FACTORS INFLUENCING WOMEN'S ATTITUDES TOWARDS COMPUTERS IN A COMPUTER LITERACY TRAINING PROGRAM

Sung-Lu CHANG
Department of Computer Science and Information Engineering
National Chung Cheng University, Taiwan
Department of Digital Media Design
Tatung Institute of Commerce and Technology, Taiwan
songlu@ms2.ttc.edu.tw

Ruey S. SHIEH (Corresponding author)
Department of Information Management
Kainan University, Taiwan
rueys99@gmail.com

Eric Zhi-Feng LIU (Corresponding author)
Graduate Institute of Learning and Instruction
Center of Teacher Education
Research Center for Science and Technology for Learning
National Central University, Taiwan
totem@cc.ncu.edu.tw

Pao-Ta YU
Department of Computer Science and Information Engineering
National Chung Cheng University, Taiwan
csipty@cs.ccu.edu.tw

ABSTRACT
In the "Digital Divide" research, adult women have generally been found to be the weakest group when compared with others. There is thus a need to provide this particular group with computer literacy training, and to give them opportunities to learn about using computers. In such training, women not only need to learn computer skills, but also a positive attitude. This study gathered qualitative and quantitative data from 175 women who attended computer literacy training, to analyze their attitudes towards computers and to identify differences in their attitudes. The data were collected from questionnaires, interviews and class observations. It was found that only women with lower educational levels had feelings of high anxiety prior to the training. However, other characteristics influenced their attitudes during the training, including age, education, nationality, and PC ownership. Factors influencing the differences in their attitudes were the difficulties of data input, physiological limitations, cultural differences, computer access and learning opportunities. Suggestions for future computer training programs for adult women are proposed.
Keywords: attitudes towards computers, digital divide, gender issues, computer literacy training, adult learning

INTRODUCTION

Due to improvements in information and communications technology (ICT), computers and the Internet have become useful tools in our daily life and work. However, there are still those who do not know how to use computers or the Internet, a situation referred to as the "digital divide," and the issue of gender has always been the topic of most concern in the discussion of this divide. The declaration of the 4th World Conference on Women in Beijing in 1995 appealed to governments and non-profit organizations to take action to strengthen women's skills, knowledge and access abilities in the area of information technology. However, according to "The World's Women 2010" report, the United Nations Department of Economic and Social Affairs indicated that the gender digital divide still exists, not only in the less developed countries with lower Internet access rates, but also in the developed countries with high access rates.

Of the 55 reported countries, the gender digital divide gap in 28 countries exceeded 5%, and the rates of males using the Internet, excluding Cuba, were higher than those of females. When further comparing the rates among different age categories, the digital divide for older females was the most serious. In a study of 27 EU countries (Eurostat, 2010), 55-74-year-old women's utility rate of the Internet fell 10% below that of men. The same situation can be found in Taiwan. Since the beginning of the widespread use of and education in information technology in Taiwan, the computer usage rate of 12-40-year-old Taiwanese has risen to above 90%, and gender differences are not obvious. However, as the middle-aged and elderly have not had the same chances to learn about information technology, the rate drops as age rises, and women are obviously falling behind men in these

age groups (Research, Development and Evaluation Commission, RDEC, 2010). For instance, females aged 51-60 lag behind males by 2.3% (69% vs. 71.3%), and the difference widens to 9.2% among those aged 61 and older (11.5% vs. 18.4%). To encourage adult women to learn computer skills and to reduce the gender digital divide, in 1995 Microsoft, in association with a number of non-profit organizations, initiated the "Women Up Project" to provide women who lacked computer skills with 24 hours of free computer literacy training in basic information technology skills. This project received the recognition of the government in 2007 when the Council for Economic Planning and Development (CEPD), Executive Yuan, invested in expanding the program into the Bridging Digital Divide for Women Project. Since then it has helped almost 20,000 women in Taiwan to learn basic computer skills each year.

According to Simonson, Maurer, Montag-Toradi, and Whitaker (1987), expanding or sustaining a positive, anxiety free attitude or value structure about computers is considered pivotal for computer literacy. Because of the rapid and continuous development of computers, skills and knowledge are important for the computer literate person, but a positive attitude toward computing is also considered to be necessary (Simonson et al., 1987). In addition, there is a traditional stereotype that women do not have good computer skills, and that their attitudes toward computing tend to be negative. The findings of many researchers have also echoed this (e.g., Alzaidiyeen, Abdullah, & Al-Shabatat, 2011; Dinçyürek, Arsan, & Cağlar, 2011; Işman & Celikli, 2009; Massoud, 1991; Liu, Lin, Chen, & Peng, 2012; Ocak & Akdemir, 2008; Topkaya, 2010). Therefore, any future projects that are offered should not just focus on computer skills learning, but should also pay attention to improvements in attitudes toward computing. The purpose of this study is to explore the differences in the attitudes of the women beginning to learn computer skills and the factors contributing to these differences, and to provide reference suggestions for the future design of these kinds of training programs.

