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Computer Self-Efficacy, Computer Anxiety, and Attitudes toward the Internet: A Study among Undergraduates in Unimas

Hong Kian Sam, Abang Ekhsan Abang Othman and Zaimuarifuddin Shukri Nordin
Faculty of Cognitive Sciences and Human Development
Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia
Fax: +60 82-672281
hksam@fcs.unimas.my

ABSTRACT

Eighty-one female and sixty-seven male undergraduates at a Malaysian university, from seven faculties and a Center for Language Studies completed a Computer Self-Efficacy Scale, Computer Anxiety Scale, and an Attitudes toward the Internet Scale and give information about their use of the Internet. This survey research investigated undergraduates' computer anxiety, computer self-efficacy, and reported use of and attitudes toward the Internet. This study also examined differences in computer anxiety, computer self-efficacy, attitudes toward the Internet and reported use of the Internet for undergraduates with different demographic variables. The findings suggest that the undergraduates had moderate computer anxiousness, medium attitudes toward the Internet, and high computer self-efficacy and used the Internet extensively for educational purposes such as doing research, downloading electronic resources and e-mail communications. This study challenges the long perceived male bias in the computer environment and supports recent studies that have identified greater gender equivalence in interest, use, and skills levels. However, there were differences in undergraduates' Internet usage levels based on the discipline of study. Furthermore, higher levels of Internet usage did not necessarily translate into better computer self-efficacy among the undergraduates. A more important factor in determining computer self-efficacy could be the discipline of study and undergraduates studying computer related disciplines appeared to have higher self-efficacy towards computers and the Internet. Undergraduates who used the Internet more often may not necessarily feel more comfortable using them. Possibly, other factors such as the types of application used, the purpose for using, and individual satisfaction could also influence computer self-efficacy and computer anxiety. However, although Internet usage levels may not have any impact on computer self-efficacy, higher usage of the Internet does seem to decrease the levels of computer anxiety among the undergraduates. Undergraduates with lower computer anxiousness demonstrated more positive attitudes toward the Internet in this study.

Keywords

Computer self-efficacy, Computer anxiety, Internet attitudes, Internet experience

Introduction

The teaching and learning process has been altered by the convergence of a variety of technological, instructional, and pedagogical developments in recent times (Bonk & King, 1998; Marina, 2001). Technology is challenging the boundaries of the educational structures that have traditionally facilitated learning. Recent advances in computer technology and the diffusion of personal computers, productivity software, multimedia, and network resources over the last decade, heralded the development and implementation of new and innovative teaching strategies. Educators who advocate technology integration in the learning process believe it will improve learning and better prepare students to effectively participate in the 21st century workplace (Butzin, 2000; Hopson, Simms, & Knezek, 2002; Reiser, 2001).

The Campus Computing Project's survey shows that the computer technologies have become core components of the campus environment and the college experience (Green, 1998) while a survey of first-year students by Sax, Astin, Korn, and Mahoney (1998) indicated that computer network use has become a way of life for the majority of the students. They use computers around the clock to accomplish a wide range of academic tasks (Green, 1998; Romiszowski & Mason, 1996). Many prepare course assignments, make study notes, tutor themselves with specialized multimedia, and process data for research projects. Most exchange e-mails with faculty, peers, and remote experts. They keep up-to-date in their fields on the Internet, accessing newsgroups, bulletin boards, listservs, and web sites posted by professional organizations. Most access library catalogs, bibliographic databases, and other academic resources in text, graphics, and imagery on the World Wide Web (Green, 1998).

Furthermore, "information technology literacy" has become the centerpiece of "professional literacy" and "workforce readiness" (Resnick & Wirt, 1996). Workforce readiness includes communication skills, competencies in emerging technologies, and critical thinking skills. Given the certainty of technological change,

far more desirable than competencies in a limited number of specific applications are broad flexible skills, transferable skills and the related confidence to adapt to new applications and environments (Rush, 1998). Romiszowski and Mason (1996) conclude that higher education will expand academic computing resources not only for their pedagogical benefits but also "because it will be seen to be the duty of education to use such systems in order to prepare its graduates for the realities of a workplace where they will be obliged to use them" (p. 449).

