Computer use among fresh graduated teachers: the moderating role of type of school environment

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This was a survey research which investigated four important issues concerning implementing computer technologies among fresh graduated teachers from teacher training colleges in Sabah. The first issue was concerned with the levels of computer anxiety, liking, usefulness and confidence and computer use among teachers. The second was concerned with the levels of support from schools environment towards the use of computer among teachers. The third issue was related to the best predictor for computer use for planning, instructional, assessment and communication. The final was concerned with moderating effect of computer school environment on the relationship between anxiety, liking, usefulness and confidence towards computer use among teachers. A set of questionnaire was used as the research instrument and stratified systematic sampling was used to determine the research samples. The samples consisted of 192 primary and secondary school teachers. The data were analysed using descriptive and inferential statistics (factor analysis and regression analysis). Research hypotheses were tested at significance level of α = 0.05. The findings showed that fresh graduated teachers have low in computer anxiety and high in computer liking, usefulness, confidence, and moderate in computer use. The findings also noted that schools have positive support to the implementation of computer use among teachers and has moderating impact between anxiety, liking, usefulness and confidence towards computer use. Finally, computer usefulness was the best predictor for computer use for planning, communication and instruction purposes. In short, the study provided wider implications for theory development, practices and policymaking that can be associated with the computer use among teachers. As a whole, most of the theoretical rationales used in explaining those relationships have been supported.

Introduction

Technology in schools has now taken a place in the agenda of international meetings, along with trade and economics. Ken Wasch, the President of Software and Information Industry Association (SIIA) in International Society for Technology in Education (2004), stated that technology in schools is critical to ensure that all students gain 21st century skills necessary for success by engaging them in the learning process. Information and communications technology has provided tools to

help in the teaching and learning processes. The Education Minister of Malaysia, Datuk Seri Hishammuddin Tun Hussein remarked that the growing importance of education is a new international development because every sensible leader recognizes that the economic, social and cultural wealth of a nation in the Information Age lies in its people, and what they know and can do (Ministry of Finance, 2004). In the technological trends of the 21st century, all member countries of the South East Asia Ministers of Education Organization (SEAMEO), including Malaysia, have begun to focus on benefit of information and communications technology to improve the teaching and learning of certain subjects, particularly Science and mathematics but the benefits from computer learning activities had not yet been fully promoted since many teachers are still not clear with its implementation, either in developing or developed countries (Jintavee, 2005).

In this Information Age, like other developed countries, there is a clear recognition that technologies can transform conventional education system and bring more advantages and benefits to Malaysians, especially for the younger generation, and the country as a whole (Berita Harian, 12 January 2004). Thus, Malaysian schools have devoted considerable resource to technology. Malaysian schools and colleges have included computer technology as an integral part of students learning experiences and as a way to equip them with the skills and knowledge necessary to succeed in the 21st century.

In the 2005 national budget, the Malaysian government had allocated a total of RM19.3 billion for the development of education sector to provide better information and communications technology facilities to schools and students (Ministry of Finance, 2004). To further strengthen education and training for knowledge based technology, a sum of RM33.4 billion was allocated for operational and development in the 2007 national budget. Of this, RM6.7 billion was for primary education, RM6.2 billion for secondary education, RM10.4 billion for higher education and RM10.1 billion for computer training programs. To enhance computer usage in schools, a sum of RM288 million was allocated under the Smart School Program, which involves the procurement of computers and peripherals for the Access Centers in 1,000 schools and in all teacher training colleges (The 2007 Budget Speech, 2006). For the forthcoming 2008 national budget, it has been expected that more allocation would be put aside to encourage and educate teachers and students towards this aspect.

Objectives of the Study

The main objective of this study is to examine computer attitudes and computer teaching efficacy of fresh graduate teachers in relationship to computer use. In order to achieve this objective, specific objectives have been developed as follows:

1) To examine the levels of computer attitudes, computer teaching efficacy and computer use among fresh graduates from teacher training colleges.

2) To examine the relationship between computer attitudes (anxiety, liking, confidence and usefulness) and computer use among fresh graduate teachers from teacher training colleges.

3) To examine the relationship between computer teaching efficacy and computer use among fresh graduate teachers from teacher training colleges.

4) To examine the effects of school environment (administrators and technical support), as moderated variable, in the relationship between computer attitudes and computer teaching efficacy towards computer use among fresh graduate teachers from teacher training colleges.

5) To determine the best predictor of the ways of computer use (planning, instruction, assessment and communication) among fresh graduate teachers from teacher training colleges.

REVIEW OF RELATED LITERATURE

Computer and Education: Malaysian Perspective

The importance of integrating computer in education had been proven when the Ministry of Education launched the Smart School. The Smart School became one of the seven flagship applications in Malaysia of the Multimedia Super Corridor (MSC) project in the year 1997 (TakingITGlobal, 2003). According to the Curriculum Development Center (2003), the Smart School project would prepare school leavers for the information age and equip them with information technology competencies. This will help them to develop their potential to face the advancement of technology. This project had involved a major transformation of the Malaysian school system. In other words, computer technology is indispensable for the success of the Smart Schools. Multimedia courseware, presentation facilities and e-mail are required in classroom settings, while library and computer laboratories are resources that will facilitate learning and teaching. Some of the expected changes include a more widespread use of computers and related information and communications technology in the classroom, and also teachers' knowledge and skills in computer technology. By the year 2010, all the estimated 10,000 Malaysian schools will be Smart Schools, involving an estimated enrolment of 5.8 million students and 450,000 teachers (Ministry of Education, 1997).

Based on the data from Sabah Education Department (Information Unit), in Sabah alone, within 54 months (4 years 6 months), 14,760 notebooks and 9,987 units of LCD projectors had been distributed to primary and secondary teachers. From the year 2003 to June 2007, the Ministry of Education has spent about RM15 millions to purchase computer related equipment for Mathematics, Science and English teachers in Sabah which is underlies the *Pengajaran dan Pembelajaran Sains dan Matematik menggunakan Bahasa Inggeris* (PPSMI) program.