LITERATURE REVIEW

In the Digital Divide research, older adult users have been found to lag behind others in ICT and Internet use. In addition, some researchers have found that older adults experience greater anxiety than younger adults (Laguna & Babcock, 1997), or have less confidence (Dyck & Smither, 1994). However, some studies have found that the differences between the two groups are not conspicuous (Broady, Chan, & Caputi, 2010; Massoud, 1991). Broady et al. (2010) found that giving older adults the proper encouragement, clear explanations of the personal benefits and an appropriate time schedule can help them to learn to use computers in an effective way.

It is generally considered that the higher education people have, the better their computer skills will be, the more positive attitudes they will have, and the less anxiety they will experience (Chou & Shieh, 2011). However, some researchers have found that computer learning attitudes are not related to learners' education levels (e.g., Laguna & Babcock, 1997; Hashim & Mustapha, 2004).

Working women have more chances to use computers than housewives. Hilbert (2011) states that working women tend to use computers more actively, no matter whether in the working environment, at home, or in public places. Nakatani and Miyamoto's (2006) findings concur, as they found that housewives experience anxiety about learning to use computers because they rarely have the opportunity to use one. To break this negative cycle, helping housewives to gain more confidence and enjoyment in a positive learning environment could be expected to lead them to an active learning attitude and a positive cycle.

The ratio of foreign spouses in Taiwan (i.e., the ratio of migrant partners to total married couples) has been increasing since 1990, peaking at 31.9% in 2003. In 2009, the number of foreign spouses had reached 429,000, 93.3% of whom were females (Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C., 2011). According to the RDEC (2010) research, the rate of Internet connection in foreign spouse households was 11.1% lower than in those of non-foreign spouses. In addition, their awareness of availability of information was 12% lower than that of non-foreign spouses. According to Massoud (1991), people of different cultural backgrounds have different computer learning attitudes, so race/ethnicity is likely to be one of the factors influencing attitudes towards computer learning. For example, Marcoulides (1991) found that there are no differences between American and Chinese students in terms of the factors affecting their computer anxiety. On the other hand, Brosnan and Lee's study (1998) found that United Kingdom nationals had less computer anxiety and more positive computer learning attitudes than Hong Kong nationals because of cultural gender differences, even though the educational backgrounds and technological advances of the two groups of subjects were comparable.

Computer ownership has always been one of the indexes in the research of the Digital Divide, and also a factor considered in computer learning attitude research. If users own a computer, they are more likely to use it regularly, which will change their computer attitudes (Ogunkola, 2008). In addition, computer owners tend to

have less anxiety, better confidence, more interest, and self-identification (Pamuk & Peker, 2009). However, another study has shown that owning a computer has no influence on users' computer attitudes (Deniz, 2007).

Research has indicated that proper computer training programs and Internet access experience can efficiently improve older adults' computer attitudes. In one study, there was an obvious decrease in older adults' computer anxiety after being taught Internet Basics and Searching for Health Information Online (Xie & Bugg, 2009). Kubeck (1999) also compared the progress between older adults and younger adults after they had learned to use a computer. Although the study found that the older adults had more difficulty in learning and understanding, after the experience of learning they tended to be more interested in learning than the younger adults, and made more progress. McInerney, McInerney and Sinclair (1994) compared the computer attitudes of college students who did and did not own a computer before and after taking computer courses. They found that while there were no differences between the two groups before they took the courses, those who owned computers had significantly more positive attitudes after the courses.

Regarding the computer attitudes of adult women, middle-aged and elderly women in Taiwan usually have negative computer attitudes, as indicated by the research of Lin, Tang and Kuo (2007). Even though they might know that computer skills are very important, they do not have confidence to use computers and are afraid of breaking them. They also tend to feel that ICT is boring. Having unhappy computer experiences is also an important factor that increases their negative computer attitudes. For example, family members might not support them when they are learning, but rather make them feel anxious and helpless. Some of them are afraid of asking questions in computer courses, so they not only regress, but actually lose interest. On the other hand, Lin et al. (2007) pointed out that women would feel more comfortable if novices learned together, and a great experience could improve their positive computer attitudes. In a case study of a community mothers' computer course reported by Shieh, Chang and Liu (2011), the instructor's patience, repeated step-by-step demonstrations, detailed notes presented with screen-image snapshots, stand-by tutors and a friendly learning environment efficiently reduced the women's anxiety.

To summarize, while there have been a number of studies on computer attitudes, very few have especially focused on adult women and on the differences in their computer attitudes. Therefore, this study combined qualitative and quantitative research to study adult women's computer attitudes during computer literacy training in an attempt to answer the following questions:

1. What is the impact of the computer literacy training on the adult women's attitudes toward computers?
2. What characteristics and factors are associated with the change in the women's attitudes?

METHODOLOGY

Participants

The participants in this study were 204 women living in Chiayi City, Taiwan. They were enrolled in a digital divide project which was launched by the Council for Economic Planning and Development (CEPD) in Taiwan, aimed at reducing the digital divide for women. According to the RDEC (2010) report, females in Chiayi City are about eight percent less likely than males to use computers and to have Internet access. The examined program offered five training course sessions for adult women, each catering for about 40 participants. During the eight-week program, the women went to class once a week for three hours either at the weekend or in the evening between November 2009 and June 2010.

