

Full Length Research Paper

Factors affecting gender differences in attitudes towards computers among students

Dr Timothy Teo

Learning Sciences and Technologies Academic Group, National Institute of Education, Nanyang Technological University, 1 Nanyang Walk, Singapore 637616. Email: kgtteo@nie.edu.sg.

Accepted 07 April, 2020

The use of computers in instruction is prevalent and will be increasingly so in the coming years. Research has found computer use to be associated with computer attitudes. Computer attitudes refer to people's reactions to computers and are influential in shaping current and future usage of the computer. Research has found these reactions to include liking computers. Among the concerns in the use of computers is the issue of gender differences that is reflected in the ways males and females regard computers. Many of the studies in computer attitudes between male and female students suggest significant differences. The aim of this paper is to discuss some of the factors that contribute to gender differences in the attitudes towards computers among students.

Key words: Computer, attitudes, gender differences.

INTRODUCTION

Computer attitudes refer to people's reactions to computers. Research has found these reactions to include liking computers (Knezek, Christensen, and Miyashita, 1998), enjoying the use of computers (Al-Khaldi and Al-Jabri, 1998), beliefs about the usefulness of computers, and perceived ease of use of computers (Woodrow, 1991). In addition, computer attitude "is a critical factor in enhancing the acceptance of computers as well as understanding current user behaviour and shaping future behaviour, such as computer usage." (Al-Jabri and Al-Khadi, 1997)

Among the concerns in the use of computers is the issue of gender differences that is reflected in the ways males and females regard computers. Many of the studies in computer attitudes between male and female students suggest significant differences. This issue is viewed as critical as it was expected that a large number of people will be involved in activities that require the use of computers either as part of their job or training in the imminent future (Armitage, 1993). To date, the number of people who need to use computers to fulfil their job and training requirements would have doubled that of a decade ago.

Traditionally, the use of computers has been portrayed to be more appropriate for males than females (Whitley, 1997). It has been observed that factors within and outside the schools may have perpetuated such

perceptions and beliefs. Some examples include how computer games and software were designed (Kiesler, Sproull, and Eccles, 1985) and the link between computers and 'masculine' subjects such as science and mathematics (Hawkins, 1985). Some research found gender differences with regard to computer use although, as computers became a routine piece of equipment in every classroom, and class activities involved the use of computers, the gender would such differences may diminish (Watt, 1984). The aim of this paper is to discuss some of the factors that contribute to gender differences in the attitudes towards computers among students. It is acknowledged that some factors are inter-related but the structure of the paper has been organised into distinct sections to facilitate reading.

Computer Training

Bernstein (1992) advocates that in order to attract women's participation, introductory computer science classes ought to concentrate on applications rather than on math or programming. Bernstein also suggested that while men may be passionate about computers, women use computers to solve problems. Consequently, women perceive computer-related training and careers as isolated and boring, lacking social interaction, and

requiring a technical disposition (Clegg and Trayhum, 2000). It was also suggested that women's prevalent computer experience are lie mainly in communication, word processing, and problem solving and these uses are often recognized as end-user technology that is viewed as requiring less technical expertise. This may have created an impression that end-users (women) are not real computer people (Venkatesh and Morris, 2000).

Software Bias

This gender stereotype is reflected in computer software, especially computer games. Research in the area of educational computer games for the early grades has also suggested that violence, competition and the scarcity of females characters all impact on girls' interest in using computer software (Inkpen et al, 1994; Koch, 1995; Funk and Buchman, 1996) and educational software programs. These product are often modeled after video games and, have been criticized for serving as a gateway to technology for boys, but not for girls (Chappell, 1996) . Consequently, educational software has been found to have a male bias with females stereotyped as weak and dependent and if she is a main character, she is modeled to attract the male audience: slim, big- breasted and scantily clad (Jenson, 1999). For example, Chappell (1996) found that in a mathematical software, the number of female characters declined with the amount of increasing violence. Christie (1995) noted that the software bias has affected girls' enjoyment of computing due to the format of gaming software; it was often competitive and violent and winning the game requires two players being pitted against each other or one player against the computer. On the contrary, girls preferred to explore feelings, solve problems, and work co-operatively and interactively, with adventure, friendship and creativity as the focus (Fiore, 1999). It appeared that the computer culture, which portrays almost obsessive and, highly focused behavior as keys to success, may be a major factor for making girls and women uncomfortable.