Table 1.1: Total Computer Items Purchased for Mathematics, Science and English Teachers in Sabah (2003 – June 2007)

Year	Item			
	Notebook (unit)	LCD (unit)	White Screen (unit)	Trolley / speaker (unit)
2003	8,372	7,134	1,716	3,023
2004	593	1,242	1,237	3,022
2005	669	16	0	0
2006	1,396	117	3,204	3,209
June 2007	3,730	1,478	1,578	2,919
Total	14,760	9,987	7,735	12,173

Computer Attitudes and Computer Use

Several models have explained the relationship between attitudes and intention or actual behavior. The models have been expended to investigate and understand how far the attitudes variable can predict and affect the acceptance technology in large organizations. Among those notable models are Technology Acceptance Model (TAM) (Davis, 1989), Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975; Ajzen & Fishbein, 1980), Theory of Planned Behavior (TPB) (Ajzen, 1985) and Multi-Attribute Attitude Model (MAA) (Wilkie & Pessemier, 1973).

TAM, TPB, TRA and MAA were based on the relationship of attitude-intention-behavior (actual) constructs. Based on those models and theories, attitudes construct has been the main focus. In the Figure 1.1, it has been shown that the attitudes construct was the major predictor to predict the actual use. Thus, the researcher has hypothesized that computer attitudes have statistically relationship with computer use among fresh graduates from teacher training colleges.

In the conceptual framework, the researcher intentionally excluded the "Behavioral intention" construct that was mentioned in TRA, TPB and TAM as it was not included in the objective of this study. Moreover, since the samples (teachers) have been posted to schools and computer use in school has been introduced to them, the researcher believed that the testing on intention was not necessary. Besides, the researcher had designed a reliable questionnaire to pool the information on the actual computer use from the samples.

In general, a person who believes that performing a given behavior will lead to positive outcomes will hold a favorable attitude toward performing the behavior. Similarly, people who believe that performing a given behavior will lead to negative outcomes will hold an unfavorable attitude toward performing the behavior. Thus, attitude toward the behavior is a function of both the beliefs that the behavior leads to certain outcomes, and by the person's evaluation of these outcomes.

In this study, the computer attitudes variable refers to teachers' attitudes toward computer. Computer attitudes variable included teachers' anxiety, liking, usefulness and confidence levels which have been conceptualized in Gressard and Loyd (1986) study.

Computer anxiety :Fear of computer technology accompanied by feelings of nervousness.
Computer Liking :Enjoyment in using computer.
Computer usefulness :The ability to perceive computer as a useful tool.
Computer Confidence : Confidence in learning or using computers.

Thus, in this study, it was hypothesized that computer attitudes (computer anxiety, computer liking, computer usefulness and computer confidence) have significant relationship and impacts on the computer use among fresh graduates from teacher training colleges in Sabah.

Computer Teaching Efficacy and Computer Use

According to Bandura's social cognitive theory (Bandura, 1977), individual with high self-efficacy will have better ability to cope with roadblocks and endure stress related to change. Conversely, an individual with low self-efficacy will be less likely to attempt innovation or follow through as barriers arise. Many previous researchers, such as Gibson and Dembo (1984), Riggs and Enochs (1990), Marcinkiewicz (1994), Torkzadeh, Pfulghoeft and Hall (1999), Ropp (1999), Jarrett (1999), Gibson (2001), Tracey *et al*. (2001), Bandura (2001), Cassidy and Eachus (2002), Sugar (2002), Green (2005) and Eyadat (2006) have suggested that self-efficacy, by itself, will influence actual performance and practices.

Based on the exhaustive literature review on teacher efficacy, the researcher in this study has uncovered an important distinction between teaching efficacy and computer use by teachers.

In this study, definition of teaching efficacy and computer use by teachers are given as follows:

i) *Personal Computer Teaching Efficacy (PCTE)*
The teacher's personal evaluation on their own capability to use computer for teaching and learning.

ii) *General Computer Teaching Efficacy (GCTE)*
Teachers' personal beliefs in using computer as an effective teaching method to improve student's motivation and performance in learning.

These two dimensions of computer teaching efficacy are based on Bandura's Efficacy Beliefs and Outcomes Expectancy dimensions. According to the Bandura's theory, there are two types of expectancies of behavior; efficacy beliefs and outcome expectation. *Efficacy belief* is the feelings of confidence in performing certain task. *Outcome expectation* was defined as the belief about the consequences that action will produce.

i) *Personal Computer Teaching Efficacy (PCTE).* Based on Bandura's (1997) conceptualization of self-efficacy as presented in the prior section, Personal Computer Teaching Efficacy (PCTE) refers to the teacher's personal evaluation on their own capability in using the computer for teaching and learning purposes. This dimension of teaching efficacy was based on efficacy beliefs dimension which has been focused in Bandura's studies. Teachers generally will avoid situations in which they doubt their ability to perform successfully. The teacher's efficacy belief influences his or her choice of teaching methods, the effort he or she expends and persist in accomplishing the task. In this study, Personal Computer Teaching Efficacy

is used as one of the sub independent variables towards computer use among teachers.

ii) *General Computer Teaching Efficacy (GCTE).* This dimension of teaching efficacy was based on Bandura's outcome expectancy dimension. This dimension embodies situation-specific expectation that computers and students themselves can influence students' results. In this study, the researcher believed that teachers with high sense of general computer teaching efficacy will believe that all their students are capable of learning via computer teaching methods and teaching with computers can make a difference in upgrading student's performance and getting better results if compared to conventional teaching methods. In contrast, teachers with low general computer teaching efficacy have come to believe that students cannot or will not learn through computer mediated teaching methods. The researcher believed that teachers who have low degree in general computer efficacies would readily give up using computer in teaching and learning as they believed that the action would not produce any favorable result. In contrast, teacher with high degree of personal and general computer efficacies would persist longer and give better feedback to the use of computer in classroom settings.

Based on the above literature review, this study has hypothesized that computer teaching efficacy (general computer teaching efficacy and personal computer teaching efficacy) has significant relationship and impact on computer use.