Some researchers have mentioned that as it is easy for adult novices to make mistakes when learning to use computers, they need more assistance than others (e.g., Czaja, 1997; Jones & Bayen, 1998). Jones and Bayen (1998) also suggested that there should be a sufficient number of instructors or teaching assistants to answer students' questions or give them appropriate help in class. Accordingly, a total of 24 college students were hired as teaching assistants in the current classes. Five of them were assigned to assist each class. All the sessions were taught by the same instructor.

Course design

Unit Design. Table 1 shows the teaching syllabus with unit descriptions. The course aimed at teaching the learners basic knowledge and hands-on skills about Windows and the Internet, including the steps involved in applying for a Windows Live account to experience a virtual identity in the cyber world. The last unit was to learn about online transactions through Internet auctions.

Table 1. Unit schedule and description

Week	*Unit*	*Description*
1,2,3	Basic computer knowledge and skills	Knowing computer components (host, input device and output device), basic Windows skills, data entry and Internet surfing (IE).
4,5	Computers and communication	Instant messenger (MSN) and email (Hotmail)
6,7	Internet publishing	Blogs (Windows Space) and online albums (Windows Album)
8	Online transactions	Internet Auctions (Hibid)

Materials Design. Using the multimedia-based worked examples rule to design the teaching materials, the units were divided into segments, each shown as a worked example (Hsu, Chang, & Yu, 2012; van Gerven, Paas, van Merriënboer, Hendriks, & Schmidt, 2003). The teaching materials were presented using Power Point, from which the participants could follow the steps based on the screen-shot images, as suggested by Shieh et al. (2011). Signals were used to highlight words and pictures, and the use of a simple background, cutting down on unnecessary embellishment, helped to avoid visual overload. Each student was given a two-slides-per-page handout in each class.

Presentation Design. The teaching location was a computer lab, where each student worked on their own computer. Each worked example segment comprised three steps: (1) the lecturer used the broadcast teaching system to broadcast the material to the students, explaining the content of the lesson, the purpose of learning, its application, and operational tips; (2) the lecturer demonstrated and explained the operation steps; and (3) the students practiced by themselves with five tutors standing by. Allowing students to do the same things right away and repeatedly after providing a worked example is an efficient method of improving their skills (Trafton & Reiser, 1993).

Instrument

The Computer Attitude Scale, initially designed for Taiwanese older adults by Lin (2007) with reference to Loyd and Loyd (1985), but slightly modified by Shieh et al. (2011), was adopted in the research. The 17-item scale is categorized into 4 sub-scales: anxiety (item1-item4), confidence (item5-item9), liking (item10-item13) and perceived usefulness (item14-item17). The scale is based on a five-point Likert scale, ranging from strongly disagree (1) to strongly agree (5). Lin claimed that the overall scale has a high reliability (Cronbach's $\alpha = 0.904$) and that the four sub-scales are all above 0.7. The current study used the pre-test data for the factor analysis and found that the confidence subscale distributed to different components. After deleting the confidence subscale and items 12, 16, and 17 due to not having loaded proper factors, the scale converged with the anxiety, liking and usefulness subscales. The Cronbach's Alpha Reliability Coefficients of the overall scale ($\alpha = 0.626$), the anxiety subscale ($\alpha = 0.773$), the liking subscale ($\alpha = 0.613$) and the usefulness subscale ($\alpha = 0.706$) were all higher than 0.6, the lowest suggested reliability coefficient value (Hair, Black, Babin, & Anderson, 2010).

Data collection and data analysis

The participants completed the Computer Attitude Scale in the first and the last class to allow for a better understanding of the changes in their computer attitudes as a result of taking the course. After eliminating the invalid questionnaires, there were 175 women who completed both. The participants' personal information was also gathered, including age, education level, work, nationality and PC ownership. In addition, ten class observations, two in each session, were conducted to acquire the dynamic interactivity of the classes. At the end of the training, 15 out of the 24 teaching assistants, identified as TA1 to TA15, took part in individual face-to-face interviews. A semi-structured interview protocol was used to attain their personal feedback about the training and about the women's in-class learning situation. Each interview lasted for approximately 20 minutes. Finally, follow-up telephone interviews of 20 randomly selected women from the program, identified as W1 to W20, were carried out to collect their learning experiences, including their opinions of the course arrangement, usefulness of the course content, interaction with the assistants, and frequency of computer usage after the training. Each interview lasted approximately 15 minutes. All interviews were audio-recorded.

SPSS 19 statistical software was used to analyze the questionnaire data. T-tests, Spearman's rho correlations, one-way ANOVA, and posthoc LSD tests were adopted to identify differences in the women's attitudes before and after the course. The interview data were transcribed verbatim, and the Atlas-ti software was used to conduct the coding, text retrieval, and node categorization.

RESULTS

According to the survey results, the mean age of the participants was 49.86 years (SD=9.856) with 88% older than 40. More than half of the participants (55%, n=97) had graduated from senior high school; more than half (54%, n=94) were not working. Ninety-four percent (n=164) of the participants were Taiwanese, as opposed to 6% non-Taiwanese. Ninety percent of the participants had a computer at home (n=157). More detailed information is shown in the associated tables below.

