

Relationship Between Computer-Mediated Communication Competence and Attitude Toward Using Frog VLE Among Secondary School Teachers

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ABSTRACT

This study aims at examining the relationship between teacher computer-mediated communication (CMC) competence and teacher attitude toward using Frog VLE, a virtual learning platform. This is a non-experimental research using a cross-sectional survey technique through the administration of a set of questionnaires that comprised teacher demographic variables, teacher CMC competence, and teacher attitude toward using Frog VLE. The participants in this study are 351 secondary school teachers from Klang District, Selangor. The results indicated that teachers showed a medium level of attitude and a medium level of CMC competence toward using Frog VLE. Results showed that there is statistically significant direct causal relationship between teacher CMC competence and teacher attitude toward using Frog VLE. CMC motivation and CMC knowledge are the two direct factors of teachers' affective and behavioural attitude toward using Frog VLE, and CMC motivation predict teachers' cognitive attitudes toward using Frog VLE.

KEYWORDS

Attitude, Frog VLE, Secondary School, Teacher CMC Competence, Virtual Learning Platform

INTRODUCTION

The Interim Strategic Plan 2011-2020 have highlighted the importance of leveraging of ICT to upgrade the quality of learning of Malaysia learners (Ministry of Education, 2012b). In accordance with the proliferation of technology and Malaysia government's vision of providing quality internet-enabled education for all, Ministry of Education Malaysia (MOE) had initiated a project known as 1BestariNet and it is one of the many initiatives identified under the first wave of the Malaysian Education Blueprint (2013-2015).

Under the project, schools will be equipped with an integrated solution allowing teaching, learning, collaboration and administrative functions to take place through the Internet-based Virtual Learning Environment better known as Frog VLE and a high-speed connectivity to all its 10,000 schools (New Straits Times, 2014). According to Mohamad Mohsin, Hassan, & Ariff (2014), the introduction of Frog VLE helps 21st century learners to learn best in this new era, to become successful in their education and life as well as improve the quality of schools in Malaysia as a whole. 1BestariNet project not simply serve as a noteworthy impetus for internet proliferation in Malaysia, it might increase national

DOI: 10.4018/IJWLTT.20220501.oa2

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income of the country (Hiong & Umbit, 2015). Implementation of 1BestariNet is estimated to keep running over for 13 years and is hoped to transform Malaysian education by seeing more technology usage in the classroom (Cheok & Wong, 2014).

The growing interest in using the internet for education and the introduction of Frog VLE into schools have presented teachers with new opportunities for computer-mediated communication (CMC). Wu, Gao, & Zhang (2014) states that CMC not only facilitate both individual-to-group and individual-to-individual communication through networks, but it also creates new opportunities for teachers to interact personally, socially and professionally with other fellow teachers as well. However, Bakic-Tomic, Dvorski, & Kirinic (2015) indicates that teachers are not aware of their lack of communication knowledge and adequate communication skills. Additionally, the authors conclude that communication competences of teachers are equally necessary as pedagogical skills. Thus, it is critical to investigate teachers' computer-mediated communication competencies in this era of technology advancement where education emphasized more on blended learning with the increasing proliferation and prioritization of virtual learning environment.

In addition, educational technology has altered many aspects of teacher instructional practices and expanded education for us (Mohamad Mohsin et al., 2014). It has been argued that the key factor in ensuring successful implementation of ICT programmes in school is to upgrade the level of knowledge and skills among teachers (Kandasamy & Shah 2013; Samuel & Zaitun, 2007). Undeniable, knowledge and skills in using technology tools are becoming increasingly important in our educational system in this era of globalisation (Adeyemi & Olaleye, 2010). However, without teachers' genuine efforts, it does not seem possible to effectively integrate technology in school (Celep & Tülüba°, 2014). Additionally, individuals' decision to adopt a new ICT tools is closely related to their skills and knowledge or competencies in order to form attitudes toward it and followed by its adoption or rejection (Rogers, 2003). Hence, it is important to investigate the level of teachers' CMC competencies to understand better the potential role of CMC competence in the development of positive attitude toward using the technology. This study aimed to examine the relationship between teachers' CMC competencies and teachers' attitudes toward using Frog VLE in Klang district secondary school.