Computer Self-Efficacy

Self-efficacy is defined as the belief in one's ability to successfully execute a certain course of behaviour. In the context of this discussion, computer self- efficacy is refers to the level of confidence to use the computer successfully. Massoud (1991) found that male students tend to have more computer-related interests and express more confidence in their ability to use computers than female students. This is consistent with Voogt (1987) who, in a study of 873 students from ages 12 to 16, found that boys were less anxious and possess more confidence in their ability to work with computer (defined

as computer efficacy) and Chen (1986) who reported a similar finding among high school students. There are clear signs of gender differences among secondary school students with regards to their confidence in using computers. It was found that boys tend to feel confident and comfortable around computers (Shashaani, 1997) while girls tend to fear using computers and feel nervous and uncomfortable around computers. Such the purported low confidence in learning and using computers may have deterred an individual from participating in computing. These observations were supported by cross cultural studies that revealed similar findings. Makrakis (1992) found significant differences between Japanese and Swedish students with respect to computer self- efficacy. The Swedish students exhibited a higher degree of self-efficacy than the Japanese sample in both gender groups. Swedish boys were more positive in their perception of computer self- efficacy than their female peers, although no significant gender difference was found among the Japanese students.

Stereotyping

Differences in computer attitudes may be the main causes that separate females from males in regard to computers. Shashanni (1993) found that stereotyping is significant in computer attitude because "there is an association between an individual's vocational preference and his or her acceptance of occupational stereotypes" (p. 176). Negative stereotypes, such as the computing field being a man's domain; also reduce female self-confidence in computer use. It was found that more males than females believe in men's superiority in the use of computer competency (Fletcher-Flinn and Suddendorf, 1996). Outside the educational milieu, there was evidence to show the degree of gender-stereotyping in the computer industry, for example, through photographs associating computers with males (Sutton, 1991).

Access to Computers

The issue of differential access to computers experienced by female and male students has been well documented, and this difference is becomes noticeable at a very young age. Brosnan (1998) identified access to a computer at home as having a significant impact upon children's computer experience attainment. The pattern of gender imbalance (on access, ownership, and usage) shown in elementary schools, high schools, and universities can be found among kindergarten and pre-school students (Fletcher-Flinn and Suddendorf, 1996). By grade four, the differences in computer usage and the attitudes towards computers and electronic games become are becoming more noticeable. Between grades four and eight the

hours spent on computers decrease for females and increase for males (Funk and Buchman, 1996). Among secondary school students, more male than female students report having a home computer (Shashaani, 1994; Volman, 1997; Woodrow, 1994), and the same gender difference has been reported for university students (Shashaani, 1997). Across the educational levels, more male than female students reported having access to home computers (Busch, 1995; Dugdale et al., 1998), having used computers at home (Colley et al., 1995), and having access to and using a home computer at least once a week (Comber et al., 1997). In the school environment, although both boys and girls have access to school computers, boys tend to dominate the computer resources, leaving girls with less access to computers in the school setting (Schofield, 1995, Underwood, and Underwood 1999). A study by Shashaani (1994) reported that 83% of the girls responded reported that they used computers at school one hour or less per week, and while 30% of the boys responded that they used computers at school for five hours or more at school. At all level, male students more than female students were likely to be chosen to assist the teacher with computer-related tasks (Sanders, 1995). Among college students, Clegg and Trayman (2000) reported that women had less access to computer than men in their pre-college years and this was a major influence in their decisions to enroll in higher education computing courses.

Computer Experience

As well as all the above factors, computer inexperience for girls both at home and at school has often been cited as an important factor in determining their attitudes and anxieties towards computers (Jenson, 1999). Koch (1995) found that boys have a greater tendency to dominate available computer resources, and parents and educators tend not to correct that fact. Furthermore, it has been observed that males tend to dominate the computers during free time in the classrooms, and females will only use the computers when given specific instructions allowing them to. Comparing to boys, girls spend less time per day playing video and computer games at home, own fewer games, and are less interested in and knowledgeable about the gaming industry (Klawe, 1998). Given the low level of exposure female students have, it is expected that they possess less computer-related skills compared to their male counterparts. In studies that deal with gender difference in computer experience, it was reported that males had a greater range of computing experience than the range that reported by females (Comber et al., 1997). Support for this view was given by Jones and Clarke (1995) who found female students of single-sex schools reporting a greater diversity of computing experience relative to female students in co-educational school. Successful

exposure to computers has been found to a significant predictor of positive attitude towards the computer (Jones and Clarke, 1995; Loyd and Gressard, 1987).