The impact of the computer literacy training on the adult women's attitudes

Table 2 presents a comparison of the women's computer attitudes before and after the training. Overall, their attitudes improved (t = 6.102, $p < 0.001$), their anxiety decreased (t = 7.982, $p < 0.001$), and their interest in computers increased (t = 2.607, $p < 0.05$). Although their perception of usefulness of computers remained highly positive (M = 4.010, SD = 0.645), it decreased slightly compared with before the training (M = 4.126, SD = 0.612; t = -2.398, $p < 0.05$).

Table 2. Mean scores of the participants' attitudes toward computers

Subscale	Mean(SD) (n=175)		*t*-value	*p*-value
	Before class	After class		
Anxiety	2.741(0.752)	3.198(0.733)	7.982	0.000***
Liking	3.464(0.632)	3.591(0.616)	2.607	0.010*
Usefulness	4.126(0.612)	4.010(0.645)	-2.398	0.018*
Overall	3.354(0.404)	3.521(0.474)	6.102	0.000***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

According to class observations, most of the women looked nervous but excited about coming to the computer training course. The interview data revealed that their anxiety about using computers was simply because they did not want to "break" them, including breaking the mouse, the keyboard, and the computer itself. However, after 2-3 weeks of hands-on practice, their fears dissipated as they learned that computers are not so easily broken. Some women (e.g., W9 and W14) reported in the interview that they also felt more confident and more comfortable when people talked about computers. Their increase in interest was reflected in their statements about their relationships with their children. W5 and W15 were excited about being able to communicate on MSN with their children and/or friends who lived out of town or abroad. W16 stated that she was able to use both email and MSN to talk with her child, which she considered an accomplishment. Several women mentioned that they learned to upload their photos and articles to Internet albums, blogs, and/or Facebook. W14 disclosed that after the data entry lesson she made a menu for her restaurant by herself, while W19 said that she created a company advertising presentation using Power Point. To W8, the most useful achievement was reportedly learning how to use a USB Flash Drive.

The various topics of the lessons, however, did not seem to have satisfied all of the learners, which reflected on the decrease in their perceptions of the usefulness of computers. W20, aged in the 30-40-year-old category, mentioned that she did not learn as much as she initially expected, though she acknowledged that she did gain more knowledge about the topics covered in the course. The class observation data revealed that the participants' comprehension about using computers varied significantly; some were able to follow the instructor's demonstrations on their first try, while most others needed multiple demonstrations before understanding. However, all were rather engaged in following the instructor's commands. The instructor also appeared very patient and slow-paced in presenting the lessons. According to TA1, more of the 30-40-year-old women preferred to learn about online auctions, whereas the older women enjoyed chatting on MSN more. Similarly, TA12 reported that not all of the women wanted to learn about blogs, as scheduled in the syllabus. She said some asked her to teach them about Facebook and how to apply for a Facebook account instead.

Overall, the women who were interviewed commented that the computer lessons were quite helpful for them. Among the lessons, the most useful items taught were email, surfing the Internet, and MSN. Most also commented that the instructor did a good job due to his patient demonstrations and explanations. Although seven out of the 20 women interviewed stated that they did not have many chances to use a computer in their daily life after the training program, thirteen said that their increased computer skills enriched their routine life. Most were also interested in attending this sort of program again to acquire more practice and more advanced skills.

Factors associated with the women's attitudes toward computers

Table 3 shows the results of paired samples t-tests comparing the women's computer attitudes before and after the training for each of the characteristic categories. It was found that almost all categories, except age below 40, no PC and non-Taiwanese, showed a decrease in the level of their anxiety ($p < 0.05$). There were five categories

of participants who increased their liking of computers: aged below 40 (t = 2.423, p < 0.05), senior high school education (t = 2.902, p < 0.01), working (t = 2.847, p < 0.01), own PC (t = 2.365, p < 0.05) and Taiwanese (t = 2.447, p < 0.05). Three categories however, aged over 59 (t = -2.152, p < 0.05), no PC (t = -2.586, p < 0.05) and Taiwanese (t = -2.290, p < 0.05), had lower perceptions of usefulness after the course.

Table 3. Paired samples t-tests for women's computer attitudes before and after the training for each characteristic category

		t-value(*p*-value)		
Characteristics	N	Anxiety	Liking	Usefulness
Age				
<40	21	1.587(0.128)	2.423(0.025)*	1.113(0.279)
40-49	74	4.879(0.000)***	1.213(0.229)	-1.258(0.212)
50-59	54	5.332(0.000)***	1.051(0.298)	-1.630(0.109)
>59	26	3.634(0.001)**	1.386(0.178)	-2.152(0.041)*
Education				
Elementary school and below	14	3.351(0.005)**	1.054(0.311)	-1.067(0.305)
Junior high school	30	3.254(0.003)**	0.174(0.863)	-0.887(0.382)
Senior high school	97	5.514(0.000)***	2.902(0.005)**	-1.529(0.130)
Junior college and above	34	3.516(0.001)**	0.453(0.654)	-1.383(0.176)
Working status				
Working	81	5.598(0.000)***	2.847(0.006)**	-1.365(0.176)
Not working	94	5.667(0.000)***	1.073(0.286)	-1.968(0.052)
PC Ownership				
Own PC	157	8.455(0.000)***	2.365(0.019)*	-1.524(0.130)
No PC	18	0.216(0.831)	1.083(0.294)	-2.586(0.019)*
Nationality				
Taiwanese	164	8.180(0.000)***	2.447(0.015)*	-2.290(0.023)*
Non-Taiwanese	11	0.134(0.896)	0.872(0.404)	-0.678(0.513)

