer literacy level may inhibit female teachers from incorporating computers into their classrooms. It is also possible that initial male computer expertise may instill a relatively passive role in female student teachers with respect to teaching computer related studies.

It is worthy to note the relatively low programming ability subscale scores for both males and females. Perhaps the other subscales were more effective in fleshing out computer skills that are more relevant to the use of today’s microcomputers.

Males appear to have a more internal locus of control than females with respect to the use of computers. This is not surprising, given the higher computer literacy scores for males. Presumably more knowledge about computers helps an individual to feel that computer related events are contingent upon his or her actions.

Males seem to be more committed to using computers than females. This result is consistent with the higher computer literacy and locus of control means found for males and inconsistent with the finding that males and females had similar attitudes toward computers. Perhaps commitment toward computers is
largely determined by knowledge. In other words, there is a certain degree of ability and understanding required before an individual will be interested in, use, and promote computers. Positive attitudes, although encouraging, may not be enough to instigate computer related behavior.

Differences between males and females with respect to computer literacy skills, computer locus of control and commitment to computers could have serious implications in education. Since males show higher mean scores for all three of these variables, students with female teachers could be at a significant disadvantage. These differences do not appear to be insurmountable, especially in light of female positive attitudes toward the use of computers. Presumably, if females have positive computer attitudes, they will be willing to participate in activities that will increase their computer literacy level. This in turn, could have a positive effect on computer locus of control and commitment to the use of computers.

However, the solution, to this “Catch-22” problem may not be all that simple. It has been speculated that increased computer literacy in females may result in corresponding increases in locus of control and commitment to computers. On the other hand, a certain degree of commitment to computers will be required before female teachers take time from an already busy schedule to actively acquire computer literacy skills. Clearly, female student teachers will have to be actively encouraged and supported in their pursuit of computer skills.

CONCLUSION

While males and females appear to have similar attitudes toward computers, significantly higher mean scores in computer literacy, computer locus of control and commitment to computers for males may have serious consequences on the equitable use of computer in the education system. An active role must be taken to stimulate female student teachers into increasing their literacy skills. It is speculated that increased computer literacy will result in a more internal locus of control and a higher degree of commitment to computers.

Contributor

Robin H. Kay received his B.Sc. and M.A. from the University of Toronto, specializing in psychology and computer science. He is currently working as a senior research assistant at the Addiction Research Foundation in Toronto. (Address: Addiction Research Foundation, 33 Russell Street, Toronto, Ontario, Canada M5S 2S1.)

References

Baylor, J. (1985), November 6-8). Assessment of microcomputer attitudes of