School Environment and Computer Use

In this study, school environment refers to the support from administrators, such as non-academic staff, principal and senior assistants and technical support like facility availabilities when adopting computer in teaching and learning process. The researcher has hypothesized that the higher the support from school environment, the stronger the relationship between computer attitudes and computer teaching efficacy towards computer use among teachers in schools.

The school environment acted as the moderator variable in the research framework and it was positioned between computer attitudes and computer teaching efficacy towards computer use.

In Goldstein and Ford's (2002) model, the working environment acted as the moderator in between learning outcomes and technology use (see Figure 2.9). As shown in Goldstein and Ford's (2002) model, learning outcomes (level of trainee's learned and retained the materials) have significant impact or influence on the transfer outcomes and also noted that the extent of transfer of training to the workplace (transfer outcomes) also depends on factors within the workplace (work characteristics).

Thus, based on the above literature review, the school environment formed the hypotheses that relationship between computer attitudes and computer teaching efficacy towards computer use were moderated by school environment.

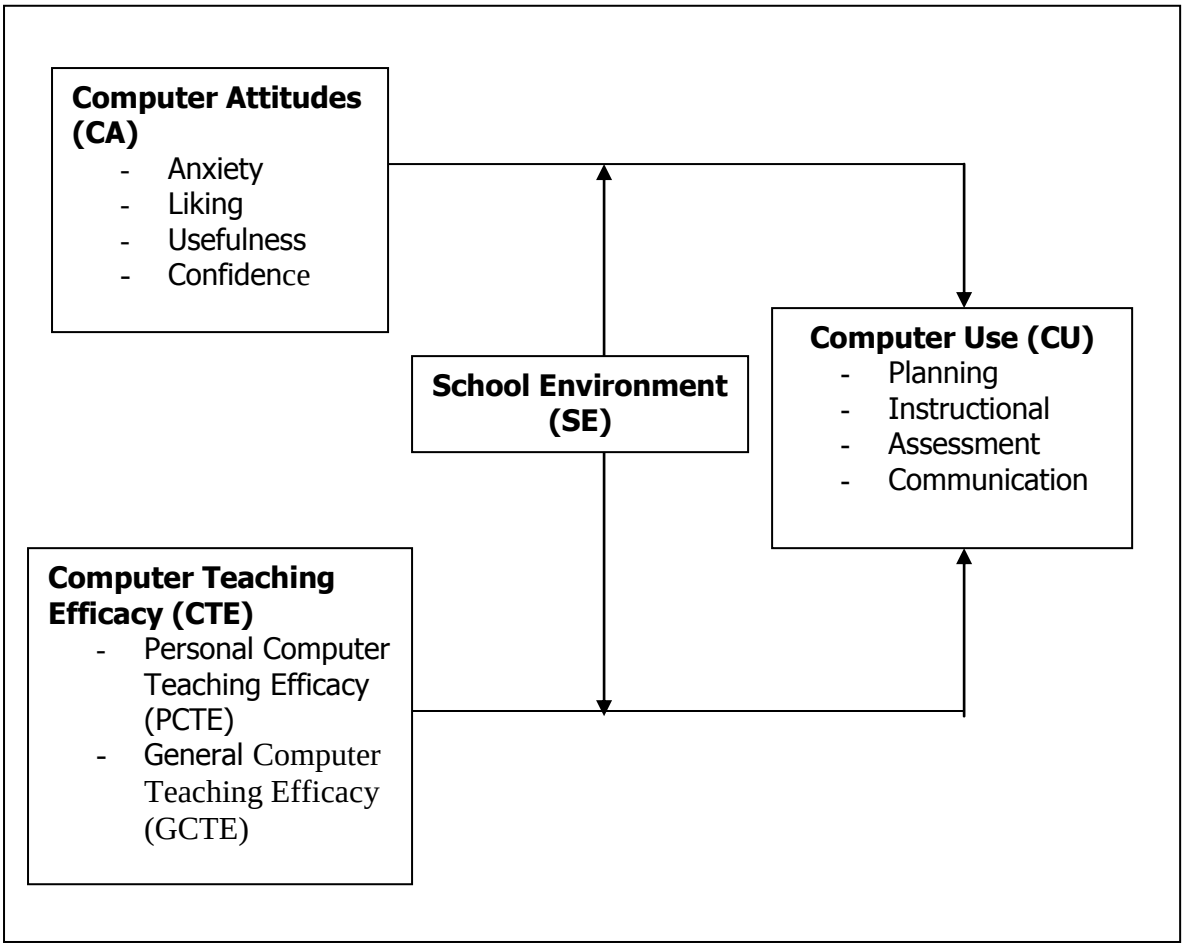
Computer Use

Generally, the researcher believed that the justification of computers use among teachers is primarily driven by a teacher's work task. Even though, nowadays the teachers' work tasks and responsibilities may vary but base on literature review of Reynolds (1992) in the work of teaching, there are some common teaching related tasks that can be used to measure the use of computer among teachers. Reynolds

(1992) noted that teaching task can be categorized as pre-active, interactive, and post-active or learning. Reynolds labeled tasks, such as comprehending, preparing and adapting content, plans and materials as pre-active; those tasks performed during instruction as interactive; and tasks that demonstrated reflection on one's own actions and student's responses, interacting with colleagues and continued professional development as post-active. Using part of Reynolds' *et al.* (1992), design, they identify that teachers, basically have six tasks. These were identified as, planning for a preparing instruction; managing the classroom; implementing instruction; evaluating student learning and instructional effectiveness; administrative responsibilities; and additional professional responsibilities.

In this study, computer use was divided into *planning, instruction, assessment* and *communication.* Rosenfeld's first task analogous to this study's planning component. Rosenfeld's second and third tasks were subsumed in this study's instruction component. The assessment component corresponded perfectly to Rosenfeld's fourth task and finally, in so much as communicating with parents, students and colleagues were part of one's additional professional responsibilities as a teacher and this was included as part of Rosenfeld's fifth and sixth tasks.