*p < 0.05, **p < 0.01, ***p < 0.001

Correlations between characteristics and computer attitudes before the course, after the course, and the before/after differences in attitudes are presented in Table 4, using Spearman's rho correlations. Before the course only education level and anxiety were significantly related (r_s = 0.194, p < 0.05). After the course, age and usefulness (r_s = -0.221, p < 0.01) were shown to have a significant relationship. Education and anxiety (r_s = 0.150, p < 0.05) and Liking (r_s = -0.158, p < 0.05), and PC ownership with anxiety (r_s = -0.159, p < 0.05) were all shown to be significant. Differences between before and after the course found that age and usefulness were significantly related (r_s = -0.162, p < 0.05), as were nationality and anxiety (r_s = -0.152, p < 0.05). PC ownership with anxiety (r_s = -0.191, p < 0.05) and usefulness (r_s = -0.151, p < 0.05) both had significant relationships.

Table 4. Spearman's rho correlations between characteristics and computer attitudes before the course, after the course, and the before/after differences in attitudes

Subscale	Spearman's rho Correlations (r_s value)				
	Age	Education	Working Status	PC Ownership	Nationality
Before class(A)					
Anxiety	-0.101	0.194*	0.023	0.044	0.002
Liking	0.009	-0.138	0.020	-0.078	0.008
Usefulness	-0.094	0.081	0.031	0.027	0.053
After class(B)					
Anxiety	0.008	0.150*	0.026	-0.159*	-0.148
Liking	-0.010	-0.158*	-0.067	-0.041	-0.018
Usefulness	-0.221**	0.092	-0.011	-0.144	-0.006
Differences(B-A)					
Anxiety	0.125	-0.070	-0.021	-0.191*	-0.152*
Liking	-0.027	-0.040	-0.092	0.041	0.017
Usefulness	-0.162*	0.070	-0.061	-0.151*	-0.036

*p < 0.05, **p < 0.01, ***p < 0.001

Based on the results listed in Table 4, the between-groups comparisons were conducted. Those containing only two categories of variables, such as PC ownership and nationality, were examined using independent sample t-tests, whereas those containing more than two categories, such as age and education, were tested using one-way-ANOVA. The t-tests revealed that the difference in the anxiety level of the Taiwanese women before and after the course decreased more than that of the non-Taiwanese women ($t = 1.981$, $p < 0.05$). As for PC ownership, there were significant differences in anxiety ($t = 2.107$, $p < 0.05$) after the course. Those who owned a computer showed a greater reduction in their level of anxiety ($t = 2.523$, $p < 0.05$) than those who did not. In addition, their perceptions of usefulness ($t = 2.597$, $p < 0.05$) also decreased less than those who did not own a computer.

The results of one-way ANOVA indicate that age and perception of usefulness after the course had a significant difference ($F(3,171) = 3.665$, $p < 0.05$), while for education level and before-class anxiety, differences existed between the groups ($F(3,171) = 3.035$, $p < 0.05$). The post hoc LSD test was adopted to further examine the differences of these significant categories. As
Table 5 discloses, the anxiety of the elementary school and below group was higher than that of the senior high school ($p < 0.05$) and junior college and above groups ($p < 0.01$) before the course. Table 6 indicates that after the course the younger than 40 group had more positive perceptions of usefulness than the 50-59-year-old group ($p < 0.05$), and was also more positive than the over 59-year-old group ($p < 0.01$), while the 40-49 group was more positive than the over 59-year-old group ($p < 0.05$).

Table 5. Post Hoc LSD test for differences between education groups on anxiety before the training

Dependent Variable	(I) Education	(J) Education	MD (I-J)	Std. Error	*p*-value
Anxiety (before training)	Elementary school and below	Junior high school	-0.424	0.239	0.078
		Senior high school	-0.445	0.211	0.037*
		Junior college and above	-0.700	0.235	0.003**
	Junior high school	Senior high school	-0.021	0.154	0.892
		Junior college and above	-0.275	0.185	0.138
	Senior high school	Junior college and above	-0.254	0.147	0.086

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 6. Post Hoc LSD test for differences between age groups on usefulness after the training

Dependent Variable	(I) Age	(J) Age	MD (I-J)	Std. Error	*p*-value
Usefulness (after training)	<40	40-49	0.181	0.156	0.246
		50-59	0.383	0.162	0.019*
		>59	0.516	0.185	0.006**
	40-49	50-59	0.202	0.113	0.075
		>59	0.334	0.144	0.021*
	50-59	>59	0.132	0.151	0.381