However, in integrating computers in higher education, researchers have proposed that positive attitudes toward computers and high computer self-efficacy and lower computer anxiety levels could be important factors in helping people learn computer skills and use computers (e.g., Busch, 1995). Sproull, Zubrow, and Kiesler (1986) recognized that some college students felt confused and a loss of personal control when they encountered technology. DeLoughry (1993) also cited that "as many as one-third of the 14 million college students in the United States suffer from 'technophobia'" (p. A25) and implied that the effectiveness for the use of computers in higher education might not be realized without research foundations and corresponding planning.

Kinzie, Delcourt, and Powers (1994) defined self-efficacy as an individual's confidence in his or her ability, which may impact the performance of tasks:

> "Self-efficacy reflects an individual's confidence in his/her ability to perform the behavior required to produce specific outcome and it's thought to directly impact the choice to engage in a task, as well as the effort that will be expended and the persistence that will be exhibited." (p. 747)

Self-efficacy has been shown to influence choice of whether to engage in a task, the effort expended in performing it, and the persistence shown in accomplishing it (Bouffard-Bouchard, 1990). The greater people perceived their self-efficacy to be, the more active and longer they persist in their effort (Bandura, 1986).

Miura (1987) has suggested that self-efficacy may be an important factor related to the acquisition of computing skills. Computer self-efficacy is a specific type of self-efficacy. Specific self-efficacy is defined as belief in one's ability to "mobilize the motivation, cognitive resources, and courses of action needed to meet given situational demands" (Wood & Bandura, 1989, p. 408). Thus, computer self-efficacy is a belief of one's capability to use the computer (Compeau & Higgins, 1995) and participants with little confidence in their ability to use computers might perform more poorly on computer-based tasks. On the other hand, previous computer experience may lead students to believe computer applications courses are easy. Heightened self-efficacy may cause students to expend little effort toward learning new computer concepts. On the other hand, Brosnan (1998) argued that better computer self-efficacy could increase persistence in studying computing.

Computer anxiety has been defined as a fear of computers when using one, or fearing the possibility of using a computer (Chua, Chen, & Wong, 1999). It is different from negative attitudes toward computers that entail beliefs and feelings about computers rather than one's emotional reaction towards using computers (Heinssen, Glass, & Knight, 1987). Computer anxiety is characterized as an affective response, an emotional fear of potential negative outcomes such as damaging the equipment or looking foolish. From an information processing perspectives, the negative feelings associated with high anxiety detract cognitive resources from task performance (Kanfer & Heggestad, 1997). Thus the performance of participants with higher computer anxiety might be poorer than those with little or no computer anxiety.

Woodrow (1991) claimed that students' attitudes toward computers were critical issues in computer courses and computer-based curricula. Monitoring the user's attitudes toward computers should be a continuous process if the computer is to be used as a teaching and learning tool. Other attributes, such as the relationship with gender and age (Morris, 1988-1989), the effects of training and learning (Ford & Noe, 1987), and computer anxiety (Paxton & Turner, 1984) were also related to attitudes toward computers.

Purpose of the research

This research looked at two research objectives. Firstly, are computer anxiety and computer self-efficacy related to the reported use of and attitudes toward the Internet among undergraduates in Universiti Malaysia Sarawak (Unimas), and secondly, are there any differences in computer anxiety, computer self-efficacy, attitudes toward the Internet and reported use of the Internet based on gender and faculty for these undergraduates? Specifically, this research investigated the following research questions:

- What is the Internet use pattern of Unimas undergraduates?

- Are there differences in the Internet use pattern based on gender and faculty?
- What are the Unimas undergraduates' attitudes toward the Internet and computer anxiety and computer self-efficacy levels?
- Are there differences in attitudes toward the Internet and computer anxiety and computer self-efficacy levels based on gender and faculty?
- Are there differences in Internet use pattern based on the Unimas undergraduates' attitudes toward the Internet and computer anxiety and computer self-efficacy?
- Are there relationships between time spent on Internet use, attitudes toward the Internet, computer anxiety, and computer self-efficacy?

Review of related literature

Computer anxiety, computer self-efficacy, and attitudes toward computers

Several studies have demonstrated the effect of computer anxiety and computer self-efficacy on computer-related behaviors. Computer self-efficacy has been shown to be positively related to performance during computer training (Webster & Martocchio, 1992). A student's confidence about computer skills may affect the willingness to learn about computer skills. The less confident a student feels about computer skills, the more he or she desires to learn about computer technology (Zhang & Espinoza, 1998).