LITERATURE REVIEW

As noted by Kandasamy & Shah (2013), knowledge in ICT is a must among teachers and is an essential element in imparting knowledge to pupils. However, the authors state that many teachers do not acquire the necessary level of ICT related knowledge. This is further supported by Mahmud & Ismail (2010), in which their study indicates that only a minority group of teachers were knowledgeable in basic ICT and there were even a group of teachers who demonstrate having very minimal knowledge of ICT. The majority of them only had average knowledge in ICT. This scenario clearly shows that the key factor in ensuring successful implementation of ICT programmes in school is to upgrade the level of ICT knowledge and skills among teachers (Kandasamy & Shah, 2013). Besides, another key factor in ensuring successful implementation of ICT programmes in school is teachers' positive attitude toward ICT (Liaw, 2002; Williams, 2015). According to Sa'ari, Luan, & Roslan (2005), being competent and having the right attitude in using computers are favourable assets for professional teachers in motivating their preparedness toward using educational technology innovations.

Further supported by Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur (2012) which states that teachers' attitudes, beliefs and their current level of knowledge and skills (CMC competence dimensions) toward ICT are the strongest barrier preventing them from using ICT. Besides, scholars have the same opinion that teacher negative attitude and poor ICT skills and knowledge are the main barriers that influence the usage of instructional ICT tools in schools (Bingimals, 2009; Samuel & Zaitun, 2007). Furthermore, literature search found that there are limited current empirical studies that study explicitly the direct relationship between teachers' CMC competencies and teachers' attitudes

toward using the ICT. Hence, this study aimed to examine the relationship between teachers' CMC competencies and teachers' attitudes toward using the Frog VLE.

Numerous studies show that there is a link between teachers' ICT-related skills, knowledge, motivation and teachers' attitudes toward using the ICT (Berner, 2003; Demetriadis et al., 2003; Gilakjani & Leong, 2012; Jegede et al., 2007; Koszalka, 2001; Lord & Brown, 2001; Rogers, 2003; Sa'ari et al., 2005). According to Koszalka (2001), teachers who actively involved in discussion group using computer-mediated communication may be an effective mechanism for promoting positive attitudes toward the use of web resources in the classroom thereby increasing the integration of such resources into teaching and learning environments.

Besides, Gilakjani & Leong (2012) indicates that attitudes are influenced by different variables including knowledge about computers and computer competencies. They found that teachers' computer competencies significantly correlate with teachers' attitudes toward using computers. Similarly, Berner (2003) collected quantitative survey data from five university/colleges in Virginia indicates that computer competency is the strongest predictor of teachers' computer use and it is a significant predictor of teachers' attitudes toward using computers.

Further supported by Tezci (2010), the study conducted on 1540 primary school teachers found that their attitudes vary with their ICT-related skills and their levels of knowledge. It shows that both teachers' ICT-related skills and levels of knowledge do influence teachers' attitudes toward using the ICT to a certain extent. "Teachers' attitudes to adapt ICT mode of use is supported by research evidence that emphasizes the situational character of knowledge and expertise" (Demetriadis et al., 2003, p.19). Additionally, according to Tezci (2010), the presence of ICT in the classroom creates a pressure and requires the effective use of ICT and it could also relate to teachers' attitudes and teachers' ICT-related knowledge. However, according to Sa'ari et al. (2005), even if teachers were equipped with knowledge and skills in using computers, the success of implementing the new curriculum with ICT in education depends greatly upon the attitudes of the teachers. Therefore, teachers should possess not only ICT knowledge and skills, but they must also have the right attitudes toward using the ICT.

On the other hand, Jegede (2007) conducted a study to identify the relationship between ICT competencies and attitudes of teachers. Through the administration of two research instruments to a total of 467 teachers randomly selected from 10 institutions (5 universities and 5 colleges of education), multiple regressions revealed that attitudes significantly correlated with ICT competencies and it is also a significant predictor of teachers' ICT competencies. According to Spitzberg (2003), social transactions and communication are interchangeable ideas. Therefore, the transactions that contribute to the development of positive attitude include communication should be related to the CMC competencies of the teachers. Teachers' perceptions of both the CMC competencies and their attitudes toward using Frog VLE must be measured in order to study the relationship between CMC competencies and their attitudes toward using Frog VLE. In addition, there are quite a number of researches indicate that positive attitude is anticipated that would encourage computer integration in any academic endeavour (Mumtaz, 2000; van Braak, Tondeur, & Valcke, 2004; Williams, 2015; Woodrow, 1992) and negative attitude make accomplishment of competency less feasible (Yildirim, 2000). Hence, in this study, the researcher argued that it is important to study teachers' perceptions of the CMC competence to understand better the potential role of CMC competence in the development of positive attitude toward using the technology.