Figure 1.2: Research Model and Hypothesis



The hypotheses of this study are as follows:

H1 Computer attitudes (CA) (anxiety, confidence, usefulness and liking) have significant correlation with computer use (CU).

H2. Computer teaching efficacy (CTE) (personal computer teaching efficacy and general computer teaching efficacy) has significant correlation with computer use (CU).

H3 The relationship between computer attitudes, computer teaching efficacy and learning outcomes towards computer use (CU) are moderated by school environment (SE).

H4. The variances in the ways of computer use (planning, instructional, assessment and communication) are significantly explained by CA (anxiety, confidence, usefulness and liking) and CTE (personal and general computer teaching efficacy).

METHODOLOGY

This study required the development and adoption of questionnaire designs that would facilitate the collection of data concerning use of computer among fresh graduates from teacher training colleges. Data regarding teachers' computer attitudes, computer teaching efficacy, computer use and school environment were collected based on the self-administered method via questionnaire.

The population of this study consisted of fresh graduate teachers from teacher training colleges namely, Gaya Teacher Training College, Keningau Teacher Training College, Kent Teacher Training College, Sandakan Teacher Training College and Tawau Teacher Training College in Sabah. The researcher sent 529 questionnaires. A total of 236 reminder letters were sent out and and 219 questionnaires were returned. The response rate of the final number of usable questionnaires, excluding the cases of outlier, samples who did not have computer at home and mistakes in filling, was 36.29 percent (192/529=36.29%) or total of 192 samples.

The statistical methods used for data analysis in this study were Descriptive Statistic and Inferential Statistic. The descriptive analysis was used in this study to analyze the levels of computer attitudes, computer teaching efficacy and computer use among fresh graduates from teacher training colleges. The inferential statistic was a basic tool of statistical tests for the hypotheses. The measurements for this study were namely regression analyses (Hierarchical and Stepwise Multiple Regression Analysis) via SPSS Version 11.5 for Windows.

Findings

The results indicated that there were more female respondents than male respondents. Out of the total 192 respondents, 62.5% were female and the others were male (37.5%). In relation to the age of the respondents, the analysis showed that majority (48.4%) of the teachers were around 26 to 30 years old and were followed by those within the rage of 21 to 25 (31.1%). Out of the 192 respondents, only 20.3 percent of the samples were above 31 and below 35 of age. Most of the respondents who have taken part in this study were Malays (71.9%) while the other races were the least.

In terms of their major subjects, Science subject was the most if compared to other subjects, Mathematics and English. From the result, it had been shown that 41.7 percent majored in Science, while English and Mathematics had 33.3 percent and 25 percent respectively.

From the samples, over 42.2% of the respondents were teaching in primary school and 57.8% were teaching in secondary schools. From the 42.2% of primary school teachers, 24% were teaching Year 1 until 3 and the rest were teaching Year 4 until 6. Besides, the data also indicated that most of the respondents were teaching Form 1 until Form 3. The data showed that 32.3% and 25.5% were lower primary and upper school teachers respectively. From the above data, it has been shown that the samples were normally distributed from lower primary until upper secondary schools.

As shown in the Table 1.2, 43.2% of the respondents indicated to have moderate level of computer attitude. Generally, 38.5% of the respondents scored low level of computer teaching efficacy.

The result of the levels of computer use has shown that only 9.9% or 19 respondents out of 192 respondents had high level of computer use. Overall, the fresh graduates from teacher training colleges have achieved the moderate level in computer attitudes, computer teaching efficacy and computer use as indicated by the mean.

Table 1.2: Distribution of Computer Attitudes, Computer Teaching Efficacy, Learning Outcomes and Computer Use Levels

Predictor	Level (range of score)	Frequency	Percen-tage	Mean	Standard Deviation
Computer Attitudes	Low (40-80) Moderate (81-120) High (121 – 160)	32 83 77	17.2 43.2 39.2	106.84	24.87
Computer Teaching Efficacy	Low (20-40) Moderate (41-60) High (61 – 80)	74 33 85	38.5 17.2 44.3	50.91	15.66
Computer Use	Low (12-31) Moderate (32-52) High (53 – 72)	71 102 19	37.0 53.1 9.9	37.68	10.37

Besides knowing the levels of computer attitudes, computer teaching efficacy, learning outcomes and computer use, the researcher also analyzed the percentage of the frequency of computer use among teachers based on the ways of computer use (planning, instructional, assessment and communication). From Table 1.3, 32.1% of the respondents used computer for planning purposes, followed by instructional

(23.7%), and communication (22.45%). Computer use for assessment purposes was the lowest with only 21.66%.

Table 1.3: Distribution of Ways of Computer Use

Ways of Computer Use	Percentage
1) Planning	32.1%
2) Instructional	23.7%
3) Assessment	21.66%
4) Communication	22.45%

Hypothesis 1

Computer attitudes (CA) (anxiety, confidence, usefulness and liking) have significant correlation with computer use (CU).

Table 1.4 (a): Results of Regression Analysis between Computer Anxiety, Computer Confidence, Computer Liking, Computer Usefulness and Computer Use

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t
	B	Std. Error	Beta	
Computer Anxiety	-.024	.082	-.023	-.290
Computer Confidence	.365	.079	.361	4.643**
Computer Liking	.077	.076	.066	1.016
Computer Usefulness	.411	.097	.328	4.222**
R – square	.369			
Unadjusted R – square	.355			
F – value	27.310			
Sig - F	.000			
Durbin – Watson	1.584			

*p< 0.05 ; **p<0.01

As shown in Table 1.4, when the four independent variables were entered into the regression equation, the coefficient of determination (R-square) was found to be 0.369 which indicated that 36.9% of the variance in the computer use can be explained by the computer attitudes variable (anxiety, confidence, liking and usefulness). The regression output presented in Table 1.4 indicated that two out of

four predictors were found to have an impact and relationships on computer use. Of the computer attitudes variables, only computer confidence (b=0.365, p<0.01) and computer usefulness (b=0.411, p<0.01) were found to have significant and positive relationships with computer use. Conversely, computer anxiety and computer liking did not have relationship with the computer use. Thus, the Hypothesis was partially accepted.