Perceived Usefulness

According to Eccles (1987), men and women make decisions based on "perceived task value", a function of sex role identity shaped by socialization. In Eccles' model, an individual's educational plan is influenced primarily by his or her expectation for success and, secondarily by subjective task value- the value that one attaches to various educational options. It was likely that, since men and women are socialized differently, sex differences in expectation and subjective value are likely to lead males and females to make different educational choices. Koohang (1989) found that male students tend to rate computers as more useful than did female students and Felter (1985) reported that girls were more pessimistic than boys about the perceived usefulness of the computer in that the former were not sure if the computer would help them to obtain a better job. Perceived usefulness of the computers had also been found to be associated with the level of computer experience (Koohang, 1989) and decision whether to enrol in computer-related courses or not (Campbell, 1989).

Role Models

Researchers have reported that the main users of computers at home are male, and since there is evidence of same-sex modeling within families, boys are more likely than girls to get interested in computers (Hess and Miura, 1985). From the primary to university levels, male teachers used computer more than female teachers, suggesting that female lacked female role models in computing (Hattie and Fitzgerald, 1987). By subject domain, computer science is more frequently taught by male teachers. Schofield, (1995) conducted a two years study in a secondary school and reported that of the 13 computer science classes conducted during the course of the research, 12.5 were taught by men. Despite the shortage of female role models among science teachers, many educators, including female teachers themselves, are not aware of the danger of perpetuating the female stereotype through their beliefs, values, and practices (Becker and Sterling, 1987) which in turn impacts negatively on girls' experience with computers (Volman, 1997; Sanders, 1995).

Computer Anxiety

Computer anxiety occurs when a user holds negative

attitudes towards the computer that results in an avoidance with technology whenever possible. When the computer is used, a slower and less accurate performance is seen and an increase in computer anxiety is experienced thus perpetuating and reinforcing the negative attitudes toward computers (Rosen and Maguire, 1990). With the combination of socialization and lack of access to experience in computers, it is reasonable to expect that female students' experience a higher level of anxiety towards computers. Multiple studies have shown that gender differences exist in computer anxiety (Brosnan, 1998; Leso and Peck, 1992; Makrakis, 1992). Among the elements interacting with computer anxiety is computer experience (Maurer, 1994). This relationship was supported by Rosen and Weil (1995) who found that, in 19 out of 20 countries, greater computer experience by males relates to gender differences in computer anxiety.

IMPLICATIONS FOR EDUCATORS

In the preceding discussion, it was suggested that male attitudes towards the computer tend to be more positive than females. Several implications arise from these findings.

1. Exposure time: More time could be given for female students to adjust to computer-related activities. This includes trying out new software, computer-based learning packages. A longer period of exposure would lead to familiarity that may develop into more positive feelings towards computers, at the same time engendering feelings of success with the computers. This is especially so among younger students.
2. Selection of content: Be sensitive to the connotations inherent in computer products. This is especially so for multimedia tools such as CD-ROMs, games, internet, and audio and video-based lessons. There should be a balance in the use of gender for graphics and sounds and these should be employed respectfully.
3. Management of perceptions: Course managers should take into account gender stereotypes. More effort could be put into marketing courses that were traditionally shunned by females and to highlight features known to be of interests to female students e.g. communication, affection, and language-based.
4. Instil confidence: Know the causes for the low confidence in using computers among the female student. By removing the cause for lack of confidence in computer use among girls, improvements in removing the inequality in the computer field can be made.
5. Early intervention: Provide greater opportunities

exposure to computers at an early age as boys and girls at this age tend to hold positive attitudes toward computers and if such attitudes were cultivated further, the gender differences may diminished in later years.