Notes: *p<0.05, **p<0.01, ***p<0.001

As mentioned in Table 4, there were no obvious differences between women who were working and those who were not. Before training there were also no significant differences between age and computer attitudes. Table 6**,** however, reveals that their attitude of usefulness changed after the training. The younger women obviously had higher perceived usefulness than the older ones. The problems that the older women mentioned in the interviews were physiological degeneration and the difficulty of Chinese input. Both 66 year-old W7 and 59 year-old W6 mentioned that they gave up learning because of their bad eyesight. W7 and 54 year-old W8 met the difficulties of Chinese input. TA5 had noticed that older women tended not to be good at either Chinese or English input skills. “Typing is really slow for me, and I need glasses to look at the monitor, so I don’t use it anymore” said W7. However, W9 (34 years old) thought it was really helpful for her as she now knows how to use Internet albums and blogs.

Anxiety was found to be related to women’s education level. Before the training, the elementary school and below group’s anxiety was higher than that of the senior high school and above groups. After the training, anxiety decreased for all levels and there were no big differences between them. Consistently, W5, who had an

elementary school level of education, stated in the interview, "I didn't study much during my childhood, but I feel happy I can still learn something." Another fact that influences women's anxiety is nationality, which showed no significant differences before training, but after training, the Taiwanese women's anxiety reduced more significantly than that of the non-Taiwanese women. It is possible that as the course was designed for Taiwanese learners, the non-Taiwanese learners did not benefit as much in the aspect of reducing anxious feelings. In addition, the cultural and language differences might have also accounted for a portion of the difficulty. For example, the phonetic input method, a commonly used method, was used to type Chinese characters in the course, whereas the learners from Mainland China were only familiar with the spelling system to input characters. In the computer communication lesson, MSN was used to teach the learners instant communication skills, but learners from China were more accustomed to using QQ. "They wanted to use QQ rather than MSN, and there's a problem to teach them data input" said TA1.

PC ownership influenced the women's anxiety levels and their feelings of usefulness. There were no differences before the training between those who had a computer and those who did not. However, the feelings of anxiety and usefulness of the women without computers were obviously lower than for those who owned a computer after the training. Four of the TAs said in the interview that they noticed that the PC owner group would practice at home and would ask their family if they had problems. For example, TA3 confirmed that some of the women she taught would ask their children if they forgot something. The TAs felt that the handouts could help the learners because they could take notes so they could practice at home by themselves. Several women (e.g., W13, W14, and W15) reportedly practiced at home using their handouts if they did not have sufficient time in class to do it. However, for those who did not have a computer at home, TA10 commented, "They would keep asking about the problem again and again" in class.

Based on the classroom observations, there was only limited interaction between the women. However, they gave feedback that they received a great deal of help from their TAs, such as, "The TA's help was really useful" and "We didn't feel pressure because the TA was friendly." In the training, one TA was provided for every six or so women, but it is hoped that this ratio could be improved, so that the TAs could help fix any problems immediately. "Even though the TA was nice, it would be better if two students shared one TA" said W18. The TAs reportedly also felt that they learned a great deal from the tutoring experiences, particularly in the aspect of increasing their patience. "I should be very patient because they often asked me the same question again and again. I had to help them review and practice many times. I became very patient and now have more interaction with my own family. In the past, my mom would ask me questions sometimes, but I didn't help her. After this program, I have a better relationship with my mom and she also thinks it is good for me." This shows the effect of Intergenerational Learning, as it provides a chance to let younger people help older people to learn about computers and to learn and grow together.

CONCLUSION AND SUGGESTIONS

Based on the study findings, we found that the women's computer attitudes were influenced by their computer training, including reducing anxiety and their perceptions of usefulness, and increasing liking. In the discussion of changing women's computer attitudes, some researchers (e.g., Hilbert, 2011; Nakatani & Miyamoto, 2006) argue that working women have better attitudes, but this was not supported in the current study. The factors that influenced the attitudes of our participants were age, education level, nationality, and PC ownership. Before the training, only lower education level women had higher anxiety. Most of the influences took effect after the computer training. After the training, younger women and those who owned a computer increased their perceptions of usefulness of computers; non-Taiwanese women increased their anxiety, while women who owned computers reduced their anxiety. This indicates that the experience of learning about computers can influence women's computer attitudes in various ways. Therefore, we should include computer learning experience as a factor in the future research, and focus on the needs of different groups of women. To decrease their learning difficulties, the following suggestions are provided.

1. Wong, Chai and Gao (2011) pointed out that non-alphabetic languages such as Chinese are more complicated to key in, including switching modes and phonetic vs. character selection, etc. The results of this study reveal that older women and women with lower education levels tend not to be good at phonetics and Chinese data input, so these became their biggest challenges and they needed extra help. For those who have difficulties in data input, using different types of input approaches is suggested, such as writing characters directly on a writing pad or keying in the phonetics of the desired characters.
2. Older women also need to be aware of the problem of physiological degeneration, especially the inconvenience caused by bad eyesight. For these women, it is suggested that TAs could assist individual learners according to their various needs. For example, accessibility settings introduced by Jacko (2005) such as magnifiers, text-to-speech utilities, on-screen keyboards and high contrast, could be employed.