RESEARCH OBJECTIVES

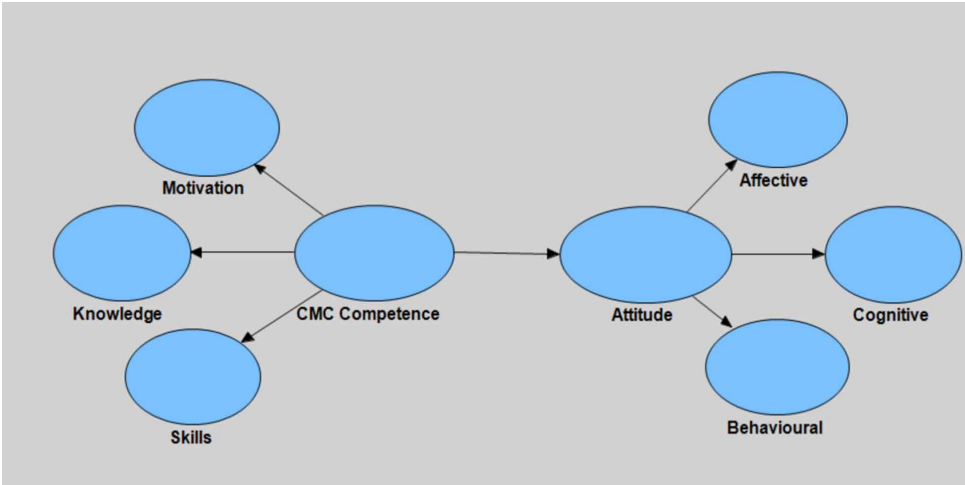
This study aims to investigate the relationship between teachers' computer-mediated communication competencies and teachers' attitudes toward using Frog VLE in Klang district secondary schools. The objectives of this study are as follows:

- a) To identify the level of teachers' computer-mediated communication competencies toward using the Frog VLE in Klang district secondary schools.
- b) To identify the level of teachers' attitudes toward using the Frog VLE in Klang district secondary schools.
- c) To identify the causal relationship between teachers' computer-mediated communication competencies and teachers' attitudes toward using the Frog VLE in Klang district secondary schools.
- d) To examine the causal relationship between teachers' CMC motivation, CMC knowledge and CMC skills on teachers' affective, cognitive and behavioural attitudes toward using the Frog VLE in Klang district secondary school.

CONCEPTUAL FRAMEWORK

Rogers Innovation Decision Process theory states “an innovation’s diffusion is a process that occurs over time through five stages, namely: knowledge, persuasion, decision, implementation and confirmation” (Rogers, 1995, p. 161). Rogers theory on innovation’s diffusion process concerning individuals shift from acquisition of knowledge about the technology to forming attitude toward it and followed by its adoption or rejection and then decide whether to confirm the generally accepted belief that attitudes impact behaviour directly or indirectly (Ajzen & Fishbein, 1980; Zimbardo, Ebbesen, & Maslach, 1977). Albirini (2006) recommends that research at the early phases of integration should concentrate on the initial two phases namely the knowledge or the competencies and the attitude toward the educational technologies. Frog VLE implemented since 2012 and considered at the beginning of the implementation stages. Thus, based on Rogers Innovation Decision Process theory and this pressing need, this study aimed to examine the relationship between teachers' CMC competencies and teachers' attitudes toward using Frog VLE. The conceptual framework of the study is as shown in Figure 1.

Figure 1. Conceptual framework of the study



This study aimed to examine the relationship between teachers' CMC competencies (independent variable) and teachers' attitudes (dependent variable) toward using Frog VLE in Klang district secondary school. Teachers' CMC competencies were based on Spitzberg (2006) theory of computer-mediated communication (CMC) competence which will be measured based on the three dimensions of CMC Competence measure, namely, motivation, knowledge and skills. On the other hand, teachers' attitudes toward using Frog VLE will be measured according to teachers self-rated based on the three components of teachers' attitudes items, namely, affective, cognitive and behavioural according to the tripartite model of attitude.

METHOD

Research Design

This study aimed at examining the relationship between teachers' computer-mediated communication competencies (CMC) and teachers' attitudes toward using Frog VLE in Klang district secondary schools. The dependent variable of this study is teachers' attitudes toward using Frog VLE based on the three components of teachers' attitudes items, namely, affective, cognitive and behavioural according to the tripartite model of attitude. The independent variable of this study is teachers' CMC competencies which will be measured according to teachers' self-rated based on the three dimensions of CMC Competence measure. These dimensions are motivation, knowledge and skills. This is a non-experimental research using a cross-sectional survey technique.