REFERENCES

- Al-Khaldi MA, Al-Jabri IM (1997). Effects of user characteristics on computer attitudes among undergraduates business students. *J. End User Comput.* 9(2): 16.
- Al-Khaldi MA, Al-Jabri IM (1998). The relationship of attitudes to computer utilization: New evidence from a developing nation. *Comput. Human Behavior* 14: 23-42.
- Armitage D (1993). Where are the girls? Increasing female participation in computer, math, and science education. In D. Carey et al. (eds). *Technol. Teacher Educ. Annu. Proc. Annual Conference on Technology Education.*
- Becker HJ, Sterling CW (1987). Equity in school and computer use: National data and neglected considerations. *J. Edu. Comput. Res.* 3(3): 289-311.
- Bernstein DR (1992). A new introduction to computer science. In C. Dianne Martin and Eric Murchie-Beyma (Eds.). *Search of Gender Free Paradigms for Computer Science Education.* Eugene OR: Int. Soc. Technol. Educ.
- Brosnan MJ (1998). The impact of psychological gender, gender-related perceptions, significant others, and the introducer of technology upon computer anxiety in students. *J. Educ. Comput. Res.* 18(1): 63-78.
- Buchman DD, Funk JB (1996). Video and Computer games in the 90's: Children's time commitment and game preference. *Children Today.* 24(1): 12-16.
- Busch T (1995). Gender differences in self-efficacy and attitudes toward computers. *J. Educ. Comput. Res.* 12(2): 147-158.
- Campbell NJ (1989). Computer anxiety of rural middle and secondary school students. *J. Educ. Comput. Res.* 5(2): 213-220.
- Chappell KK (1996). Mathematics computer software characteristics with possible gender-specific impact: A content analysis. *J. Edu. Comput. Res.* 15(1): 25-35.
- Chen M (1986). Gender and Computers: The Beneficial Effects of Experience on Attitudes. *J. Educ. Comput. Res.* 2: 265-282.
- Christie A (1995). No chips on their shoulders: Girls, boys and telecommunications. (Doctoral dissertation, Arizona State University, 1995). *Dissert. Abs. Int.* 56 (11A): 96-08340.
- Clegg S, Trayhun D (2000). Gender and Computing: Not the Same Old Problem. *Br. Educ. Res. J.* 26(1): 75-90.
- Colley A, Hill F, Hill J, Jones A (1995). Gender effects in the stereotyping of those with different kinds of computing experience. *J. Educ. Comput. Res.* 12(1): 19-27.
- Comber C, Colley A, Hargreaves DJ, Dorn L (1997). The effects of age, gender, and computer experience upon computer attitudes. *Edu. Res.* 39(2): 123-133.
- Dugdale S, Dekoven E, Ju M (1998). Computer course enrolment, home computer access, and gender: Relationships to high school students' success with computer spreadsheet use for problem solving in pre-algebra. *J. Educ. Comput. Res.* 18(1): 49-62.
- Eccles JS (1987). Gender roles and women's achievement-related decisions. *Psychol. Women Quart.* 11: 135-171.
- Felter M (1985). Sex differences on the California stateside assessment of computer literacy. *Sex Roles,* 13(4):181-191.
- Fiore C (1999). Awakening the Tech Bug in Girls. *Learning and Leading with Technol.* 26(5): 10-17.
- Fletcher-Flinn CM, Suddendorf T (1996). Computer attitudes, gender and exploratory behavior: A developmental study. *J. Educ. Comput. Res.* 15(4): 369-392.
- Funk J, Buchman DD (1996). Children's perceptions of gender differences in social approval for playing electronic games. *Sex Roles* 35(3):219-231.
- Hattie J, Fitzgerald D (1987). Sex differences in attitudes, achievement and use of computers. *Aust. J. Educ.* 31(1): 3-26.