Hypothesis 2

Computer teaching efficacy (CTE) (personal teaching efficacy and general teaching efficacy) has significant correlation with computer use (CU).

The regression was carried out to determine the relationship between computer teaching efficacy (personal computer teaching efficacy and general computer teaching efficacy) and computer use. As for the personal computer teaching efficacy variable, both personal computer teaching efficacy (b=0.252, p<0.01) and general computer teaching efficacy (b=0.397, P<0.01) had significant and positive relationship with computer use (refer to Table 4.12(b)). Thus, Hypothesis was accepted.

Table 1.5: Results of Regression Analysis between Personal Computer Teaching Efficacy, General Computer Teaching Efficacy, Learning Outcomes and Computer Use

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t
	B	Std. Error	Beta	
General Computer Teaching Efficacy	.252	.077	.273	3.251**
Personal Computer Teaching Efficacy	.397	.094	.356	4.238**
R – square	.340			
Adjusted R – square	.333			
F – value	48.686			
Sig – F	.000			
Durbin – Watson	1.544			

*p< 0.05 ; **p<0.01

Hypothesis 3

The relationship between computer attitudes, computer teaching efficacy and learning outcomes towards computer use (CU) is moderated by school environment (SE).

H3 (a) The relationship between computer attitudes (anxiety, confidence, liking, usefulness) and computer use (CU) is moderated by school environment (SE).

Table 1.6 depicted the results of the regression analysis for school environment as the moderator in the relation between computer attitudes and computer use.

Table 1.6: Moderating Impact of School Environment on the Relationship between Computer Attitudes and Computer Use

Independent Variable	**Beta (Step 1)**	**Beta (Step 2)**	**Beta (Step 3)**
Main Variables			
Computer Anxiety	-0.024	-0.016	-0.981
Computer Confidence	0.365**	0.343**	-1.081
Computer Liking	0.077	0.068	-1.182
Computer Usefulness	0.411**	0.419**	2.645**
Moderating Variable			
School Environment		0.052	-0.792
Interaction Terms			
Computer Anxiety*moderator			0.265
Computer Confidence*moderator			0.461*
Computer Liking*moderator			0.409*
Computer Usefulness*moderator			0.710*
R square	0.369**	0.370	0.428**
R square change	-	0.001	0.059
Sig. F change	0.000	0.603	0.000
Durbin Watson	1.665		

*p< 0.05 ; **p<0.01

It was discovered that when the interaction terms were added to the regression analysis in the last step, the R- square was 0.428. The change was about 5.9% compared to the model that was without inclusion of the moderator variable (school environment). Based on the change of the R-square and F-ratio and its statistical significance, the researcher confirmed that there was a moderating effect by the school environment. In other words, school environment had moderated the relationship between independent predictors and dependent variable as a whole. Thus, this provided full support for the moderating effects hypothesis listed in Hypothesis 3.

In this analysis, while testing the moderating effect, the researcher only interpreted the significant effect in the interaction section (step 3) and did not interpret the beta values in the third step as there is bound to be problems of multicollinearity. Once step 3 shows a significant R square increase, then it can be

concluded that there is moderation effect. Through the Collinearity Statistics, it has been shown that in the interaction section (step 3), the Tolerance was less than .20 and VIF was ≥5, therefore it indicated multicollinearity.

To show the moderating effect of school environment on the computer attitudes and computer use relationship more clearly, graphs have been drawn. The variables were re-categorized into two levels, high and low before the graph was drawn as both variables were continuous. The 2 levels were based on the median where any value lower than the median was categorized as low level and values above the median were assigned as high level. The results of the significant interactions have been presented in Figure 1.3.