Computer self-efficacy was also found to be associated with attitudes toward computer technologies (Zhang & Espinoza, 1998). Furthermore, Zhang and Espinoza (1998) also reported that past enrollment in computer programming courses was found to be positively related to self-efficacy and computer self-efficacy positively related to plans to take more computer related courses.

A high level of computer anxiety, on the other hand, has been negatively related to learning computer skills (Harrington, McElroy, & Morrow, 1990), resistance to the use of computers (Torkzadeh & Angula, 1992; Weil & Rosen, 1995), and poorer task performance (Heinssen et al., 1987).

Taken together, these studies show that these three characteristics can have an important impact on computer use and ability to learn to use computers.

Computer anxiety, computer self-efficacy, and attitudes toward computers with gender and computer use

In this age of all-pervading use of computers in most parts of the world, the issue of gender and computer use should be redundant. Nonetheless, as recently as the year 2000, in the United Kingdom, HESA (2000) reported that only 17% of enrollment to study computing at universities was female. Balka and Smith (2000) likewise reported that in the United States of America, the proportion of females studying computing was also getting less in recent years. Thus gender differences in computer use are still relevant, especially with the advent of the Internet to continue to study the genderisation of computing as proposed by Gackenbach (1998).

The research on gender and computing has often, although not conclusive, reported that males have more experience and use of computers (Brosnan & Lee, 1998; Balka & Smith, 2000). For example, Chua et al. (1999) and Coffin and Mackintyre (2000) in their meta analyses on the relationships between computer anxiety, computer attitudes, computer self-efficacy and computer experience state that most findings usually reinforce the gender effects and suggest that greater levels of computer experience are associated with lower computer experience and more positive computer attitudes.

Females also usually have more negative attitudes toward computers (Durndell & Thompson, 1997; Whitely, 1997) and greater computer anxiety (McIlroy, Bunting, Tierney, & Gordon, 2001) than males. Research on computer self-efficacy in general also revealed that males on average have better computer self-efficacy than females (Torkzadeh & Koufteros, 1994). Several studies have investigated female students' choice of courses and careers, and self-efficacy has turned out to be a critical predictor. Female students have significantly lower self-efficacy than male students regarding math-related and traditionally male-dominated subjects, including computer science (Hackett, 1985).

However, controlling for computer experience, men and women had similar interest toward computers (Badagliacco, 1990). Loyd, Loyd, and Gressard (1987) reported that female students had less computer anxiety

than male students, and female students liked working with computers more than male students. Rosen, Sears, and Weil (1987) on the other hand, found that gender was not related to computer anxiety, but was significantly related to computer attitudes, with women having more negative attitudes.

Furthermore, there are few examples of study to the contrary on the gender issue in computing. For example, Brosnan and Lee (1998) found that males were more computer anxious than females in a study in Hong Kong.

Recently, it has also been suggested that the contemporary male and female students alike are pragmatic; their sights are set less on intellectual development than professional advancement and the utilitarian promise of higher education appeals to their desire to remain competitive and to increase personal income (Fulkerth, 1998; Sax et al., 1998). Shaw and Giacquinta (2000) reported that their findings suggested two frequently held beliefs, that older adult students showed more resistance than do younger students toward computing for academic purposes and that males are more involved with, interested and skilled in the use of computers than females, are no longer accurate. Pervasive use and importance of computers among undergraduates (Green, 1998; Sax et al., 1998) and striving for professional advancement (Fulkerth, 1998; Sax et al., 1998) have been suggested as possible reasons to account for these findings.

On the other hand, Shaw and Giacquinta (2000) discovered that educational technology students reported using computers more frequently, for a wider array of purposes, and for greater number of hours each week than students in the Educational Administration, Business Education, and Higher Education programs. They also reported completing more formal instruction and more positive attitudes toward the value of computers in academic studies.

Nearer at home, in a study conducted in Unimas, Hong (1998) reported that there were no significant differences in undergraduates' attitudes toward computers and computer anxiety for male and female undergraduates and their different fields of study. However, low computer anxiety level and high self-efficacy with computer skills were significant predictors of success in computer-related courses.