Participants

The target population of this study consisted of a total of 34 daily public secondary schools in Klang districts, Selangor. Participants were randomly selected and consist of 351 public secondary school teachers in the age range of 31-40 years old (39.3%; n=138); 41-50 years old (27.6%, n=97); below 31 years old (20.2%, n=71), and 51 years old and above (12.8%, n=45). Among them, 291 are females (82.9%) and 60 are males (17.1%). The majority of the respondents have more than ten years of experiences with computer (74.4%; n=261). However, there are 72 teachers out of 351 respondents (20.5%) have five to ten years of experiences in using computer and only 5.1% (n=18) of the respondents have less than five years of experiences in using computer.

Instrumentation

The instrument of the study consists of three sections. Section A is teachers' demographic characteristics (age, gender and computer experiences). Section B is teachers' attitudes toward using Frog VLE adapted from Albirini's (2006) 'Teachers' attitudes toward ICT in education' questionnaire. Teachers' attitudes toward using Frog VLE will be measured based on the three components of teachers' attitudes items, namely, affective, cognitive and behavioural. Teachers' CMC competencies toward using Frog VLE (Section C) will be measured based on CMC Competence measure (version 5) that adapted from Professor Brian H. Spitzberg. There are three different dimensions of CMC competence measure, namely, motivation, knowledge and skills. All items for Section B and Section C were rated on the numerical rating scale, ranging from '0' which is anchored with the words 'not agree at all' to '10' which is anchored with the words 'highest agreement'.

The instrument developed was pilot tested by 34 teachers from one secondary school in Petaling Jaya, Selangor. Analysis from SPSS shows that the Cronbach Alpha for teachers' attitudes toward using Frog VLE dimensions were in the range of .760 to .883 and teachers' CMC competencies dimensions were in the range of .793 to .884. Hence, it shows that the instrument developed for this study showed a very good level of internal consistency reliability.

Table 1. Value of the multivariate critical ratio for each variable

Variable	Univariate Normality		Multivariate c.r.
	Skewness	Kurtosis	
Attitude	-.220	.116	64.625
Affective	-.012	.324	17.236
Cognitive	-.390	.602	38.271
Behavioural	-.010	-.252	12.893
CMC Competence	-.071	-.306	67.508
Motivation	-.127	-.272	36.384
Knowledge	.000	-.297	34.620
Skills	-.129	-.567	27.691

Analysis of Data

Statistical Package for Social Sciences (SPSS) version 21.0 and Smart PLS 2 were used to analyze the numerical data collected from the respondents in this study quantitatively. The first two research questions to be answered by descriptive statistics in term of mean and standard deviation. Research question three and four are to be answered by structural equation modeling (SEM) procedures with SMART PLS 2 to assess the causal relationship between teachers' CMC motivation, CMC knowledge and CMC skills on teachers' affective, cognitive and behavioural attitudes toward using the Frog VLE. SEM analysis was performed to run normality test and to test the validity and reliability of the model. Firstly, the convergent validity and discriminant validity for all variables in the model were examined and followed by examining the composite reliability and Cronbach's alpha internal consistency reliability of the variables.

PRELIMINARY ANALYSIS OF DATA: NORMALITY TEST FOR THE DATA DISTRIBUTION

Multivariate normality test output for teachers' attitudes and teachers' CMC competencies toward using Frog VLE are presented in Table 1.

Table 1 indicates that the data for the variables teachers' attitudes toward using Frog VLE and teachers' CMC competencies are normally distributed for univariate normality (skewness and kurtosis values) which is in the range of -1.96 to +1.96 (Chua, 2013). However, the data are not normally distributed for multivariate normality (does not achieve the benchmark for multivariate normality where the value of the multivariate critical ratio need to be less than 8.00) (Chua & Chua, 2017c). Hence, the data can be presented descriptively using the mean score (univariate normality achieved) but non-parametric tests are used to analyze the data.

Preliminary Analysis of Data: Validity and Reliability of the Variables

Validity and reliability of the variables (constructs) in the model should be established prior to further data analysis (Chua & Chua, 2017a). In terms of validity, convergent validity of the items is achieved when the loadings of the items for each variable are greater than .50 and the average variance extracted (AVE) for the variable are greater than .50 (Hair, Hult, Ringle, & Sarstedt, 2016). In terms of reliability, when the values of composite reliability and Cronbach's alpha are greater than .70, the reliability of the items is achieved. Table 2 shows the output of the validity and reliability analysis for the variable teachers' attitudes and teachers' CMC competencies toward using Frog VLE. The

