The Use of Instructional Technology in Teaching: A Comparative Analysis

Abdul Latheef Mohamed , Mojgan Afshari, Simin Ghavifekr, Saedah Siraj & Ahmad Zabidi Bin Abdul Razak

Faculty of Education, University of Malaya.

Corresponding Author: Department of Educational Management, Planning & Policy, Faculty of Education, University of Malaya. mojganafshari@um.edu.my mojganafshari@yahoo.com

ABSTRACT

The current computer-based instructional technologies found in schools around the world provide enormous opportunities for teachers to use them for effective and efficient lesson delivery. This study was aimed at comparing the level of computer use for teaching purposes by business and science stream teachers in the secondary schools of Maldives. A descriptive research methodology was conducted to collect data for this quantitative study. A survey questionnaire was administrated to 85 participants (43 business teachers and 42 science teachers). The findings of this study indicate that science stream teachers have higher level of computer use for teaching purposes in comparison with business stream teachers. An independent sample t-test analysis indicated that there is no significance in the perceived support for computer use between business and science stream teachers. To increase technology use for teaching purposes and decrease the differences between two groups of teacher, training programs need to be carried out separately to meet the training needs of the each group of teachers.

Keywords: **Instructional Technology, Teaching & learning, Computer-based education**

INTRODUCTION

Technology has transformed the world in "enabling increased innovation and productivity, connecting people and communities, and improving standards of living and opportunities across the globe" (Bauer & Kenton, 2005, p. 5). Nowadays, educational institutions have started investing significantly in technological advancement. The survey Report on Information and Communications Technology in India and South Asia (2010) indicated that 60% of secondary schools in the country have a computer lab and most of the schools have a technician and a computer teacher. It is also stated that the government hopes to equip all the secondary schools with the sufficient capacity to maintain and operate with instructional technology effectively and efficiently. According to Shally, Cashman, Gunter, and Gunter (2008), computer-based technologies that are present in the schools provide enormous opportunities for teachers to utilize them for effective and efficient lesson delivery.

Many research studies have been reported on teachers using technology in the teaching and learning process. However, too few studies have examined the difference in technology integration in teaching among teacher groups and these studies pay little or no attention to the differences among subject teachers in terms of technologies used in teaching. Moreover, there is no evidence on the differences existing between subject teachers in the literature. Therefore, this study was aimed at investigating the factors determining the integration of computer-based technology for teaching purpose between business and science teachers in the secondary schools of Maldives. The purpose of this study was to identify the differences between business and science stream teachers in the secondary schools of Maldives in terms of: their level of computer use; the perceived level of ability; the perceived access to computers; the attitude toward computer use and the perceived support for computer use. This study can be beneficial for the relevant government sector policy makers, teacher training institutions, school administrations, teachers and the other stakeholders of secondary schools in Maldives, who can acquire more knowledge concerning the levels and extent of computer use in schools and make more accurate decisions on the diffusion of instructional technology in schools.

LITERATURE REVIEW

Previous studies (Mumtaz, 2000; Grainger & Tolhurst, 2005; Niederhauser & Stoddart, 2011) have shown that a wide range of factors influence the teachers' decisions to use technology effectively in their teaching and learning process. Niederhauser and Stoddart (2011) believed that attitude has a significant impact on teachers' level of computer-based technology integration in teaching. The way teachers perceive the technology as a teaching tool greatly determined their level of technology integration in classroom practices (Clark, 2000; Ertmer, 2005). According to Vermillion, Young, and Hannafin (2007), negative attitudes toward technology use in the classroom pose a barrier to successful application of technology into the teaching and learning process. In an investigation of science teachers' use of computer applications, Ocak and Akdemir (2008) stated that more than three quarters of teacher participants in the study increasingly adopt computer applications in teaching. The study showed highly significant relationship between these teacher participants and their positive attitude towards computer applications as tools for instructional purposes. Ocak and Akdemir (2008) suggested that the spread of computer applications in recent years could be the reason for this attitude change among science teachers.

Teachers' perceived support to computer from administrative, technical and collegial support have been confirmed crucially by some studies. For administrative support, a study conducted by Butler and Sellbom (2002) suggested that administration should take measures to overcome barriers such as hardware and software for technology integration in education. The importance of technical support was stressed by the studies done by Gattetson and Reinsvold (2007) and research carried out by Bauer and Kenton (2005). In addition, peer support is beneficial to teachers' using technology effectively and efficiently, which was proven in studies performed by Yildirim and Yildirim (2009), Bullock (2004), Ronnkvist, Dexter, and Anderson (2000). Teachers' perceived ability level in computer use is a selected factor directly influencing the level of technology application in teaching, which suggests that training for teachers to promote the level of ICT ability is necessary and should be provided for them. Research showed that those teachers who had been trained before using technology had higher ability to adopt ICT in teaching (Lau & Sim, 2008). According to Zhou and Xu (2007), the ability level of female was less than that of male because female teachers lacked confidence and training opportunities.

