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Technology in Mathematics Teaching: The Pros and Cons

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Abstract

This paper centers on the use of laptop by Mathematic teachers at 28 secondary schools in Malaysia. It addresses some benefits and challenges faced by the teachers in integrating technology into Mathematics teaching-learning process, as well as their daily activities related to the process such as the use of resources, and the preparation and planning of lesson. A survey was carried out among 172 teachers who were currently teaching the subject area to get their views on laptop use. Although teachers experience challenges in using laptop for Mathematics teaching, they also gained much benefit from it. The survey findings might be useful for the Ministry of Education in developing continuing professional development courses and trainings for teachers. Hence, teachers would be better equipped with the appropriate knowledge, skills, and resources, to support them in their teaching-learning process in the classroom.

Keywords: Laptop; Mathematics teacher; Benefit; Challenges; Professional development

1. Introduction

Vast technology advances over the millennia has developed digital communities all over the world. Recognized as a vehicle that can elevate the education system to a higher level in a technology driven world, many countries are exploring the potential of Information and Communication Technology (ICT) as a means of improving and enhancing the learning of the e-generation as well as achieving efficiencies in classroom instructions. A matrix of ICT initiatives were carried out in many countries global wide since the last decade with the governments investing massive expenditure to harness and entrench ICT into the education system.

The integration of ICT is an essential agenda of the government to raise standards in schools and promote teachers’ and students’ access, skills and knowledge to new technologies. The application of ICT in education is one of primary concerns for educators all over the world. Since the early 1970s, the Malaysian Government introduced a myriad of initiatives to facilitate a wider adoption of ICT to boost capabilities in every field including education (Ministry of Education, 2005). New initiatives and innovations have been introduced to elevate the Malaysian educational system to fulfill the national aspirations as well as to meet the international challenges. The emergence...
of ICT in Malaysia started from the Smart School Concept which was rolled out in 1999 (Ministry of Education, 1997), the Teaching and Learning of Science and Mathematics in English (better known by its Malay acronym PPSMI) program in 2003 (Noraini Idris, Loh, Norjoharuddeen Mohd. Nor, Ahmad Zabidi Abdul Razak & Rahimi Md. Saad, 2006), and the 1:1 e-learning program called the MoE-Intel School Adoption Project in 2006 (Ministry of Education & Intel Malaysia, 2008).

The sprouting of mobile computing in schools started in the year 2003 when the government introduced the PPSMI program. This program was launched so as to prepare the new generation with the advancement and development, as the acceleration of science and technology that know no boundaries demands new skills and capabilities to meet global challenges and needs. As such, the Ministry of Education decided that Science and Mathematics will be taught in English in all fully aided Government schools from 2003 onwards (Noraini Idris et al., 2006). Considering Malaysia as an export economy and technology driven country, and much of science-based courses in the tertiary level relies heavily on English reference materials, the government decided that it is imperative for the young generations to be proficient and competent in English. As part of the program, every Science and Mathematics teachers were granted laptops as a means to enhance the delivery of both subject areas in English.

In the 2003 Budget, the Malaysia’s former Prime Minister, Tun Dr. Mahathir Mohamad said that the government provided an allocation of RM5 billion for a period of seven years from 2002 to 2008, to implement the PPSMI program (Ucapan Bajet Tahun 2003, 2002). This provision is used to train teachers, provide launching grant for schools and support teaching-learning materials, in addition to providing basic facilities and physical infrastructure including ICT. Teachers are also provided with laptops, and schools are provided with LCD projectors and other related equipments, so as to ensure that the learning of Science and Mathematics in English can be implemented effectively. For this purpose, a total of RM978.7 million were spent in 2002 and 2003 to kick start the PPSMI program.

Thus, this initiative requires teachers to master ICT skills in operating the facilities provided by the Ministry of Education during instructional delivery (Noraini Idris et al., 2006). Teachers involved in the PPSMI program are also paid a stipend as an incentive for teaching the Science and Mathematics subjects in English as well as integrating technology into their instruction. According to the Ministry of Education Circular Letter Number 3 (2003), the PPSMI teachers are given the Education Subjects Incentive Payment (better known by its Malay acronym BISP or Bayaran Insentif Subjek Pendidikan). As such, the BISP rates for Education Services Officers who teach Science and Mathematics subjects in English are; 5% of basic salary for Graduate Education Services Officers, and 10% of basic salary for Graduate Diploma Education Services Officers.