The rapid growth of the use of the Internet brings up the question of whether the gender, age, and computer use issues reported earlier would be present with regard to the Internet. Furthermore, Schumacher and Morahan-Martin (2001) commented on the limited research comparing computer and Internet use. Gackenbach (1998), however, commented that the findings from the few studies on Internet use and attitudes suggest a parallel between computers and the Internet. For example, Kraut, Patterson, Lundmark, Kiersley, Mukopadhyay, and Scherlis (1998) found that more males than females use the Internet. Furthermore, males access more domains and use it more often and for longer periods of time than females. There were also differences in Web navigation strategies (Balka & Smith, 2000) and communication styles on the Internet (Sussman & Tyson, 2000) based on gender. These studies indicated a continuation of the computer literature in the study on Internet use (Morahan-Martin, 1998). Would this apparent trend be valid for undergraduates in Unimas?

Methodology

This study employed a survey research design to investigate undergraduates' computer anxiety, computer self-efficacy, and reported use of and attitudes toward the Internet. This study also examined differences in computer anxiety, computer self-efficacy, attitudes toward the Internet and reported use of the Internet for undergraduates with different demographic variables in Universiti Malaysia Sarawak (Unimas).

Sample

The subjects for this study were 148 undergraduates at Universiti Malaysia Sarawak (Unimas). The mean age of the subjects was 23.8 years old (standard deviation = 4.06), ranging from 19 to 43 years old. Majority of the subjects were in the 19-23 age group. The demographic characteristics of the subjects are shown in Table 1.

Research instruments

A questionnaire was used to collect data for this study. The questionnaire was divided into five sections. The first section collected demographic characteristics such as age, race, gender, and faculty/ center. The second

section of the questionnaire required the subjects to report how much time in a week they used the Internet and the uses to which the Internet was used for.

The third section of the questionnaire was the Computer Anxiety Rating Scales (CARS). CARS was used to assess the subjects' level of computer anxiety. CARS is a 19 items self-report inventory, designed and validated by Heinssen et al. (1987). The subjects responded on a five-point Likert type scale (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, and 5=strongly agree). Total scores ranged from 19, indicating a low level of computer anxiety, to 95, which would indicate a high degree of computer anxiety.

Table 1. The subjects' demographic characteristics

		N	%
Gender	Female	81	54.7
	Male	67	45.3
Ethnicity	Chinese	66	44.6
	Malay	43	29.1
	Sarawak Bumiputeras	26	17.6
	Others	13	8.7
Faculty/Centre	Faculty of Computer Science and Information Technology	32	21.7
	Faculty of Resource Sciences and Technology	27	18.2
	Faculty of Engineering	23	15.5
	Faculty of Social Sciences	20	13.5
	Faculty of Economic and Business	17	11.5
	Centre for Language Studies	12	8.1
	Faculty of Applied and Creative Arts	11	7.4
	Faculty of Cognitive Sciences and Human Development	6	4.1

The fourth section was the Internet Attitude Scale (IAS). IAS was modified from the Computer Attitude Scale, developed and validated by Nickell and Pinto (1986). In the IAS, used to measure attitudes toward the Internet, the word "computer" was replaced with "the Internet" throughout the scale. The IAS is a 20-item self-report inventory, rated on a five point Likert type scale (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, and 5=strongly agree). Total scores on IAS ranged from 20, indicating an extremely negative attitude toward the Internet, to a score of 100, which would imply an extremely positive attitude toward the Internet.

The fifth section was the Computer Self-Efficacy Scale (CSE) (Torkzadeh & Koufteros, 1994; Murphy, Coover, & Owen, 1989). CSE has 29 items, each item preceded by the phrase "I feel confident". The subjects responded to a five-point Likert type scale (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, and 5=strongly agree). Total scores for CSE ranged from 29 to 145, with high scores indicating a high degree of confidence in a subject's ability to use computers (Durndell, Haag, & Laithwaite, 2000).

The reliability for sections three, four and five of the questionnaire was acceptable, with Cronbach alpha values of 0.6334, 0.7186, and 0.9049 respectively for CARS, IAS, and CSE. The questionnaire is appended in Appendix 1.

