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Adoption of Technology: School Location as Moderator

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Abstract: This study aims to identify the relationship between teacher self-efficacy and the level of technology adoption with the location of school as moderator. This study uses a survey method. The study sample used random sampling. Data was collected from a sample of 218 Mathematics teachers teaching at national secondary schools in both urban and rural areas using questionnaires. The questionnaires were adapted from other sources and have the confidence value of 0.96. The quantitative data was analised using descriptive statistics and multiple regression analyses. Analyses in the study show that there is a significant relationship between self-efficacy and the level of technology adoption. The findings indicate that the variable school location as moderator has a significant influence on the relationship between teacher self-efficacy and the adoption of technology. This result clearly explains that the interaction between school location and teacher self-efficacy needs to be focused on so that the level of adoption of technology is increased. The result of the study also provides a positive implication on the increase in the level of technology acceptance among mathematics teachers in urban as well as rural schools.

Key words: Self efficacy, technology adoption, ICT, school location, urban

INTRODUCTION

Teaching assisted by Information and Communication Technology (ICT) through the exploration of digital resources can help in improving student's interest as well as make the process of Teaching and Learning (T&L) more effective. To face the new challenges from globalisation, liberation, internationalization and development of ICT in the 21st century, the Malaysian Ministry of Education (MOE) prepared the Master Plan of Educational Development (MPED) 2006-2010, enabling it to produce citizens who are knowledgeable, ICT literate, skilled and honourable. The aim of the plan is to bridge the digital divide between the urban and rural areas by providing ICT facilities and improving the ICT skills among teachers and students (MPED 2006-2010, 2006). Effective usage of ICT in Teaching and Learning (T&L) is essential since inadequate usage and management of ICT in the classroom may result in deficit in educational outcomes (Toit, 2015).

Statement of the problem: The implementation of the ICT programme has encouraged teachers to use courseware in T&L. Malaysia has embarked on many efforts to increase digital infrastructure coverage throughout the country and yet it is still insufficient, especially in rural areas, mainly due to high cost of broadband deployment and low returns on investment (Eleventh Malaysia Plan, 2015). The MOE through its educational technology division has supplied courseware to schools to be used in T&L. This outcome explains that the MOE has begun to realise the importance of using courseware in the learning environment of the classroom. This is because teaching with the aid of courseware would serve as a guide or mentor through interactive feedback rather than just as a provider of information and understanding only (Lee *et al*., 2005). Osakwe (2013) and Halawani (2015) point out that the growth and development of ICT has significantly impacted the basic T&L mechanisms in education such as reading, writing and numeracy. With the advent of multimedia technology, there could be a likelihood of a global virtual school in terms of long-distance education application (Saade and Bahli, 2005).

Although, many efforts have been made to improve the integration of ICT in T&L, the issue of how far the process of diffusiveness has provided effect on the acceptance and integration of ICT still remains questionable. This is shown in the studies by Azizah (2006) and the Curriculum Development Centre (2006) where the acceptance of courseware in T&L is still at a low level. In addition, a study by Norazlina (2008) to identify the obstacles encountered in the use of computers and ICT among teachers shows it to be at a moderate level. The effect shown is that the aim of

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using ICT as an aid of T&L to facilitate the delivery of a concept effectively and effect understanding of the subject matter taught to students is not achieved. In view of this, this study aims to identify the diffusive factors (self-efficacy, relative advantage and support and time) in relation to the level of acceptance of technology and the role of the variable, school location as the moderator.

Objectives of the study: To determine the influence of the variable moderator of school location on the relationship among diffusion factors (self-efficacy, relative advantage and support and time) with the acceptance of the courseware.

Literature review

Innovative diffusive factor: Rogers (2003) cited in diffusion of innovations theory state that diffusion is the process where the innovation is connected through certain channels over time among the members of a social system which is a special type of communication concerned with the spread of messages that are perceived as new ideas. Whereas, innovation is an idea, practice or object that is perceived as new by an individual or other unit of adoption. The characteristics of an innovation as perceived by the members of a social system, determine its rate of adoption.

Self-efficacy: Bandura (1997) and Khan *et al.* (2015) defined self-efficacy as the beliefs in one's capabilities to organize and implement the courses of action required producing given achievements. The studies by Bull (2009), Bennett and Bennett (2003) and Lin and Jeffres (1998) show that teachers who have low self-efficacy have a high level of anxiety towards computers. This effect increases the barrier to learning a technological advancement.

Relative advantage: The relative advantage of an innovation tends to increase the level of acceptance of that innovation (Moore and Benbasat, 1991). The findings of Butler and Sellborn (2002), Rogers (2003) and Patricia, (2000) showed that the advantages of the technology itself were important factors that helped teachers make the decision to adopt and use technology in T&L.

Support and time: Webb (2011) and Groves and Zemel (2000) explain that the aspects of support such as training on how to use the issue of a lack of teachers, material available, budget allocation and the support of the administration influence the acceptance of technology. Braak (2001) and Norhayati are of the opinion that teachers do not often use technology in their teaching because they are not given sufficient time to make the necessary preparations.