This shows the government’s determination to ensure the successful implementation of PPSMI. It also reflects the government’s noble agenda to prepare Malaysians in adapting and living with ICT in a technology emergence world. Consequently, this initiative has also contributed to the growth and development of people involved with it. As such, this paper aims to determine the benefits and challenges faced by the Mathematics teachers in integrating technology into their teaching-learning process, as well as their daily activities related to the process such as the use of resources, and the preparation and planning of lesson.

2. **Methodology**

This research involved 172 Mathematics teachers who were granted laptops from the PPSMI program. This research is quantitative in nature, hence, a set of questionnaire developed by the researcher was used for the survey. The questionnaire has gone through a series of validity tests by ICT experts, reliability test using SPSS Statistical Package, and was also translated using the back translation technique by a group of bilingual experts. The internal consistency of the pilot and actual study yielded a high reliability. Data were collected using two methods namely school visits and via mail.
3. Findings

Research participants are solely Mathematics PPSMI program teachers. A total of 36 (20.9%) males, and 136 (79.1%) females participated in this survey, aged between 24 and 55 years old. Their teaching experience ranged from 6 months to 32 years. Teachers’ use of laptops was measured in three dimensions namely teaching-learning, use of resources, and lesson preparation and planning. In order to facilitate the presentation and discussions of the results, the percentage of respondents’ agreement level will be presented as SD (Strongly Disagree), D (Disagree), N (Neutral), A (Agree) and SA (Strongly Agree). The teachers stated their preferences from five choices with the respective scoring – 1 point (SD), 2 points (D), 3 points (N), 4 points (A) and 5 points (SA).

The first dimension was on teaching-learning (Table 1). Three items were above the overall mean (3.54). The item “I feel using the laptop benefits my teaching” had the highest mean score of 4.03 (S.D.=0.77), followed by the item “I can explain something more effectively to my students with the aid of a laptop used in conjunction with the LCD projector” with a mean score of 3.80 (S.D.=0.92). The negative item “The presence of laptop in my classroom is disruptive to my teaching” had the third highest mean score of 3.67 (S.D.=0.88).

Table 1. Percentages, Means and Standard Deviations for Items on Teaching-Learning

| Items                                                                 | SD % | D % | N % | A % | SA % | Mean | SD  |
|-----------------------------------------------------------------------|------|-----|-----|-----|------|------|-----|
| 1. I feel using the laptop benefits my teaching                       | 0.6  | 5.2 | 8.7 | 61.6| 23.8 | 4.03 | 0.77|
| 2. The use of laptop in the teaching-learning process saves time       | 2.9  | 23.3| 18.0| 41.3| 14.5 | 3.41 | 1.08|
| 3. * The presence of laptop in my classroom is disruptive to my teaching | 1.2  | 10.5| 22.1| 52.9| 13.4 | 3.67 | 0.88|
| 4. * I can teach better without the help of a laptop                   | 8.7  | 33.1| 32.0| 23.3| 2.9  | 2.78 | 0.99|
| 5. I can explain something more effectively to my students with the aid of a laptop used in conjunction with the LCD projector | 1.7  | 8.1 | 19.2| 50.0| 20.9 | 3.80 | 0.92|

Table 2 outlined the findings of the second dimension, use of resources. Five items scored above the overall mean (3.68). As such, the highest mean score was from the item “Having a laptop has helped me to obtain access to more up-to-date information” (M=4.06, S.D.=0.79). The item “I often use the Internet with the laptop to enhance my teaching” scored the lowest among all (M=3.38, S.D.=0.92).