Data collection and data analysis procedures

The questionnaire was distributed to the subjects at the end of the academic year 2002/2003. All subjects were volunteers. Data analyses were carried out with the Statistical Packages for Social Sciences using frequencies, percentages, cross-tabulations and chi-square tests, t-tests, One-Way ANOVAs and Pearson's correlations

Results

Results in Table 2 showed that most of the undergraduates have used the Internet for e-mail services (98.6%), research purposes (95.9%), downloading electronic papers (95.3%), entertainment (85.1%), and gathering product and service information (82.4%). However, only 66.2%, 56.8%, 50.0%, and 46.6% of the

undergraduates used the Internet for downloading software and games, assessing newsgroups, chat room, and games respectively. Only 6.8% of the undergraduates have conducted purchase over the Internet.

Table 2. Distribution of activities subjects' conducted over the Internet

Activities: I have used the Internet for	Yes	No
1. downloading software and games	98 (66.2%)	50 (33.5%)
2. shopping	10 (6.8%)	138 (93.2%)
3. research	142 (95.9%)	6 (4.1%)
4. newsgroups	84 (56.8%)	64 (43.2%)
5. games	69 (46.6%)	79 (53.4%)
6. product and service information	122 (82.4%)	26 (17.6%)
7. entertainment	126 (85.1%)	22 (14.9%)
8. education (electronic papers etc)	141 (95.3%)	7 (4.7%)
9. e-mail	146 (98.6%)	2 (1.4%)
10. chat room	74 (50.0%)	74 (50.0%)

On average, the undergraduates spent 9.2 hours in a week using the Internet (standard deviation = 1.2 hours). Twenty-three of the undergraduates (15.5%) reported using the Internet on average 10 hours in a week while 11 undergraduates (7.4%) used the Internet for 14 hours in a week. Most of the undergraduates used the Internet for three to five hours in a week (N=68, 45.9%)

Differences in the Internet use pattern and use levels based on race, gender, and faculty

There were no differences in the undergraduates' usage pattern for the ten common activities with the Internet based on gender. However, significantly more undergraduates from the Faculty of Computer Science and Information Technology have used the Internet for downloading software and games as compared to undergraduates from the Faculty of Applied and Creative Arts (refer to Table 3).

Table 3. Differences in using the Internet for downloading software and games based on faculty

Faculties	I have used the Internet for downloading software and games	
	Yes	No
Faculty of Cognitive Sciences and Human Development (FCSHD)	11 (-0.3)	7 (0.4)
Faculty of Economics and Business (FEB)	10 (-0.4)	7 (0.5)
Faculty of Engineering (FE)	15 (-0.1)	8 (0.1)
Faculty of Applied and Creative Arts (FACA)	1 (-2.3)	10 (3.3)
Faculty of Social Sciences (FSS)	15 (0.5)	5 (-0.7)
Faculty of Resource Science and Technology (FRST)	15 (-0.7)	12 (1.0)
Faculty of Computer Science and Information Technology (FCSIT)	31 (2.1)	1 (-3.0)

Note: 1. $\chi^2 = 32.189$, df = 6, $p < 0.0005$
2. numbers in brackets refer to standardized residuals

There were no differences in the undergraduates' Internet usage levels, as measured by the time they spent on using the Internet, based on gender (t=1.413, df=145, p=0.160). However, there were differences in undergraduates' usage levels based on Faculty (F=2.509, df=6/146, p=0.025). Post-hoc analyses showed that undergraduates at Faculty of Computer Science and Information Technology and Faculty of Applied and Creative Arts had significantly higher usage time than the other faculties.

Computer anxiety, attitudes toward the Internet and computer self-efficacy

Based on the undergraduates' responses to the CARS, they showed moderate computer anxiousness Likewise, the undergraduates had moderate attitudes toward the Internet based on their responses to the IAS. However, the undergraduates had high computer self-efficacy.