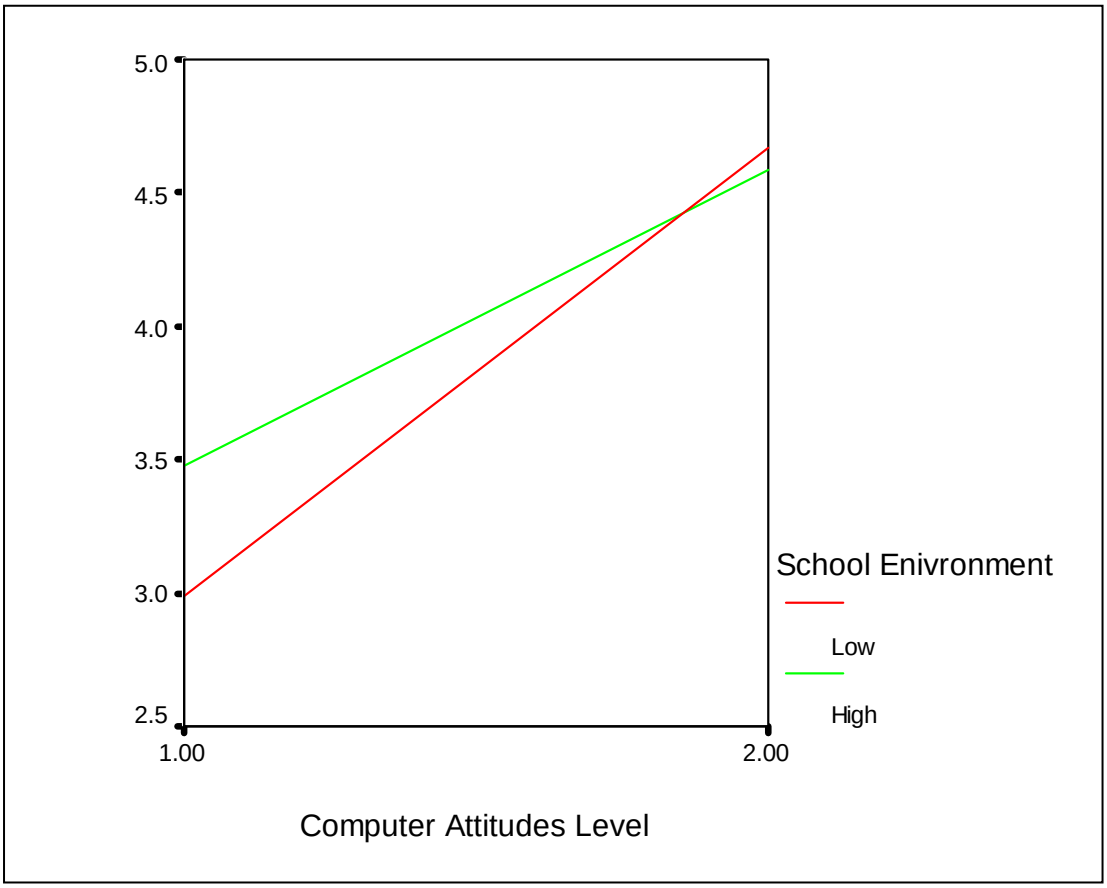


Figure 1.3: The Moderating Effect of School Environment on the Computer Attitudes and Computer Use

As can be seen in Figure 1.3, the relationship between computer attitude and computer use was moderated by school environment and the change in the level of computer use was positive and constant. On examining the specific interaction, the graph has shown the intersection and it explained that school environment variable did not have high moderating impacts for those who are having high level of computer attitude. In this study, Hypothesis 5(a) was accepted.

H3 (b) The relationship between computer teaching efficacy (personal computer teaching efficacy and general computer teaching efficacy) and computer use (CU) is moderated by school environment (SE).

From Table 1.7, when the interaction terms were added to the regression analysis in step 3, the R-square was changed about 9.7% and F-change statistics was significant which indicated that there was a possible moderating impact. These results provided support for the H6 of the study.

To see the impact of moderation, the researcher has plotted a graph as shown in Figure 1.4. The variables were re-categorized into two levels, high and low using a median split before the graph was drawn. The graph shows a positive relationship between computer teaching efficacy and computer use together with the moderator variable.

Table 1.7: Moderating Impact of School Environment on the Relationship between Computer Teaching Efficacy and Computer Use

Independent Variable	**Beta (Step 1)**	**Beta (Step 2)**	**Beta (Step 3)**
Main Variables			
Personal Computer Teaching Efficacy	0.252**	0.252**	-1.011*
General Computer Teaching Efficacy	0.397** □	0.394**	-1.17*
Moderating Variable School Environment		0.010	-1.700**
Interaction Terms Personal Computer Teaching Efficacy*moderator			0.384**
General Computer Teaching Efficacy*moderator			0.470**
R square	0.340**	0.340	0.437**
R square change	-	0.000	0.097
Sig. F change	0.000	0.917	0.000
Durbin Watson	1.480		

*p< 0.05 ; **p<0.01

The graph shows that school environment has low impacts to the relationship when the levels of computer teaching efficacy were low. It gradually increased when levels of computer teaching efficacy became higher. This meant that, although school environment provides the best support to teachers, the use of computer will remain at the low level if teachers' computer teaching efficacy was low. In this study, Hypothesis was accepted.

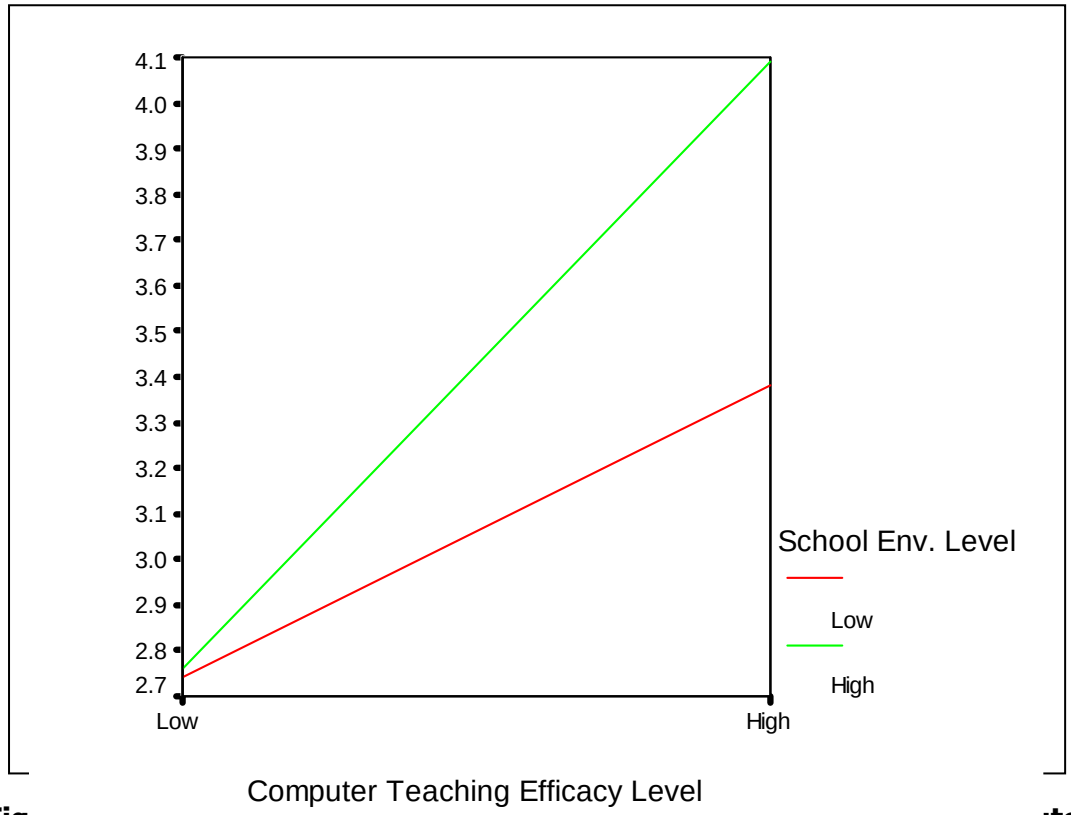


Fig... iter Teaching Efficacy and Computer Use

i) Hypothesis 4

The variances in the ways of computer use (planning, instructional, assessment and communication) are significantly explained by the computer attitudes and computer teaching efficacy.