Table 2. Percentages, Means and Standard Deviations for Items on Use of Resources

| Items                                                                 | SD % | D % | N % | A % | SA % | Mean | SD  |
|-----------------------------------------------------------------------|------|-----|-----|-----|------|------|-----|
| 1. Having a laptop has helped me to obtain access to more up-to-date information. | 0.6  | 4.1 | 12.8| 54.1| 28.5 | 4.06 | 0.79|
| 2. With the laptop, I have the freedom to access the Internet anywhere I like. | 2.3  | 10.5| 22.7| 44.2| 20.3 | 3.70 | 0.98|
| 3. Having a laptop enables me to surf websites to search for relevant information. | 2.9  | 5.8 | 13.4| 54.1| 23.8 | 3.73 | 0.98|
4. I often use the Internet with the laptop to enhance my teaching.  
5. Having a laptop enables me to experiment with new software at home.  
6. I use my laptop to obtain access to the Internet at home.  
7. Having a laptop has given me the access to a greater range of teaching resources than ever before.  
8. I can download documents from the Internet now that I have a laptop.  
9. With a laptop, I intend to purchase educational electronic resources (e.g.: CD, VCD and DVD).

Mean of means=3.68

The third dimension measured the use of laptop in terms of lesson preparation and planning (Table 3). There were eight items, and five of them scored above the overall mean (3.56). The highest mean score was from the item “It is easier to manage the planning of lessons because all the information needed could be stored in the laptop” (M=3.98, S.D.=0.73). The negative item, “Preparing teaching aids using the laptop takes up more of my time” had the lowest mean score of all (M=2.47, S.D.=1.04).

Table 3. Percentages, Means and Standard Deviations for Items on Lesson Preparation and Planning

| Items                                                                 | SD % | D % | N % | A % | SA % | Mean | SD |
|-----------------------------------------------------------------------|------|-----|-----|-----|------|------|----|
| 1. I use the laptop to prepare my lesson plan.                        | 7.0  | 23.3| 22.7| 35.5| 11.6 | 3.22 | 1.13|
| 2. I can structure my lessons clearly using appropriate materials now that I have a laptop. | -    | 7.6 | 23.3| 57.0| 12.2 | 3.74 | .77 |
| 3. Having a laptop enables me to create my own slide presentation.   | -    | 5.8 | 18.0| 62.2| 14.0 | 3.84 | .73 |
| 4. Preparing teaching aids using the laptop takes up more of my time. | 15.1 | 44.8| 23.3| 12.2| 4.7  | 2.47 | 1.04|
| 5. The use of a laptop helps me to create instructional materials which help students learn better. | -    | 7.6 | 17.4| 61.0| 14.0 | 3.81 | .76 |
| 6. I wish that I had more time during the day to explore using the laptop effectively in my classroom. | -    | 7.6 | 17.4| 54.7| 20.3 | 3.88 | .82 |
| 7. I use my laptop to find out more about the needs of my students through the Internet. | 1.7  | 12.2| 29.1| 46.5| 10.5 | 3.52 | .90 |
| 8. It is easier to manage the planning of lessons because all the information needed could be stored in the laptop. | -    | 4.7 | 13.4| 61.0| 20.9 | 3.98 | .73 |

Mean of means=3.56  
negative item
4. Conclusion

The first dimension was teaching-learning. As a result of having laptops, teachers were able to use their laptops with ICT peripherals such as the LCD projector. The results implied that they perceive laptops as a tool that benefited their classroom instruction even though there were some teachers who were neutral in indicating their perception on explaining lessons better with laptops. A number of them noted that laptops disrupt the classroom instruction. Nonetheless, there was also a number of teachers who claimed that they could teach well with the use of laptops. This was expected as not all teachers would willingly embrace change. A study by Cuban (1986) found that teacher who rejected or at least resisted change failed to recognize the need for improvement or fear of experimentation. There was also a possibility that the teachers are so used to teaching the subjects without the aid of ICT that the teachers refused to change.

The second dimension was use of resources. Laptop usage had indeed given teachers greater freedom to access the Internet from different locations. The portable feature of the laptop had benefited the teachers as it had allowed them to work anywhere they prefer. The results revealed that most of the teachers enjoyed the Internet access that came along with the portable laptop. As such, teachers remarked that laptop had given them access to an extensive range of information from the World Wide Web (Silvernail & Lane, 2004; Cowie & Jones, 2005). It was also noted that teachers tend to purchase electronic resources now that they owned a laptop. These include educational CD, VCD or DVD. Since teachers were allowed to bring the laptop home, this had enabled them to experiment and get familiar with new software first before using them for their students. These findings were similar to the study done by Cunningham, Kerr, McEune, Smith and Harris (2004) who found that teachers were now extending their range of packages used. They were able to experiment with their laptops at home. This had enabled them to gain confidence and at the same time develop their teaching techniques.