Furthermore, teachers' perceived access to computer use is associated closely with their level of technology integration in teaching. Hew and Brush (2007) stated that there was a significant difference in teaching by means of technology between teachers who had access to computers and those who had not. Moreover, Kiili (2003) concluded that computer location was an important element which directly affected teachers' access to computers. The findings showed that teachers had a tendency to prefer using computer in the classroom rather than in computer laboratories. In addition, results of a study by Norton and Cooper (2001) on the factors influencing teachers' computer use in secondary schools indicated that the selected schools were equipped with latest technological advancements and teachers had no problem in accessing the technology. However, the problem identified in the study was the lack of information and knowledge among teachers on how to use the technology for instructional purposes.

METHODOLOGY

A descriptive research design was employed to collect data for this quantitative study from the business and science stream teachers of the four lower secondary schools in Maldives.

A survey questionnaire was administrated to 85 participants including 43 business teachers and 42 science teachers. The instrument consisted of a total of 158 items including: 17 items on the level of computer use for teaching purposes; 17 items relating to teachers' perceived ability level in computer use; 15 items for teachers' perceived access to computer use; 10 items for teachers' attitudes toward computer use, 10 items relating to teachers' perceived support and 10 items for teachers' characteristics. Participants gave their opinions to each statement in the first five sections on a 5-point Likert Scale, ranging from 1 (Never or Beginner or Strongly Disagree) to 5 (Very often or Expert or Strongly Agree).

The survey questionnaire employed in this study was reviewed by two experts in the field of educational technology and educational management. Their comments on the content validity were considered to modify the elements of the survey questionnaire. Moreover, internal consistency reliability of this questionnaire was established. The value of Cronbach's alpha coefficient for all these scales was above .70. Participants from two

groups of teachers completed the survey questionnaire provided by the researcher though e-mail. Among the participants, 84% of them offered usable responses, including 40 business teachers and 40 science teachers (Table 1). Furthermore, descriptive statistics and independent sample t-test were used to analyze data.

Table 1
Summary of Population and Usable Responses

Population	Number in Population	Number in Sample	Number of Usable Responses	% of Usable Responses
Business Stream	102	43	40	42%
Science Stream	96	42	40	42%
Total	198	85	80	84%

FINDINGS & DISCUSSION

The analysis of this study was guided by the research questions and based on the descriptive and inferential statistics of the findings. Descriptive statistics consists of procedures used to summarize and describe the important characteristics of a set of measurements (Mendenhall, Beaver, & Beaver, 2009). Moreover, inferential statistic was used to generalize the results obtained from a random sample back to the population from which the sample was drawn (Blaikie, 2003).

In this study, an independent sample t-test (Table 2) was used to compare the level of computer use, the level of ability in computer use, access to computer, attitude toward computer and the perceived support for computer use between two groups of teachers. A number of assumptions such as normality, homogeneity of variances were checked before conducting these analyses.

Table 2
A t-Test for Comparing the Level of Perceived Ability, Access, Attitude toward Computer and Perceived Support for Computer Use Between Two Groups of Teachers

	N		Mean		t	Sig
	Business	Science	Business	Science		
Level of computer use	40	40	2.40	3.2	4.78	0.000
Perceived Ability level	40	40	2.78	3.08	5.76	0.000
Perceived access	40	40	3.50	3.60	4.65	0.000
Attitude toward computer use	40	40	3.02	3.44	4.02	0.000
Support for computer use scale	40	40	2.44	2.41	0.009	0.061

The level of computer use

According to above table, there was a significant difference in the level of computer use between Business (M = 2.40, SD = 1.59) and Science teachers (M = 3.20, SD = 1.67); t = 4.78, p= .000. The magnitude of the differences in the means (mean difference = .8) was large (eta squared = .23).

Science stream teachers reported significantly higher level of computer use for teaching purposes than business stream teachers. However, the adoption pattern of computer resources is very similar between the two groups of teachers. Word processing, internet/intranet, graphics and presentations were the computer applications most widely used for teaching purposes by business and science stream teachers. The least-used computer resources were database management, multimedia authoring, simulations, drills and games.

This pattern of computer use suggests that teachers have high levels of computer use for more common and widely used applications such as word processing, internet/intranet, but have low levels of computer use for more specialized applications. This pattern of computer use is similar to the study conducted by Isleem (2003) in Ohio public schools. Specialized applications increase the complexity of the innovation, thus supporting Rogers' theory of diffusion (1995) in terms of complexity being a hindrance to adoption. Whereas more common and widely used applications are compatible with the adopter's existing values and therefore confirm Rogers' theory stating compatibility improves adoption.

The perceived level of ability to use computer

Results of the study indicated that there was a significant difference in the ability level to use computers between Business (M=2.78, SD=1.29) and Science teachers (M=3.08, SD=2.03); t=5.76, p=.000. The magnitude of the differences in the means (mean difference = .3) was large (eta squared = .30).

Science stream teachers reported significantly higher level of ability in computer use for teaching purposes than business stream teachers. However, the findings indicated a similar pattern in the level of ability to that of the computer use with high perceptions of skills or ability in more commonly used resources such as word processing, internet/intranet and integrated software.