Table 2. Validity and reliability of the variables

Latent variables	Items	Convergent validity		Reliability	
		Loading	AVE	Composite Reliability	Cronbach's Alpha Reliability
Attitude Affective	B1	0.561***	.663	.852	.736
	B2	0.833***			
	B3	0.826***			
Cognitive	B4	0.764***	.681	.919	.881
	B5	0.871***			
	B6	0.839***			
	B7	0.868***			
Behavioural	B8	0.834***	.643	.878	.814
	B9	0.863***			
	B10	0.675***			
	B11	0.832***			
CMC Competence Motivation	C1	0.882***	.726	.914	.873
	C2	0.866***			
	C3	0.857***			
	C4	0.786***			
	C5	0.266***			
Knowledge	C6	0.901***	.850	.945	.912
	C7	0.889***			
	C8	0.930***			
	C9	0.883***			
Skills	C10	0.735***	.675	.893	.839
	C11	0.812***			
	C12	0.889***			
	C13	0.886***			

*** significant at $p < 0.01$.

results indicate that the two variables achieve their convergent validity (both loadings of the items and AVE are greater than .50) and reliability (both composite reliability and Cronbach's alpha are greater than .70).

Table 3 and Table 4 illustrate the inter-correlations of teachers' attitudes toward using Frog VLE and inter-correlations of teachers' CMC competencies toward using Frog VLE respectively. Based on Table 3 and Table 4, the inter-correlation coefficients among variable teachers' attitudes and variable teachers' CMC competencies were less than .90 indicate that all the indicators in measuring teachers' attitudes and teachers' CMC competencies toward using Frog VLE do not have significant multicollinearity problem. Thus, the discriminant validity of all the items in measuring both teachers' attitudes and teachers' CMC competencies toward using Frog VLE is achieved.

Table 3. Inter-correlations of teachers' attitudes toward using Frog VLE

	Affective	Attitude	Behavioural	Cognitive	
Affective	1.0000				
Attitude	0.8910	1.0000			
Behavioural	0.6609	0.8370	1.0000		
Cognitive	0.7198	0.8922	0.5618	1.0000	

Table 4. Inter-correlations of teachers' CMC competencies toward using Frog VLE

	CMC Competencies	Knowledge	Motivation	Skills	
CMC Competence	1.0000				
Knowledge	0.8738	1.0000			
Motivation	0.8936	0.6608	1.0000		
Skills	0.8979	0.693	0.6996	1.0000	

RESULTS

The Level of Teachers' Attitudes toward Using the Frog VLE

Descriptive statistic in term of mean and standard deviation was used to analyze the data collected from 351 teachers in Klang district secondary schools. The analysis yield results as shown in Table 5.

Referring to Table 5, the overall mean for teachers' attitudes toward using Frog VLE is 5.57. This could interpret as medium level of teachers' attitudes toward using Frog VLE in Klang district secondary schools. The results of the analysis for each of the teachers' attitudes toward using Frog VLE dimensions indicate that all the three dimensions namely, affective ($M=5.88$, $S.D.=2.04$); cognitive ($M=5.72$, $S.D.=2.04$); and behavioural ($M=5.12$, $S.D.=2.16$) show medium level of mean.

Table 5. Mean, standard deviation and the level of teachers' attitudes toward using Frog VLE (N=351)

Dimension	Mean	Standard Deviation	Level
1) Affective	5.88	2.04	Medium
2) Cognitive	5.72	2.04	Medium
3) Behavioural	5.12	2.16	Medium
Overall	5.57	1.80	Medium

The Level of Teachers' CMC Competencies Toward Using the Frog VLE

The descriptive analysis yield results are presented in Table 6.

Referring to Table 6, the overall mean of teachers' CMC competencies is 4.21. This could be interpreted the respondents rated themselves as demonstrating medium level of CMC competence toward using Frog VLE. The results indicate that teachers in Klang district, Selangor secondary schools show medium level of CMC competence toward using Frog VLE. All three dimensions for

Table 6. Mean, standard deviation and the level of teachers' CMC competencies toward using Frog VLE (N=351)

Dimension	Mean	Standard Deviation	Level
1) Motivation	4.45	2.03	Medium
2) Knowledge	4.08	2.15	Medium
3) Skills	4.10	2.00	Medium
Overall	4.21	1.82	Medium

teachers' CMC competencies (motivation, knowledge, and skills) have mean that are interpreted as medium level. The highest mean among the three dimensions of CMC competencies was motivation (M=4.45, S.D.=2.03), followed by skills (M=4.10, S.D.=2.00), and lastly knowledge (M=4.08, S.D.=2.15) dimension.