The third dimension was lesson preparation and planning. Teachers had used their laptops to structure their resources on their own. The results showed that laptop is a powerful tool that could enable teachers to create teaching resources that are geared to the students’ needs. As such, they accessed the Internet to acquire more information on the needs of their students (Fairfax County Public School Office of Program Evaluation, 2003; Silvernail & Lane, 2004; Cowie & Jones, 2005). Besides, laptops offer large amount of data storage that is accessible at anytime and anyplace. This had indeed facilitated teachers in managing their lesson plans because all of the information that they needed could be stored in the laptop. This was supported by the Fairfax County Public Schools study in 2003 that reported perceived benefits of laptops included accessibility and convenience, where teachers acknowledged the advantages of having their files, documents and web addresses, in one place. Effective utilization of laptop had also benefited teachers to clearly plan and prepare their lessons.

Overall, the findings indicate that teachers were not only able to adapt laptops, but they were now using the mobile technology in most of their activities in school. Laptop had promoted efficient use of time because of its mobility, ability to be used in conjunction with ICT peripherals, and accessibility to the Internet. It had also enhanced classroom instruction, facilitated teachers in understanding students’ need, improved teachers’ work quality, offered the opportunity to a wide range of resources through the Internet, and boost teachers’ ICT skills.

Since the current study is a purely quantitative study where the results depend on the honesty of the respondents, therefore, a need analysis which is qualitative and exploratory in nature can be conducted. This is as a means to obtain in depth information and mass fascinating opinion on how laptops have benefited teachers in their professional development. Open-ended interviews may be effective to gather as much information needed, as teachers are allowed to express their perspectives freely. This should be considered prudently as it may shed an insight on the government’s noble effort of endowing laptops for Mathematics classroom instruction. In addition, it may help in providing a much clearer, broader and deeper understanding on the professional development of teachers for new technologies.

References

Cowie, B. & Jones, A. (2005). Digital horizons: Laptops for Teachers’ Evaluation Study Update on Secondary Teacher’s Experience. University of Waikato. Retrieved October 30, 2007 from http://www.minedu.govt.nz/web/downloadable/dl8568_v1/laptop-leaders-report-12-9-with-edits-ds.doc

Cuban, L. (1986). Teachers and Machines: The Classroom Use of Technology Since 1920. New York & London: Teachers College Press.
Cunningham, M., Kerr, K., McEune, R., Smith, P., & Harris, S. (2003). *Laptops for Teachers: An Evaluation of the First Year of the Initiative*. ICT in School Research and Evaluation Series No. 19. Becta/National Foundation for Educational Research (NFER). *Laptop Computer Pilot Interim Report 2002-2003*. (2003). Fairfax Public Schools Office of Evaluation. Department of Education Accountability, USA.

MoE (Ministry of Education) of Malaysia. (2005). *Smart School Roadmap 2005-2020: An Educational Odyssey*. Cyberjaya. Retrieved October 5, 2007 from http://www.msc.com.my/smartschool/downloads/roadmap.pdf

Noraini Idris, Loh, S.C., Norjoharuddeen Mohd. Nor, Ahmad Zabidi Abdul Razak & Rahimi Md. Saad. (2006). The Professional Preparation of Malaysia Teachers in the Implementation of Teaching and Learning of Mathematics and Science in English. *Eurasia Journal of Mathematics, Science & Technology Education*, 3(2), pp. 101-110.

Silvernail, D.L. & Lane, D.M.M. (2004). *The Impact of Maine One-To-One Laptop Programme on Middle School Teachers and Students*. Maine Education Policy Research Institute University of Southern Maine Office, USA.

Ucapan Bajet Tahun 2003 (2002). *Ucapan Bajet Tahun 2003 oleh YAB Dato’ Seri Dr. Mahathir bin Mohamad Perdana Menteri dan Menteri Kewangan Malaysia*. Rang Undang-undang Perbekalan 2003. Dewan Rakyat.