School location as a moderator: The study by Kamarudin (1997) shows that there is no significant difference in the level of literacy between teachers who teach in the urban and rural schools. Nevertheless, the study by Norazlina (2008) to identify the obstacles faced by teachers in the use of the computer and ICT found that the use of the computer and ICT among teachers in the rural areas was less than that of the urban areas. This finding shows that the lack of facilities is a major obstacle to the use of the computer and ICT in rural area schools.

Acceptance level of courseware: The concept of acceptance is explained as the integration of the courseware with the process of T&L by the teacher. The level of a binding acceptance is measured based on the level of acceptance as suggested Moersch (1995). This level of acceptance uses 7 scales (0-6) that are starting with the level of no technology use (0 level) till the level of the widest use of technology (level 6). The purpose of using this measurement is to determine the acceptability of the courseware in T&L by Mathematics teachers.

According to Moersch (1995), a teacher will move from one level to another based on the use of technology in T&L. The level of technology acceptance in teaching allows a teacher to reach a higher level and a teacher-based approach will shift to student-based instruction.

MATERIALS AND METHODS

This study used a survey method. The study sample was selected using random sampling. Data was collected from a sample of 218 Mathematics teachers at day SMKs in urban and rural areas by using questionnaires. The questionnaire was adapted from other sources and had a reliability index of 0.96. The quantitative data was analised using descriptive statistics and multiple regression analysis.

RESULTS AND DISCUSSION

Background of respondents: The findings of this study (Table 1 and 2) show the number of female teacher respondents were more (65.9%) compared to number of male teacher respondents (34.4%). Other than that, the number of teachers based on location showed that the percentage of Mathematics teachers from the urban schools and rural schools were about the same that is each at 50.5% (110 people) from urban schools and 49.5% (108 persons) from rural schools, respectively.

Location of school as moderator: Hierarchical multiple regression analysis (Table 3) involving variable diffusion factors (self-efficacy, relative advantage and support and

Table 1: Study instrument

Main dimension	No. of items	Sources
Self-efficacy	6	Moore and Benbasat (1991)
Relative avantage	5	Bandura (1997)
Support and time	7	Poe (2000)
Acceptance of courseware	25	Moersch (1995)

Table 2: Background of respondents in study

Variables	Frequency	Percentage
Gender		
Male	75.0	143.0
Female	3.4	65.6
Location of school		
Urban school	110.0	108.0
Rural school	50.5	49.5

time) showing 76% variance (R^2) can be explained by the aforementioned three independent variables. The findings show self efficacy ($\beta = 0.572$, $t = 12.06$, $p = 0.000$), relative advantage ($\beta = 0.244$, $t = 5.04$, $p = 0.000$) and support and time ($\beta = 0.207$, $t = 4.71$, $p = 0.000$) have significant effects on the level of acceptance of the interactive multimedia software. The three independent variables have a positive relationship with the acceptance of the courseware variables.

The Dlocation school1 variable moderators explain the 77% variance (R^2) on the level of acceptance of the interactive multimedia software. The relationship between the Dlocation school1 variables ($\beta = -0.058$, $t = -1.53$, $p = 0.127$) with the acceptance of the interactive multimedia software is not significant because the $p>0.05$. The coefficient value of -0.06 shows that mathematics teachers in rural schools have a greater influence on the acceptability of the interactive multimedia software compared to the mathematics teachers in urban schools.

The analysis of the results of the interaction between school location as a variable moderator and the independent moderator shows that R^2 increased to 79.3%. Table 2 shows that there are two significant interactions between the variable moderator of school location and the independent variable of diffusion on the acceptance level of the interactive multimedia software that is the interaction between d location school 1 and self-efficacy ($\beta = -0.928$, $t = -4.36$, $p = 0.000$) and Dlocation school with relative advantage ($\beta = 0.741$, $t = 3.72$, $p = 0.000$). The interaction between Dlocation school1 and self-efficacy is negative whereas the interactive relationship between Dlocation school1 and relative advantage is positive.

Interactions between location of school and self efficacy: Figure 1 shows the interaction between self-efficacy and location of school with regards to acceptance of courseware as well as their relationship to be negative. The findings show that there is a strong relationship between the self-efficacy variable and the level of acceptance when the location of a school is urban compared to a school whose location is rural. Overall, the

Fig. 1: Plotting interaction between self efficacy and school location on the acceptance of courseware