The independent variables were computer anxiety, computer confidence, computer liking, computer usefulness, personal computer teaching efficacy and general computer teaching efficacy. The dependent variable was the frequency of computer use for planning, instructional, assessment and communication.

From Table 1.8, multiple regression analysis has revealed a significant linear relationship between frequency of computer use for planning and the six stated independent variables ($F = 11.604$, $p<0.01$). Specifically, out of the six stated independent variables, only one variable only has significance in beta coefficient ($b = 0.323$, $p<0.01$). Results from the analysis demonstrated that the R-square was 0.306 and this meant that all the predictors in the regression model have an estimated 30.6 percent of the variation in the frequency of computer use for planning.

For the frequency of computer use for instructional, computer usefulness also has demonstrated statistical significance at 0.01 level of significant. Thus, computer usefulness variable was perceived to be the best predictor and the Beta weight was 0.392. Overall, the six independent variables have 36.1% of the variance in the frequency of computer use for instructional purposes (R – square = 0.361).

Based on the Beta value and significant t values for frequency of computer use for assessment in Table 1.8, it can be determined that four variables were perceived to be the best predictors. Computer liking, computer usefulness, computer anxiety and general computer teaching efficacy were the variables that significantly contributed to the variance for frequency of computer use for assessment. The R – square (0.229) was significant and implied that 22.9% of variance in frequency of computer use of assessment could be explained by the seven predictors although some of the independent variables were not significant at 0.05 levels of significance.

In frequency of computer for communication, only one independent variable was statistically significant. Computer usefulness has beta coefficient value of 0.417 and was significant at 0.01. Other independent variables have shown not significance but overall, all the independent variables contributed 26.7% of the variance in computer use for communication in this study.

The hypothesis which stated that the variances in the ways of CU (planning, instructional, assessment and communication) have been significantly explained by Computer Attitudes and Computer Teaching Efficacy were partially accepted.

Table 4.20: Multiple Regression Analysis: Predictors of Frequency of the Ways of Computer Use

Variable	Planning			Instructional			Assessment			Communication		
	Beta	**T**	**sig**	**Beta**	**T**	**sig**	**Beta**	**t**	**sig**	**Beta**	**t**	**sig**
Anxiety	.041	.437	.662	-.034	-.264	.792	-.364	-2.727	**.007**	-.052	-.453	.651
Confidence	.154	1.028	.306	.177	.860	.391	-.233	-1.081	.281	-.203	-1.088	.278
Liking	-.018	-.206	.837	.026	.217	.828	.334	2.656	**.009**	-.123	-1.130	.260
Usefulness	.323	3.034	**.003**	.392	2.686	**.008**	.423	2.766	**.006**	.417	3.148	**.002**
Personal Computer Teaching Efficacy	.214	1.692	.092	.319	1.840	.067	.201	1.103	.271	.311	1.974	.051
General Computer Teaching Efficacy	.056	.439	.661	.265	1.530	.128	.427	2.350	**.020**	.300	1.908	.058
Unadjusted R Square	0.306			0.361			0.229			0.267		
F value	11.604			14.877			7.812			9.580		
Sig F	0.00			0.00			0.00			0.00		

The Best Predictors for Computer Use for Assessment

As depicted in Table 1.8, the best predictor for computer use for planning, instructional and communication was computer usefulness variable. In the case of computer use for assessment purposes, the results indicated that there were four predictors (Computer liking, computer usefulness, computer anxiety and general computer teaching efficacy) which were statistically significant to the computer use for assessment. In order to examine how far the variance in the dependent variable was significantly explained by the significant predictors and goodness of fit of the model from the significant predictors by examining its F-ratio, the researcher had used stepwise linear regression to establish a significant linear relationship between a set of explanatory (Computer liking, computer usefulness, computer anxiety and general computer teaching efficacy) variables and computer use for assessment purposes. Through this, the problems of multicollinearity can be reduced.
The stepwise method started with a selection of the best predictor of the dependent variable and then additional variables were selected in terms of the incremental explanatory power they add to the model, while maintaining the overall statistical significance of the model (Hair *et al.*, 1998).

From the stepwise analysis, the mixture of the significant predictors would explain the greatest possible variance in the dependent variable with the least error and the results can also be used to determine the order of importance of the significant predictors in contributing towards the dependent variable.

Table 4.21 presents the results of stepwise regression analyses for the best predictor that predicts the frequency of computer use for assessment.

Table 4.21: Stepwise Multiple Regression Analysis of Computer Use for Assessment

Variable (Model)	F - Value	Sig. F	R-Square	R-square Change
General Computer Teaching	22.372	0.000**	0.105	0.105
Computer Usefulness	15.889	0.000**	0.144	0.039
Computer Anxiety	15.045	0.000**	0.194	0.050
Computer Liking	13.159	0.000**	0.220	0.026

**p<0.01

Results from the analyses demonstrated that the best predictor for computer use for assessment purposes was general computer teaching efficacy variable (F = 22.372, p< 0.01), followed by computer usefulness (F = 15.889, p<0.01), computer anxiety (F = 15.045, p<0.01) and lastly computer liking (F = 13.159, p<0.01). General computer teaching efficacy predictor explained 10.5% (R-square = 0.105) of the variance in computer use for assessment purposes, computer usefulness explained 3.9% of the variance (R-square = 0.144), computer anxiety significantly explained 5.0% (R-square = 0.194) and lastly computer liking predictor explained 2.6% of the variance in computer use for assessment purposes (R-square = 0.220). It was also concluded that general

computer teaching efficacy was the best predictor for computer use for assessment purposes compared to the 3 other predictors.

IMPLICATIONS AND RECOMMENDATIONS

From the results, it has been corroborated that computer attitudes have positively influenced the use of computer among teachers. Therefore, it goes to show that computer attitude has an important role to play in influencing teachers' use of computers. Henceforth, in this regard, the Ministry of Education and the related government departments should do more in terms of introducing computer in the teaching profession, especially while they are in the teacher educational program. The integration of computer into the curricular activities should be introduced on the first day of training program.