Table 4. Means and standard deviations for computer anxiety, attitudes toward the Internet and computer self-efficacy

	Mean	Standard deviation
Computer anxiety (based on CARS) (1=low computer anxiety, 5=high computer anxiety)	3.3373	0.3055
Attitudes toward the Internet (based on IAS) (1=negative attitudes toward the Internet, 5=positive attitudes toward the Internet)	3.2081	0.3389
Computer self-efficacy (based on CSE) (1=low computer self-efficacy, 5=high computer self-efficacy)	3.8656	0.5955

Differences in computer anxiety, attitudes toward the Internet and computer self-efficacy based on gender and faculty

With reference to Table 5, there were no significant differences in computer anxiety levels, attitudes toward the Internet, and computer self-efficacy based on gender. Undergraduates from the seven faculties and one centre also did not show significant differences in their computer anxiety levels and attitudes toward the Internet (refer Table 6). There was however differences in computer self-efficacy among the undergraduates based on faculty. Undergraduates from the Faculty of Computer Science and Information Technology (Mean=4.154) have significantly better computer self-efficacy than undergraduates from the Faculty of Creative and Applied Arts (Mean=3.574).

Table 5. t-tests results for differences based on gender

		N	Mean	Std Dev	t	df	p
Computer anxiety (based on CARS)	Male	67	3.335	0.317	0.607	145	0.947
	Female	80	3.339	0.297			
Attitudes toward the Internet (based on IAS)	Male	67	3.199	0.359	0.312	146	0.755
	Female	81	3.222	0.323			
Computer self-efficacy (based on CSE)	Male	67	3.902	0.678	0.680	146	0.498
	Female	81	3.835	0.520			

Table 6. One-Way ANOVA results for differences based on faculty

	SS	Df	MS	F	P
Computer anxiety (based on CARS)					
Between group	0.821	6	0.137	1.496	0.184
Error	12.806	140	0.091		
Total	13.627	146			
Attitudes toward the Internet (based on IAS)					
Between group	0.588	6	0.098	0.848	0.535
Error	16.297	141	0.116		
Total	16.885	147			
Computer self-efficacy (based on CSE)					
Between group	5.321	6	0.887	2.671	0.017*
Error	46.812	141	0.332		
Total	52.133	147			

Note: *p<0.05

Differences in Internet use based on computer anxiety, computer self-efficacy, and attitudes toward the Internet

The findings from this study (refer Table 7) showed that undergraduates with better attitudes toward the Internet did more "downloading of software and games" activities. Likewise, undergraduates who had higher computer self-efficacy were more likely to "use the Internet for product and service information." The findings also showed that undergraduates "used the Internet for educational purposes (electronic papers etc)" regardless of their computer self-efficacy and computer anxiety levels. Likewise, no matter what their levels of computer anxiety, attitudes toward the Internet, and computer self-efficacy may be, many of the undergraduates "used the Internet mainly for emails."

Table 7. $\chi 2$ tests results for differences in Internet use based on attitudes toward the Internet, computer self-efficacy, and computer anxiety

		Attitudes toward the Internet		Computer self-efficacy		Computer anxiety	
		Low	High	Low	High	Low	High
Downloading of software and games							
	Yes	12	57				
	No	30	49				
		χ^2=7.677, df=1, p=0.006					
Used the Internet for product and service information							
	Yes			5	117		
	No			6	20		
				χ^2=11.220, df=1, p=0.001			
Used the Internet for educational purposes (electronic papers etc)							
	Yes			9	132	16	124
	No			2	5	3	4
				χ^2=4.772, df=1, p=0.029		χ^2=5.851, df=1, p=0.016	
Used the Internet mainly for emails							
	Yes	40	106	10	136	17	128
	No	2	0	1	1	2	0
		χ^2=5.117, df=1, p=0.024		χ^2=5.340, df=1, p=0.021		χ^2=13.3660, df=1, p<0.0005	

Note: Only significant results are shown in the table above.

Relationships between times spent on using the Internet, computer anxiety, attitudes toward the Internet, and computer self-efficacy

The results shown in Table 8 indicated that there were no significant relationship between time spent in a week using the Internet and the undergraduates' attitudes toward the Internet and computer self-efficacy. However, undergraduates who spend longer hours using the Internet for educational purposes generally had lower computer anxiety. The relationship, however, was not strong.

Although there were no significant relationships between computer anxiety and attitudes toward the Internet with computer self-efficacy, there was, however, a significant relationship between computer anxiety and attitudes toward the Internet. Undergraduates who were highly computer anxious generally have more negative attitudes toward the use of the Internet.