Causal Relationship between Teachers' CMC Competencies and Teachers' Attitudes Toward Using the Frog VLE

The PLS-SEM analysis using SMART PLS was performed to establish the relationship between teachers' CMC competencies and teachers' attitudes toward using the Frog VLE. T-statistics, standardized regression weight, (β) and R^2 of path coefficients of teachers' CMC competencies on teachers' attitudes toward using Frog VLE, as shown in Table 7.

Table 7. T-statistics, standardized regression weight (β) and R^2 of path coefficients of teachers' CMC competencies on teachers' attitudes toward using Frog VLE

Independent variable	Regression		T-statistics (Bootstrapping value)	Standardized regression weight (β)	R^2
		Dependent variable			
CMC Competencies		Attitudes	13.8228***	.7312	.535

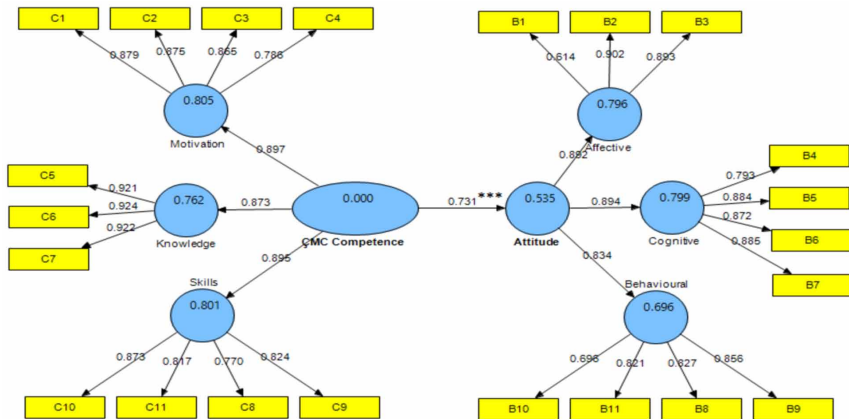
Note: CMC= Computer-mediated communication; *Significant at $p < .05$; **Significant at $p < .01$; ***Significant at $p < .001$

The output showed in Table 7 indicates that teachers' CMC competencies having a significant total effect on teachers' attitudes toward using Frog VLE with t-statistics greater than 1.96 ($\beta = .7312$, $t = 13.8228$, $p < .001$). By referring to Table 7, R^2 for teachers' attitudes toward using Frog VLE is equal to .535, it is interpreted as with the help of teachers' CMC competencies, teachers' attitudes toward using Frog VLE would be maximized to 53.47%. In other word, as high as 53.47% of teachers' attitudes toward using Frog VLE is due to teachers' CMC competencies in term of CMC motivation, knowledge and skills. Thus, we can conclude that teachers' CMC competencies is a significant predictor of teachers' attitudes toward using Frog VLE. Figure 2 illustrates the total effect model of teachers' CMC competencies on teachers' attitudes toward using Frog VLE.

Causal Relationship between Teachers' CMC motivation, CMC knowledge and CMC skills on Teachers' Affective, Cognitive and Behavioural Attitudes Toward Using the Frog VLE

T-statistics, standardized regression weight, (β) and R^2 of path coefficients of teachers' CMC motivation, CMC knowledge and CMC skills on teacher affective, cognitive and behavioural attitude toward using Frog VLE is as shown in Table 8.

Figure 2. The total effect model of teachers' CMC competencies on teachers' attitudes toward using Frog VLE



Based on Table 8, CMC skills is not a significant factors of teachers' affective ($t=.476$, $\beta=-0.06$, $p>.05$), cognitive ($t=.680$, $\beta=.085$, $p>.05$) and behavioural ($t=1.22$, $\beta=-.168$, $p>.05$) attitude toward using Frog VLE. This implies that CMC skills does not predict teachers' affective, cognitive and behavioural attitude toward using Frog VLE directly. The insignificant path coefficients between CMC skills with affective, cognitive and behavioural attitude and between CMC knowledge and cognitive attitude were deleted. Table 9 presented the t-statistics, standardized regression weight (β) and R^2 of the relationship among the variables in the final model after insignificant path coefficients were deleted from the model.