Besides that, teachers need to be encouraged to own personal computer so that they can access it at home regularly. The government should give more financial support for teachers to own their own personal computer.

Results from the multiple regression analysis demonstrated that computer usefulness is the best predictor for ways of computer use for planning, instructional and communication. Thus, teacher educational programs should enhance students' knowledge and belief on the usefulness of the computer in teaching and learning. Teacher educational programs should ensure that these knowledge and belief are emphasized when designing educational technology courses as well as when modifying the content of the courses.

In general, efforts should be made to encourage more positive computer attitudes among teachers, since many findings from the previous researches and the results have indicated that computer attitudes have significant impact on teachers' acceptance of technology. Schools should provide the training, funding and support required for this process. By strengthening staff training in technologies, schools can help encourage more positive attitudes toward computers, especially to reduce teachers' anxiety towards computer in general. Thus, the school boards of management should ensure that in-service technology training program be a part of their yearly activities.

By meeting the needs related to technology integration and helping to instill more favorable computer attitudes will directly assist in the integration of computer into the teaching and learning activities.

Computer Teaching Efficacy

It was also conclusively reported that computer teaching efficacy is a good predictor for the computer use among fresh graduates from teacher training colleges in Sabah. As mentioned earlier, computer teaching efficacy consists of personal computer teaching efficacy and general computer teaching efficacy. Through the analysis, it was shown that general computer teaching efficacy and personal computer teaching efficacy were good predictors for computer use and this goes to show that role of computer teaching efficacy plays a significant role in computer use among teachers. Furthermore, general computer teaching efficacy was also shown as the best predictor for computer use for assessment purposes.

Due to the importance of computer teaching efficacy in simulating higher use of computer among teachers, the Ministry of Education or related government departments should pay extra attentions to increase the employees' belief and confidence in using computers in teaching and learning. This can be achieved by the schools through the increased in-service staff training and educational program which might foster a feeling of positive computer teaching efficacy. It has been reported that a Computer Assisted Instruction (CAI) and distance education as a technology component may provide teachers with experience and models of appropriate uses of instructional technology in classrooms. Even though these tools may not fully cover the issue of technology use, teachers could see the impacts of computer towards teaching and learning. This action is believed to be able to develop the confidence and belief in teaching and learning with computers, especially for the fresh graduates from teacher training colleges. Upon seeing the positive impact technology-enhanced activities that had positive impacts on their students learning outcomes, it would encourage teachers to reexamine and modify their beliefs regarding the use of technology in teaching and learning. In addition, by using buddy systems approach where computer novice teachers worked together with the expert teachers in implementing educational technologies into classroom projects, it provides an effective way to develop positive computer teaching efficacy among teachers. The positive computer teaching efficacy of teachers was further enhanced by student's improvements and achievements.

This finding is vitally important as from the present descriptive analyses, 38.5% of fresh graduates from teacher training colleges in Sabah are at the low level of computer teaching efficacy.

Full technology integration throughout the teacher educational program in all courses is a must. Pre-service teachers could see faculty as a model of the effective use of technology for teaching and learning in various academic areas.

Besides that, in order to increase an individual's self-efficacy, management should look into computer experience and access computer at home variables, which are the two factors that differentiate the level of computer teaching efficacy. From the results, it has been shown that the higher the computer experience and frequent accessibility to a computer at home, the greater the level of computer teaching efficacy. Those who prepare pre-service teacher educational program should be aware that the differences in the number of years students have experience with computers and accessibility to a computer in the home have an impact on their perceptions of computer teaching efficacy. Teacher educational programs should increase students' computer experience by providing them with many opportunities to take educational technology courses as well as opportunities to employ and to practice their education technology skills before graduating from teacher training colleges. When trainee teachers have higher computer experience, they will feel more confident in their ability to use computer in teaching and learning and their level of computer teaching efficacy will increase.

School Environment

It was also conclusively reported that school environment has moderating impacts on the relationship between computer attitudes and computer teaching efficacy. The significance of school environment in enhancing the relationships between computer attitudes and computer teaching could be due to the fact that teachers need

administrative and technical support to encourage them to use the computer. Teachers need strong and enthusiastic leadership from principal in order to achieve higher confidence and belief in the use of computers. Technical support is vital when teachers are having difficulties in operating the computer based technologies equipment. Having knowledgeable people and willingness to answer questions are critical in overcoming the obstacles to use computer. In the Malaysian schools, especially in the rural areas, lack of availability of computers and software, and incompatibility between the software and hardware are very common situations where most teachers may know how to 'operate' a computer but do not know or understand its benefits. Training for principals is vital in ensuring that they are conscious of the importance of computer in teaching and learning. Through training, they would be able to know how to encourage (giving coaching, feedbacks and leading) teachers to use computers.

Many teachers have voiced out that the number of computers in their classrooms was insufficient. Lack of equipment could be construed as a barrier for teachers in using technology, as well as to further integration of technology in creative and innovative ways.

School districts should look for different funding resources to make computer technologies available for each teacher and in each classroom. Principal or headmasters should give motivation and support to their staff and encourage them to use computer although at the initial level it could be very difficult.

In short, computer attitudes and computer teaching efficacy were found to be significant predictors to the computer use among teachers. In this study, the important implication for theoretical development is related to the area of computer attitudes and computer teaching efficacy. It is also evident that the presence of school environment positively affects the use of computer in school.

Conclusions

This study has concluded that computer attitudes and computer teaching efficacy have statistically significant relationship to the computer use among teachers. In this study, the researcher also discovered that school environment has mediating impacts on the relationship between computer attitudes and computer teaching efficacy towards computer use. Based on the hierarchical multiple regression analysis, it has been demonstrated that computer usefulness variable is the best predictor for computer use for planning, instructional and communication. General computer teaching efficacy is the best predictor for computer use for assessment purposes.

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