Table 8. Correlations between time spent on using the Internet, attitudes toward the Internet, computer self-efficacy, and computer anxiety

	Time spent on using the Internet	Attitudes toward the Internet	Computer self-efficacy	Computer anxiety
Time spent on using the Internet		0.056	0.125	0.166*
Attitudes toward the Internet			0.005	-0.454***
Computer self-efficacy				0.038
Computer anxiety				

Note: * p<0.05, *** p<0.001

Discussions

In general, the results suggest that the respondents had moderate computer anxiousness, medium attitudes toward the Internet, and high computer self-efficacy. Similar to findings reported by Green (1998) and Romiszowski and Mason (1996), the undergraduates at Unimas also use the Internet extensively for educational purposes such as doing research, downloading electronic resources and e-mail communications.

This study challenges the long perceived male bias in the computer environment (Chen, 1986; Balka & Smith, 2000; Durndell & Thompson, 1997; McIlroy et al., 2001; Torkzadeh & Koufteros, 1994; Whitely, 1997) and instead supports recent studies that have identified greater gender equivalence in interest, opportunity, use, and skills levels (Green, 1998; Shaw & Giacquinta, 2000). Gender, at least among the undergraduates in this study, did not account for differences in the Internet use pattern, computer self-efficacy, computer anxiety, and attitudes toward the Internet. Female as well as male undergraduates seem to be equal in their receptivity to the use of the Internet, the extent of their use of the Internet, and the purposes for which they use the Internet. These findings seem to support the profile of contemporary undergraduates in the literature (Fulkerth, 1998; Green 1998; Sax et al., 1998) and their mindfulness of the role of computer-based technologies across professions and industries (Callan, 1998; Rush, 1998).

There were differences in undergraduates' usage levels based on the discipline of study. Undergraduates from the Faculty of Computer Science and Information Technology (FCSIT) and Faculty of Applied and Creative Arts (FACA) were found to use the Internet longer than those from other faculties. Although undergraduates from these two faculties recorded the highest usage levels compared to undergraduates from other faculties, the only differences in computer self-efficacy levels were between undergraduates from these two faculties. FCSIT undergraduates had significantly better computer self-efficacy than undergraduates from FACA. These two findings seemed to indicate that higher levels of Internet usage did not necessarily translate into better computer self-efficacy among the undergraduates. A more important factor in determining computer self-efficacy could be the discipline of study (Shaw & Giaquinta, 2000) and undergraduates studying computer related disciplines may in general have higher self-efficacy towards computers and the Internet.

Although the general belief is that "the more is better", in this study there is no empirical evidence to support this assumption in contradiction of a positive relationship between the Internet usage levels and self-efficacy (Seyal, Rahim, & Rahman, 2002). Undergraduates who used computers often may not necessarily feel more comfortable using them. Possibly, other factors such as the types of application used, the purpose for using, and the role of satisfaction, could also influence computer self-efficacy and computer anxiety. Nonetheless, although the Internet usage levels may not impact on computer self-efficacy, higher use of the Internet does seem to decrease the levels of computer anxiety among the undergraduates. Undergraduates with lower computer anxiousness demonstrated more positive attitudes toward the Internet, in this study.

Conclusions

It is believed that gender would not be a factor influencing undergraduates' attitudes toward computers, computer self-efficacy, and attitudes toward the Internet in the near future, as computers become a prevalent tool in our daily lives, regardless of whether one likes to use it or not.

The findings on this study, however, indicate that learning in the computer environment requires the special challenge of developing a mix of declarative, procedural, conceptual, and logical knowledge (Johnson & Johnson, 1996) as suggested by the theories of learning in general (Farnham-Diggory, 1992). While successful learning is always a function of the interaction of many factors, those known to be essential for cultivating computer skills include extensive practice (Anderson, 1990), experimentation with many "instances" or "examples" of applications (Brown, Collins, & Duguid, 1989), a positive attitude, motivation, and the sense of satisfaction that attends accomplishment (Brown et al., 1989; Farnham-Diggory, 1992). These factors clearly interact in a circular fashion, for example, the more one has or take the opportunity for instruction and practice, the more time one will devote, this supports motivation and satisfaction which, in turn, extend one's use and thirst for more.

Thus, as suggested by Shaw and Giacquinta (2000), faculty should in addition to integrating computer use in their courses, make regularly available a wide range of short-format, hands-on workshops and demonstrations in which undergraduates can be given individual attention. The subjects of the workshops and demonstrations

should parallel applications being integrated into course activities, in order to enhance exposure and high levels of practice.