Among the two direct factors of teachers' affective attitudes toward using Frog VLE, CMC motivation is the main factor ($\beta=.529$, $p<.001$), followed by CMC Knowledge ($\beta=.251$, $p<.01$). One-unit input of CMC motivation would cause a .529-unit increase in teachers' affective attitudes toward using Frog VLE. The implication is that with higher level of CMC motivation and CMC knowledge, the more positive the affective attitudes of teachers toward using Frog VLE. In addition, a total of 49.6% of cognitive attitudes is due to teachers' CMC motivation ($\beta=.704$, $p<.001$), whereas the main factors of teacher behavioural attitude are teacher CMC knowledge ($\beta=.302$, $p<.01$) and

Table 8. T-statistics, standardized regression weight (β) and R^2 of the relationship among the variables in the model

Regression			T-statistics (Bootstrapping value)	Standardized regression weight (β)	R^2
Independent variable		Dependent variable			
Motivation		Affective	4.815***	.555	.519
Knowledge		Affective	2.739**	.275	
Skills		Affective	0.476	-.06	
Motivation		Cognitive	5.185***	.628	.412
Knowledge		Cognitive	0.217	.025	
Skills		Cognitive	0.680	.085	
Motivation		Behavioural	3.928***	.464	.501
Knowledge		Behavioural	3.026**	.371	
Skills		Behavioural	1.22	-.168	

Note: *Significant at $p<.05$; **Significant at $p<.01$; ***Significant at $p<.001$

Table 9. T-statistics, standardized regression weight (β) and R^2 of the relationship among the variables in the final model

Regression			T-statistics (Bootstrapping value)	Standardized regression weight (β)	R^2
Independent variable		Dependent variable			
Motivation		Affective	5.534***	0.529	.517
Knowledge		Affective	2.595**	0.251	
Motivation		Cognitive	10.905***	0.704	.496
Knowledge		Behavioural	3.584**	0.302	.402
Motivation		Behavioural	5.185***	0.393	

Note: *Significant at $p < .05$; **Significant at $p < .01$; ***Significant at $p < .001$

Table 10. Sub-models of the teacher affective, cognitive and behavioural attitude

Sub-model Regression model		R^2	Effect
1	Affective = .5287 motivation + .2505 knowledge	.517	Moderate
2	Cognitive = .7041 motivation	.496	Moderate
3	Behavioural = .3925 motivation + .3018 knowledge	.402	Moderate

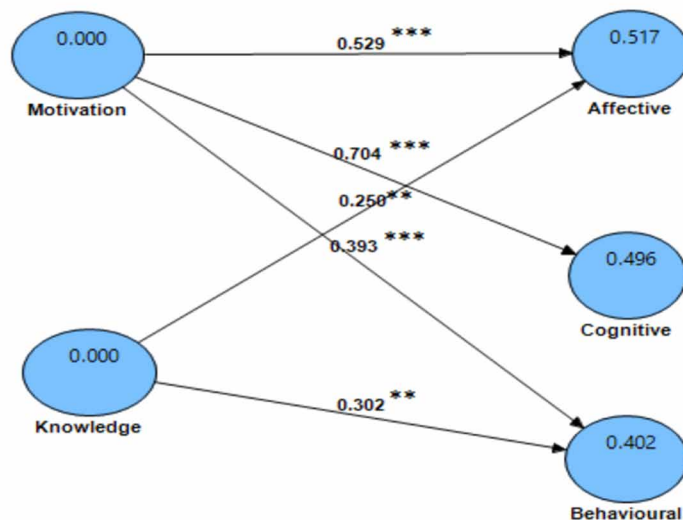
Effect size for R^2 : weak effect = .04; moderate effect = .25; strong effect = .64

Source: (Ferguson, 2009)

CMC motivation ($\beta = .393$, $p < .001$). The sub-models of the teacher affective, cognitive and behavioural attitude are presented in Table 10.

The final model depicted in Figure 3 consists of the causal relationship between the motivation and knowledge dimensions of teachers' computer-mediated communication competencies on teachers' affective, cognitive and behavioural attitudes toward using the Frog VLE.

Figure 3. Causal relationship between the motivation and knowledge dimensions of teachers' computer-mediated communication competencies on teachers' affective, cognitive and behavioural attitudes toward using the Frog VLE



DISCUSSION

The actual utilization of technology in school depends to a great extent on teachers' attitudes toward using the ICT. Regardless of how advanced and how sophisticated the technology, its successful implementation relies on end-users having a positive attitude toward it (Liaw, 2002). Therefore, teachers' attitudes are critical in initiating the use of ICT in school's programme and to effectively integrate technology in school (Celep & Tülüba°, 2014). Findings indicate that teachers in Klang district, Selangor secondary schools show medium level of attitude toward using Frog VLE. This findings align with Chai, Hong, & Teo (2009) and Tezci (2010) findings who found that teachers in their study demonstrated medium level of attitude toward the computer. This was further supported by those (Afshari et al., 2009; Albirini, 2006; Cakir, 2014; Celep & Tülüba°, 2014; Demirci, 2009; Harrison & Rainer, 1992; Kandasamy & Shah, 2013; Teo, 2008; Williams, 2015; Yildirim, 2000; Yunus, 2007) on ICT use. These researches found that teachers demonstrated positive attitudes toward using ICT. On the other hand, Samuel & Zaitun (2007) findings indicate that teachers possessed negative attitudes toward educational technology innovations which showed contradicting findings from this study.