3. Programs that are designed for immigrant societies should adjust their design based on different cultural requirements, as pointed out by Veith, Schubert and Wulf (2007). In this research, the foreign brides' anxiety was higher than that of the Taiwanese women. It is suggested that the program needs to be designed based on their culture and language to teach them how to set up a multilingual environment with familiar data input and software. For example, Chinese women are familiar with using Hanyu Pinyin (spelling) data input and QQ to communicate with their friends and family, so this should be taken into consideration in the design of the program.
4. Women who do not own their own computer do not have many chances to practice after class, so they have less access to a computer. It is suggested that after-class practice time be provided on a regular basis to increase their chances to practice. In addition, Selwyn (2003) suggested that governments or NGOs provide more public computers to give the public more chances to use them.
5. Mayhorn, Stronge, McLaughlin and Rogers (2004) argue that step-by-step teaching could reduce older adults' learning load. Consistent with the findings reported by Shieh et al. (2011), this study also found that the use of screen snapshots and step-by-step methods in the design of the teaching materials was helpful to the learners because they could review at home by themselves and could more easily recall what they had learned in class. It is suggested that future programs adopt similar approaches to the design of the training course materials for adult learners.

In addition to improving the adults' computer skills, it appears that the teaching assistants also gained opportunities to learn from the adult members, which echoes the assertions about Intergenerational Learning (Poynton, 2005). In other words, while the participating women improved their computer skills, the TAs also grew via interaction with the women. This is an example of mutual learning that was not expected at the beginning of the program, and so was not investigated in the current study. It is suggested that future research can study this overlooked aspect to further understand the value of Intergenerational Learning occurring between adult learners and young tutors in a training program.

REFERENCES

Alzaidiyeen, N.J., Abdullah, A.G.K., & Al-Shabatat, A.M. (2011). The information aged: Examination of university students' attitudes towards personal digital assistants (pdas) usage in terms of gender, age and school variables. *Turkish Online Journal of Educational Technology*, *10*(3), 287-295.

Broady, T., Chan, A., & Caputi, P. (2010). Comparison of older and younger adults' attitudes towards and abilities with computers: Implications for training and learning. *British Journal of Educational Technology*, *41*(3), 473-485.

Brosnan, M., & Lee, W. (1998). A cross-cultural comparison of gender differences in computer attitudes and anxieties: The United Kingdom and Hong Kong. *Computers in Human Behavior*, *14*(4), 559-577.

Chou, J.R., & Shieh, C.J. (2011). The digital divide in Taiwanese unemployed adult population. *Scientific Research and Essays*, *6*(7), 1514–1521.

Czaja, S.J. (1997). Computer technology and the older adult. In: Heldander MG, Landauer TK, Prabhu PV (eds) *Handbook of human–computer interaction*. Amsterdam: Elsevier.

Deniz, L. (2007). Prospective class teachers' computer experiences and computer attitudes. *International Journal of Social Sciences*, 35, 116-122.

Dinçyürek, S., Arsan, N., & Cağlar, M. (2011). The orthopaedically handicapped and computer usage: the case of trnc. *Turkish Online Journal of Educational Technology*, *10*(1), 209-215.

Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R. O. C. (2011). *Women and Men in R.O.C.(Taiwan) Facts and Figures (Version 2011)*. Retrieved April 14, 2012, from http://eng.stat.gov.tw/public/data/dgbas03/bs2/gender/2011GenderImages(Eng).pdf.

Dyck, J.L., & Smither, J.A. (1994). Age differences in computer anxiety: the role of computer experience, gender and education. *Journal of educational computing research, 10*(3), 239-248.

Eurostat. (2010). *Internet usage in 2010 – Households and Individuals - Issue number 50/2010*, Retrieved April 14, 2012, from http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-QA-10-050/EN/KS-QA-10-050-EN.PDF

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis: A global perspective* (7th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Hashim, H.R.H., & Mustapha, W.N. (2004). Attitudes toward learning about and working with computers of student at UITM. *Turkish Online Journal of Educational Technology*, *3*(2), 3-7.

Hilbert, M.(2011). *Digital gender divide or technologically empowered women in developing countries? A typical case of lies, damned lies, and statistics.* Women's Studies International Forum, *34*(6), 479-489.

Hsu, J.M., Chang, T.W., & Yu, P.T. (2012). Learning effectiveness and cognitive loads in instructional materials of programming language on single and dual screens. *Turkish Online Journal of Educational Technology, 11*(2), 156-166.