In addition to allocating fiscal resources to on-campus hardware and infrastructure, universities should also provide for upgrading of users' skills and user support (Green, 1998;; Shaw & Giacquinta, 2000), opportunities for undergraduates to purchase affordable software and hardware for use at home, and remote connectivity to the campus network for all students. This is view of the limitations in the ability of university to put in place adequate and up-to-date computer facilities on-campus and as suggested by Shaw and Giacquinta (2000) that undergraduates' generally prefer to do academic computing at home rather than at the universities.

Furthermore, students who are going to participate in courses that require the use of the Internet would benefit if offered technology literacy courses prior to enrolling in courses that require its use (Hong, 2002). One may conclude that these courses would increase computer literacy, consequently improving attitudes toward learning.

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Appendix 1

Computer Anxiety Scale (CARS)

Item	
1	I feel insecure about my ability to interpret a computer printout
2	I look forward to using a computer on my job
3	I do not think I would be able to learn a computer programming language
4	The challenge of learning about computers is exciting
5	I am confident that I can learn computer skills
6	Anyone can learn to use a computer is they are patient and motivated
7	Learning to operate computers is like learning any new skill, the more you practice, the better you become
8	I am afraid that if I begin to use computer more, I will become more dependent upon them and lose some of my reasoning skills
9	I am sure that with time and practice I will be as comfortable working with computers as I am in working by hand
10	I feel that I will be able to keep up with the advances happening in the computer field
11	I would dislike working with machines that are smarter than I am
12	I feel apprehensive about using computers
13	I have difficulty in understanding the technical aspects of computers
14	It scares me to think that I could cause the computer to destroy a large amount of information by hitting the wrong key
15	I hesitate to use a computer for fear of making mistakes that I cannot correct
16	You have to be a genius to understand all the special keys contained on most computer terminals
17	If given the opportunity, I would like to learn more about and use computers more
18	I have avoided computers because they are unfamiliar and somewhat intimidating to me
19	I feel computers are necessary tools in both educational and work settings

Internet Attitudes Scale (IAS)

Item	
1	The Internet will never replace human life
2	The Internet makes me uncomfortable because I don’t understand it
3	People are becoming slaves to the Internet
4	The Internet is responsible for many good things we enjoy
5	Soon our lives will be controlled by the Internet
6	I feel intimidated by the Internet
7	There are unlimited possibilities of Internet applications that have not been thought of yet
8	The overuse of the Internet may be harmful and damaging to humans
9	The Internet is dehumanizing to society
10	The Internet can eliminate a lot of tedious work
11	The use of the Internet is enhancing our standard of living
12	The Internet turns people into just another number
13	The Internet is lessening the importance of too many jobs done now by humans
14	The Internet is a fast and efficient means of gaining information
15	The Internet’s complexity intimidates me
16	The Internet will replace the working human
17	The Internet is bringing us into a bright new era
18	Soon our worlds will be run by the Internet
19	Life will be easier and faster with the Internet
20	The Internet is difficult to understands and frustrating to work with

Computer Self-Efficacy Scale (CSE)

Item	
I feel confident:	
1	working on a personal computer
2	getting software up and running
3	using the users guide when help is needed
4	entering and saving data (numbers and words) into a file
5	escaping (exiting) from the program (software)
6	calling up a data fie to view on the monitor screen
7	understanding terms/ words relating to computer hardware
8	understanding terms/words relating to computer software
9	handling a floppy disc correctly
10	learning to use a variety of programs (software)
11	learning advanced skills within a specific program (software)
12	making selections from an onscreen menu
13	using the computer to analyze number data
14	using a printer to make “hardcopy” of my work
15	copying a disc
16	copying an individual file
17	adding and deleting information from a data file
18	moving the cursor around the monitor screen
19	writing simple programs for the computer
20	using the computer to write a letter or essay
21	describing the function of computer hardware (e.g. keyboard, monitor, disc drives, computer processing unit)
22	understanding the 3 stages of data processing: input, processing, output
23	getting help for problems in the computer system
24	storing software correctly
25	explaining why a program (software) will or will not run on a given computer
26	using the computer to organize information
27	getting rid of files when they are no longer needed
28	organizing and managing files
29	troubleshooting computer problems