- Hawkins J (1985). Computers and girls: Rethinking the issues. *Sex Roles* 13(3): 165-180.
- Hess RD, Miura IT (1985). Gender differences in enrollment in computer camps and classes. *Sex Roles* 13: 193-203.
- Inkpen K, Upitis R, Klawe M, Lawry J, Anderson A, Ndunda M, Sedighian K, Leroux S, Hsu D (1994). We Have Never Forgetful Flowers in Our Garden : Girls' Responses to Electronic Games. *J. Comput. Math. Sci. Teaching* 13(4): 383-403.
- Jensen J (1999). Girls ex machina: A school-based study of gender, culture and technology. Ph.D. Thesis, Simon Fraser University.
- Jones T, Clarke VA (1995). Diversity as a determinant of attitudes: A possible explanation of the apparent advantage of single-sex settings. *J. Educ. Comput. Res.* 12(1): 51-64.
- Klawe MM (1998). When does the use of Computer Games and Other Interactive Multimedia Software Help Students Learn Mathematics? Retrieved August 31, 2005, from <http://www.cs.ubc.ca/nest/egems/reports/authors.html>.
- Koch C (1995). Is equal computer time fair for girls? A computer culture in a grade 7/8 classroom. Retrieved August 31, 2005, from <http://www.cs.ubc.ca/nest/egems/reports/authors.html>.
- Koohang AA (1989). A study of attitudes toward computers: Anxiety, confidence, liking, and perception of usefulness. *J. Res. Comput. Educ.* 22(2): 137-150.
- Knezek GR, Christensen R, Miyashita K (1998). Instruments for assessing attitudes toward information technology. Denton, TX: erience as factors in the computer attitudes of middle school students. *J. Early Adolesc.* 7: 13-19.
- Leso T, Peck KL (1992). Computer anxiety and different types of computer courses. *J. Educ. Comput. Res.* 8(4):469-478.
- Loyd B, Loyd D, Gressard C (1987). Gender and computer experience as factors in the computer attitudes of middle school students. *J. Early Adolesc.* 7: 13-19.
- Makrakis V (1992). Cross-cultural Comparison of Gender Differences in Attitude towards Computers in Japan and Sweden. *Scand. J. Educ. Res.* 36(4): 275-287.
- Massoud SL (1991). Computer attitudes and computer knowledge of adult students. *J. Educ. Comput. Res.* 7(3): 269-291.
- Maurer MM (1994). Computer anxiety correlates and what they tell us: A literature review. *Comput. Human Behavior* 10(3): 369-376.
- Rosen LD, Maguire P (1990). Myths and realities of computerphobia: a meta-analysis. *Anxiety Res.* 3: 175-191.
- Rosen LD, Weil MM (1995). Computer anxiety: A cross-cultural comparison of university students in ten countries. *Computers in Human Behavior* 11(1): 45-64.
- Sanders J (1995). *Girls and technology: Villain wanted*. ITexas Centre for Educ. Technol. Science, Mathematics, and Engineering. New York: Teachers College Press.
- Schofield JW (1995). *Computers and Classroom Culture*. Cambridge, USA: Cambridge University Press.
- Shashaani L (1993). Gender-based differences in attitudes toward computers. *Comput. Educ.* 20(2): 169-181.
- Shashaani L (1994). Gender-differences in computer experience and its influence on computer attitudes. *J. Educ. Comput. Res.* 11(4): 347-367.
- Shashaani L (1997). Gender differences in computer attitudes and use among college students. *J. Educ. Comput. Res.* 16(1): 37-51.
- Sutton, R. (1991). Equity and computers in the schools: A decade of research. *Rev. Educ. Res.* 61(4): 475-503.
- Underwood J, Underwood G (1999). Task effects on co-operative and collaborative learning with computers. In K. Littleton and P. Light (Eds.). *Learning with computers*. New York: Routledge.
- Venkatesh V, Morris MG (2000). Why Don't Men Ever Stop to Ask For Directions? Gender, Social Influence, and Their Role in Technology Acceptance and Usage Behavior. *MIS Quart.* 24: 115-139.
- Volman M (1997). Gender-related effects of computer and information literacy education. *J. Curriculum Stud.* 29(3): 329-349.
- Voogt J (1987). Computer literacy in secondary education: The performance and engagement of girls. *Comput. Educ.* 11:305-312
- Watt D (1984). Bridging the Gender Gap. *Popular Computing*, September. pp. 54-56.
- Whitely B (1997). Gender differences in computer related attitudes and behavior: A meta-analysis. *Comput. Human Behavior* 13, 1-22.
- Woodrow JE (1991). A Comparison of Four Computer Attitude Scales. *J. Educ. Comput. Res.* 7: 165-187.
- Woodrow JE (1994). The development of computer-related attitudes of secondary students. *J. Educ. Comput. Res.* 11(4): 307-338.