Technological advancement has introduced and presents teachers with new opportunities for computer-mediated communication (CMC). Thus, it is critical to investigate the level of teachers' computer-mediated communication competencies in this era of technology advancement where education emphasized more on blended learning with the increasing proliferation and prioritization of virtual learning environment. The present study showed that teachers demonstrate medium level of CMC competencies toward using Frog VLE. This could be interpreted as the teachers are moderately motivated to use Frog VLE and they perceived that they are still lacking of knowledge and skills regarding how to utilize Frog VLE. This finding is consistent with findings of previous studies (Kandasamy & Shah, 2013; Mahmud & Ismail, 2010; Samuel & Zaitun, 2007; Yunus, 2007). On contrary, this finding rejected the results of the study conducted by Umar & Yusoff (2014) which showed that teachers are highly competent in ICT for communication purposes.

Based on PLS-SEM analysis, it was found that teachers' CMC competencies is a significant predictor of teachers' attitudes toward using Frog VLE. As demonstrated by Berner (2003), Gilakjani & Leong (2012), Jegede (2007), Koszalka (2001), Lord & Brown (2001), and Sa'ari et al. (2005) in their research on ICT, it shows that there is significantly correlated relationship between teachers' ICT competencies and teachers' attitudes toward using the ICT. As stated by Yunus (2007), continuity with ICT explorations and use will lead to increase of knowledge, skills and motivation toward using the ICT and finally lead to a positive attitude toward using the ICT. Further supported by Tezci (2010) explained that there is positive correlation between teachers' experience and knowledge of ICT with computer and Internet attitude. These findings reveal that the higher the teachers' level of knowledge and skills, the more their positive attitudes. Similarly, Koszalka (2001) stated that teachers who actively involved in discussion group using computer-mediated communication may be an effective mechanism for promoting positive attitude toward the use of web resources in the classroom thereby increasing the integration of such resources into teaching and learning environments. This empirical study of the relationship between the variables had elucidate the centrality of teachers' CMC competencies on teachers' attitudes toward using ICT in schools.

The results of the present study have indicated that CMC motivation and CMC knowledge are the two direct factors of teachers' affective and behavioural attitudes toward using Frog VLE and CMC motivation predict teachers' cognitive attitudes toward using Frog VLE. The findings of the present study are consistent with Chua & Chua's (2017b) study that there is significant and positive causal relationships between CMC motivation and CMC knowledge and attitudes of teachers toward using Frog VLE. However, findings indicate that there is no significant causal relationship between CMC skills and teachers' attitudes toward using Frog VLE which is contradicting to the findings of Chua & Chua (2017b). The authors state that those who are highly motivated, knowledgeable and possess

good CMC skills have a positive attitude toward Facebook. The inconsistency of research findings will require further attention in future research.

CONCLUSION

In conclusion, this study found that teachers show medium level of attitudes and medium level of CMC competencies toward using Frog VLE. There is statistically significant direct causal relationship between teachers' CMC competencies and teachers' attitudes toward using Frog VLE. CMC motivation and CMC knowledge are the two direct factors of teachers' affective and behavioural attitude toward using Frog VLE and CMC motivation predict teachers' cognitive attitudes toward using Frog VLE. Based on this finding, the researcher argues that teachers' CMC competencies is one of the important factors that might influence teachers' attitudes toward using Frog VLE. As suggested by Berner (2003), teachers' CMC competencies is a critical factor to influence teachers' attitudes from the social perspectives. Thus, it is important to enhance teachers' CMC competencies in order to foster positive attitudes toward using Frog VLE among the teachers.

Our studies have several limitations. First, self-administered questionnaire is the only research instrument for the researchers to review the data comprehensively. Future studies should include other techniques of data collection such as interviews for the purpose of cross validation on the responses given. Second, the survey was cross-sectional in nature, and from Klang district secondary schools only at a single point in time. Due to these limitations, we encourage future studies to be conducted on different respondent groups at different places with different research design.

Future research related to Frog VLE usage is recommended to examine from the perspective of principals. This is because principals play a significantly important role in ensuring successful integration of ICT within the school (Gronow, 2007). In order to ensure the field of computer-mediated communication continues to mature, the researchers propose that significantly more research should be carried out in this field.

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