Işman, A. & Celikli, G. E. (2009). How does student ability and self-efficacy affect the usage of computer technology? *Turkish Online Journal of Educational Technology, 8*(1), 33-38.
Jacko, J. F. (2005). Empirical validation of the Windows® accessibility settings and multimodal feedback for a menu selection task for users with Diabetic Retinopathy. *Behaviour and Information Technology*, *24*(6), 419-434.
Jones, B.D., & Bayen, U.J. (1998). Teaching older adults to use computers: Recommendations based on cognitive aging research. *Educational Gerontology*, *24*(7), 675-689.
Kubeck, J. D. (1999). Finding information on the World Wide Web: Exploring older adults' exploration. *Educational Gerontology*, *25*(2), 167-183.
Laguna, K., & Babcock, R.L. (1997). Computer anxiety in young and older adults: Implications for human-computer interactions in older populations. *Computers in Human Behavior*, *13*(3), 317-326.
Lin, C.H. (2007). *A study of the relationship of older adults' computer experience between life satisfaction and computer attitude*. Thesis, Graduate Institute of Adult and Continuing Education, National Chi Nan University.
Lin, I.C., Tang, W.H., & Kuo, F.Y. (2007). Bridging the digital divide: A case study of middle-age women in Taiwan. *PACIS 2007 Proceedings.*
Liu, E. Z. F., Lin, C. H., Chen, F. Y., & Peng, P. C. (2012). Cluster analysis of adolescent blogs. *Turkish Online Journal of Educational Technology*, *11*(2), 69-79.
Loyd, B.H. & Loyd, D.E. (1985). The reliability and validity of an instrument for the assessment of computer attitudes. *Educational and Psychological Measurement, 45*(4), 903-908.
Marcoulides,G. A.(1991). An examination of cross-cultural differences toward computers. *Computers in Human Behavior*, *7*(4), 281-289.
Massoud, S.L. (1991). Computer attitudes and computer knowledge of adult students. *Journal of Educational Computing Research, 7*(3), 269-291.
Mayhorn CB, Stronge AJ, McLaughlin AC, & Rogers WA. (2004). Older adults, computer training, and the systems approach: A formula for success. *Educational Gerontology.* 30(4), 185–203.
McInerney, V., McInerney, D. M., & Sinclair, K. E. (1994). Student teachers, computer anxiety and computer experience. *Journal of Educational Computing Research*, *11*(1), 27–50.
Nakatani, M. & Miyamoto, M. (2006). Enhancing the acceptance of computers by housewives. In: *Proceedings of the Human Factors and Ergonomics Society of Australia 42nd Annual Conference 2006*, University of Technology, UTS, Sydney, 20-22 November.
Ocak, M.A. & Akdemir, O.(2008). An investigation of primary school science teachers' use of computer applications. *Turkish Online Journal of Educational Technology*, *7*(4), 54-60.
Ogunkola, B. J. (2008). Computer attitude, ownership and use as predictors of computer literacy of science teachers in Nigeria. *International Journal of Environmental and Science Education*, *3*(2), 53–57.
Pamuk, S. & Peker, D.(2009). Turkish pre-service science and mathematics teachers' computer related self-efficacies, attitudes, and the relationship between these variables. *Computers and Education*, *53*(2), 454-461.
Poynton, T.A. (2005). Computer literacy across the lifespan: a review with implications for educators. *Computers in Human Behavior*, *21*(6), 861-872.
RDEC. (2010). *Digital Divide in Taiwan 2010 Summary.* Retrieved April 14, 2012, from http://www.rdec.gov.tw/public/Data/17151574571.pdf.
Selwyn, N. (2003). ICT for all? access and use of public ICT sites in the UK. *Information, Communication and Society. 6*(3), 350–375.
Shieh, R.S., Chang S.L., & Liu, E.Z.F. (2011). A case study of low-status women's attitudes towards computers. *Educational Studies*, *37*(2), 233-243.
Simonson, M.R., Maurer, M., Montag-Torardi, M., & Whitaker, M. (1987). Development of a standardized test of computer literacy and a computer anxiety index. *Journal of Educational Computing Research*, *3*, 231-247.
Topkaya, E.Z. (2010). Pre-service English language teachers' perceptions of computer self-efficacy and general self-efficacy. *Turkish Online Journal of Educational Technology, 9*(1), 143-156.
Trafton, J.G. & Reiser, B.J. (1993). The contributions of studying examples and solving problems to skill acquisition. In M. Polson (Ed.), *Proceedings of the Fifteenth Annual Conference of the Cognitive Science Society* (pp. 1017-1022). Hillsdale, NJ: Erlbaum.
van Gerven, P.W.M., Paas, F., van Merriënboer, J.J.G., Hendriks, M., & Schmidt, H.G.(2003). The efficiency of multimedia learning into old age. *British Journal of Educational Psychology. 73*(4), 489–505.
Veith, M., Schubert, K., & Wulf, V. (2007). come_IN: Identity and role affiliation mediated by an inter-cultural computer club. In *Proceedings of the IADIS International Conference e-Society*. Retrieved April 14, 2012, from http://come-in.wineme.fb5.uni-siegen.de/files/pubs/veithschubertwulf2007.pdf

Wong, L.H., Chai, C.S., & Gao, P. (2011). The Chinese input challenges for Chinese as second language learners in computer mediated writing: An exploratory study. *Turkish Online Journal of Educational Technology*, *10*(3), 233-248.

Xie, B., & Bugg, J. M. (2009). Public library computer training for older adults to access high-quality Internet health information. *Library and Information Science Research*, *31*(3), 155-162