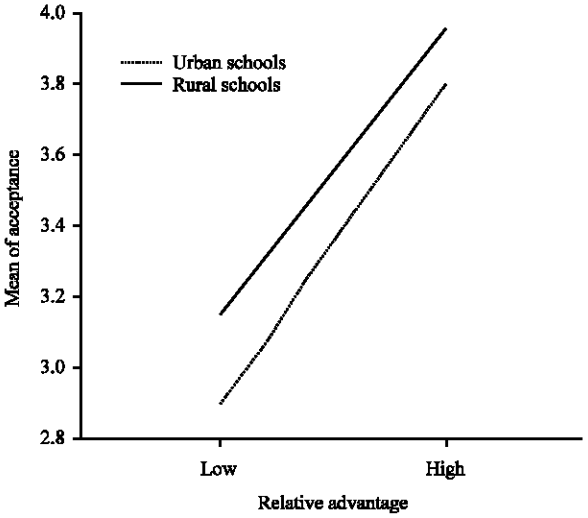

Fig. 2: Plotting of the interaction between relative advantage and location of school

figure shows that there are no significant differences in the level of acceptance when the self-efficacy is low. Conversely, significant differences can be seen when the level of self-efficacy is high. In other words, when the level of self-efficacy is high, teachers in urban and rural schools report a higher level of acceptance compared to when self-efficacy is low.

Interaction between school location and relative advantage: Figure 2 shows the interaction between relative advantage and school location on the level of

Table 3: Analysis of school location as moderator between the relationship of diffusion factors and the acceptance of courseware

	Step 1			Step 2			Step 3		
Model variable	β	t-value	Sig.	β	t-value	Sig.	β	t-value	Sig.
Independent variable									
Self-efficacy	0.572	12.06	0.000	0.588	12.1.0	0.000	0.799	12.20	0.000
Relative advantage	0.244	5.04	0.000	0.233	4.77	0.000	0.017	0.23	0.819
Support and time	0.207	4.71	0.000	0.214	4.86	0.000	0.241	4.14	0.000
Moderating variable									
Dschool location1	-0.058	-1.53	0.127	0.104					0.537
Model interaction									
Dschool location1*	-0.928	-4.36							0.000
Self-efficacy									
Dschool location1	0.741	3.72	0.000						
Relative advantage									
Dschool location1	-0.012	-0.07							0.942
Support and time									

R^2 = 0.764; 0.767;0.793; adjusted R^2 = 0.760;0.762;0.785; R^2 change = 0.764; 0.003; 0.026; Sig. F change = 0.000; 0.127; 0.000; Durbin Watson = 1.869; 1.869; 1.869; Sig. on p<0.05

acceptance of courseware. The findings show a strong relationship between the variable relative advantage and the level of acceptance when the school is located in an urban area. Overall, Fig. 2 shows that there is no significant difference on the level of acceptance when the relative advantage is high. But, a significant difference may be seen when the relative advantage is low. Other than that, Fig. 2 makes it clear that when relative advantage is high, teachers in both urban and rural schools report a higher level of acceptance compared to when the situation of relative advantage is low.

Summary: Based on the findings, it can be concluded that the location of the school serves as a moderator variable on the relationship between the diffusion factor and acceptance of courseware. The variable school location as a moderator provides a significant influence on the relationship of self-efficacy and relative advantage with the acceptance of courseware. This explains that location of school needs to be addressed in the innovative diffusion process so that it contributes to a higher level of acceptance of the courseware. This is because the increase in the level of acceptance of courseware will result in a teacher moving from one stage to another based on the use of technology in T&L (Moersch, 1995).

CONCLUSION

The findings of the study show that the variables of self-efficacy, relative advantage and support and time accounted for 76.4% variance in the courseware acceptance and become highly significant predictors. Consequently, the location of the school contributes 0.3% (R^2 change) to the variance of the acceptance of the software and its influence is not significant. At the third level, it is found that changes in R^2 change and F change show that the interaction of school location and the diffusion factors contribute 2.6% to the variance of the courseware acceptance. This is where R^2 rises to 79.3%.

The results of the study shows that there are two significant interactions between the location of school as moderator with the independent variable of diffusion on the level of courseware acceptance, that is interaction between school location and self-efficacy and the interaction of location of school and relative advantage. This result shows that the researcher has sufficient evidence to state that the location of teachers act as a moderator in the relationship between self-efficacy and relative advantage in the acceptance of courseware.

SUGGESTIONS

The finding suggests a strong relationship between the self-efficacy variable and relative advantage with the level of acceptance when the location of the school is urban compared to when the school is a rural school. This finding is in line with the study of Norazlina (2008) who found that the use of computers and ICT among teachers in the rural schools is still modest. This situation is likely due to the lack of facilities and the low levels of ability in rural national secondary schools. Even, if a Mathematics teacher in a national secondary school has the confidence to integrate ICT and courseware which is provided and of quality would find that the lack of ICT facilities and the low level of student ability forming obstacles to the acceptance of courseware.

IMPLICATIONS

The result of this study has identified school location as moderator between the factor of diffusion and the level of acceptance of courseware. Therefore, it is important that at the time of diffusion of courseware, the factor of

school location be emphasised so that the interaction of school location with the variable factor of diffusion would increase the level of acceptance of courseware among mathematics teachers. Meanwhile, the policy makers, specifically the malaysian ministry of education, should give full attention to ensuring the effectiveness of the diffusion process and the acceptance of the innovative courseware in urban and rural schools. The ministry should also provide full support and encouragement towards the integration of courseware in T&L.

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