The pattern of adoption confirms the Rogers' (1995) theory through the innovation attributes of relative advantage, compatibility and complexity. In addition, the findings of this study are in agreement with the findings of Rahman and Idrus (2002) as it revealed that self-perceived ability level of computer usage among educators was high when they exhibited frequent usage on a daily basis. The present study reported that the science stream teachers use computers for teaching purposes more frequently than business stream teachers resulting in an increased level of ability in computer use for teaching purposes in comparison with business stream teachers.

Access to computers

Findings of this study illustrated that there was a significant difference in the level of access to computers between Business (M = 3.50, SD = 1.47) and Science teachers (M = 3.60, SD = 1.62); t = 4.65, p= .000. The magnitude of the differences in the means (mean difference = .1) was large (eta squared = .22).

Science stream teachers reported significantly higher level of perceived access to computers for teaching purposes than business stream teachers. These results support the findings of previous studies. In addition, the results of this study supported the findings of several studies (e.g., Hew & Brush, 2007; Zhu, 2010) reporting that increase in perceived access to computers among teachers increases their level of computer use for teaching purposes. In this study, science stream teachers reported a higher level of perceived access to computers as well as higher level of computer use for teaching purposes.

However, the most frequent perception of access to computers had a similar pattern for two groups of teachers. The findings indicated the highest of access to computers were in the staff room and at home. On the other hand, the findings revealed a difference in the pattern for the most frequent perceptions for their lack of access to computers. The study indicated that the most frequent perceptions of lack of access to computers were in the computer lab for science stream teachers and in the laboratories for the business stream teachers.

The attitudes toward computer use

Moreover, a significant difference was found in the attitudes towards computers between Business (M=3.02, SD=1.64) and Science teachers (M=3.44, SD=1.87); t=4.65, p=.000. The magnitude of the differences in the means (mean difference = .42) was large (eta squared = .17).

The findings indicated that science stream teachers have a significantly positive attitude towards computer use for teaching purposes than business stream teachers. This result is consistent with Ocak and Akdemir's (2008) findings, in which they found a highly significant relationship between the level of computer use for teaching purpose and science teachers' attitude toward computers.

The perceived support for computer use

The findings indicated that there is no significant difference [t(80) = .009, p > .05] in the perceived support for computer use between business and science stream teachers in the secondary schools of Maldives. The findings of this study are in contrast to the findings of Hoerup (2001), where support was an influential factor for computer adoption.

Besides that, the findings revealed a similar pattern of agreement between two groups of teachers regarding the perceived support for computer use for teaching purposes. The most frequent perception of support for both science (80%) and business (77.5%) stream teachers were that they acknowledge the encouragement they received from their colleagues to use computers for teaching purposes and an agreement that their colleagues

provide assistance with hardware and/or software updates and/or technical support. The most frequent negative perception of support for both business (72.5% and 72.5%) and science stream teachers (77.5% and 77.5%) were an agreement that the administration provides consistent hardware and software and an agreement that the administration encourages participation in conferences, seminars and/or information about computer use respectively.

CONCLUSION

In this information age, technology-assisted education is increasingly popular all over the world. There has been a rapid increase in technology use in schools of Maldives and almost all the schools have access to computer, internet, digital printing and photo-copying facilities. Now, most of the schools are planning to replace the traditional way of "Chalk and Talk" with "whiteboards, smart- boards, and iboards". In this regard, the most important question is whether the teachers in schools are equipped with appropriate knowledge and skills and the attitudes to use instructional technologies in their teaching process. This study, aimed at identifying the differences between business and science stream teachers in the secondary schools of Maldives in terms of the level of computer use, the perceived level of ability, access to computer, attitude toward computer use and the perceived support for computer use.

The results of this study indicated that science stream teachers had significantly higher level than business stream teachers in terms of computer use, skills in using computer resources and the perceived access to computers for teaching purposes. The findings of this study supported the previous studies conducted by Isleem (2003) in Ohio public schools, Rogers' theory of diffusion (1995) in terms of complexity being a hindrance to adoption, the study of Zuraidah, Hanafi, and Rozhan (2002) and other studies (Hew & Brush, 2007; Zhu, 2010) on how increasing perceived access to computers increases the level of computer use for teaching purposes. Moreover, science stream teachers have a generally positive attitude regarding computers as tools for teaching purposes, which is consistent with Rogers (1995) and Ocak and Akdemir (2008). Besides, study results indicated that there is no significant difference in the perceived support for computer use between business and science stream teachers, the results of which contradicts with the findings of Hoerup (2001).

Based on the findings, it is suggested that establishing regular professional development programs for improving teachers' expertise and encouraging by means of providing incentives to teachers who exhibit positive attitudes help to improve their level of computer use of teaching purposes. Furthermore, hardware and software access to teachers should be upgraded constantly and it is necessary to carry out the awareness programs to school administrators in guiding them to provide necessary support and assistance to teachers in using technology for teaching purpose. Last but not least, teacher training institutions should provide opportunities for teachers to help them use technology effectively in their teaching and learning process. Future studies should be conducted in different levels of schooling to investigate benefits of using instructional technology teaching on such factors as self-efficacy, training and incentives. Future research may compare the adoption level of instructional technology between teachers and university lecturers.

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