

EXPLORING THE EXTENT OF ICT ADOPTION AMONG SECONDARY SCHOOL TEACHERS IN MALAYSIA

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Since year 2003, a wide range of ICT such as laptop, LCD projectors, trolley with speaker and UBS system, as well as software like power point, flash and interactive courseware have been used to support teaching and learning of Mathematics and Science throughout schools in Malaysia. In some schools, extra effort has been made to provide additional facilities like computer laboratories, wireless internet connection and local area network to assist teachers' in their teaching and professional tasks. Ideally, teachers should be very receptive toward the adoption and implementation of ICT in education. Effective use of ICT with multimedia and graphics for example, enriches teaching and enhance interactivity in learning. With a large investment in the ICT infrastructure, and increased emphasis on the use of ICT in teaching, teachers are expected to be competent and effective in utilizing these tools. However, are all teachers ready and making full use of the ICT in schools? To what extent are teachers utilizing ICT tools in schools, how have they perceived their competency to be and what are their specific training and support needs, if any? The paper aimed to examine these issues. Surprisingly, results indicated that elderly teachers were eager to adopt ICT in schools. They were receptive to ICT and reported a high extent of ICT use in teaching and professional job. In general, teachers held a reasonably positive attitude towards ICT adoption in school, and those who received either prior to and on the job training recorded a higher competency in ICT. Respondents who were more competent in using computers reported more favorable perception towards ICT. On top of these, teachers who have been using ICT extensively in their daily routines still indicate high training and support needs. Respondents also felt that among the various stakeholders, teachers as the classroom practitioners should have a greater say in deciding how ICT is being used in schools.

Categories and Subject Descriptors: K.3 [Computing Milieux]: Computers and Education

General Terms: ICT, secondary education

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1 INTRODUCTION

In Malaysia, the role of English as a secondary language taught in school has been changed into the medium of instruction of Mathematics and Science subjects when the government decided that these two subjects are to be taught in English from 2003 onwards. One of the major challenges to the implementation of this policy is teacher's proficiency to deliver the two subjects in English (Pillay & Thomas, 2004). Teachers in Malaysian schools had varying English proficiency as most of them received their education entirely in the national language, Bahasa Melayu, right from the primary to the tertiary level. In order to overcome this problem, the Ministry of Education (MOE) had developed a retraining programme (ETeMS) to enhance teachers' English language proficiency. In addition, ICT are used to support the teaching and learning of these two subjects in schools throughout the country. Under the national budget, RM5 billion has been allocated for the year 2002-2008, to provide training, launching grants, and educational aids to schools nationwide for smooth implementation of the policy.

Specifically, Mathematics and Science teachers, together with English language teachers have been given laptop computer, and teaching courseware to assist them in teaching and professional tasks. Classrooms are equipped with LCD projector, screen, and trolley with speakers and an UPS system. In addition, a launching grant of RM5000 to RM15000 was given to each school to acquire additional reference resources. This represented a massive investment to "kick start" the use of ICT in schools across the country. Under this policy, teachers are not only required to be proficient in English, but also to be savvy in the use of ICT in classroom. With such an increased emphasis on ICT, and a large investment in its infrastructure, teachers are expected to be competent and effective in adopting it. However, after six year of implementation, are all teachers making full use of the ICT in schools? To what extent have teachers been utilizing the ICT in schools, how have they perceived their competency to be, and what are their specific training and support needs in ICT? The paper sought to investigate these issues.

2 LITERATURE REVIEW

A review of 219 studies on the use of technology in education consistently found that students in technology rich environments experienced positive effects on performance in all subject areas (Look, 2005). In particular, Becta (2003) pointed out that ICT provide fast and accurate feedback to students, and speed up computations and graphing, thus freeing students to focus on strategies and interpretation. Further, use of interactive multimedia software, for example, motivates students and leads to improved performance. In fact, studies showed that more students finished high school and many more consider attending college where they routinely learned and studied with technology (Becta, 2003). Barak (2004) pointed further revealed that the use of ICTs in education would promote deep learning, and allows schools to respond better to the varying needs of the students.

Despite the apparent benefits of the use of ICT for educational purpose, studies showed that in many cases, the learning potential of ICT is deprived as many teachers are still not fully ICT literate and do not use it in their teaching. Studies on teachers' readiness for ICT generally, suggest that there is still a long way to go before schools in the region will be able to take full advantage of the opportunities provided by 21st century technology (Ya'acob et. al., 2005; So & Paula, 2006). Barak (2006) reveals that while teachers exploit ICT for their own learning, they are cautious about integrating advanced technologies in schools. The study also suggests that while teachers recognize the potential of technology in stimulating students' learning and making school studies relevant to real-life contexts, they do not think that ICT is preferable for class-based instruction for promoting cooperation and reflection in learning.

To investigate the factors hindering teachers' readiness and confidence in using ICTs, Tella, et al. (2007) found that inadequate knowledge to evaluate the role of ICT in teaching and learning, lack of skills in the use of ICT equipment and software had resulted in a lack of confidence in utilising ICT tools. This is consistent with Preston (2000) who concluded that lack of technical support to be key inhibitor to the use of ICT in classroom. As shown by Bradley and Russell (1997), recurring faults, and the expectation of faults occurring during teaching sessions have reduced teachers' confidence and caused teachers to avoid using technology.

In addition, obstacles such as access to equipment, time pressures, lack of mentor and opportunities for apprenticeship of observation also have an impact on teachers' ability to use ICT (Slaouti & Barton, 2007). Further, teachers' workload and time management was found to be inhibiting the implementation of computer instruction in classroom (Guha, 2000). While there is a great deal of studies about how ICT is

being used in developed countries, there is not much information on how ICT is being integrated into schools in developing countries (Beukes-Amis and Chiware, 2006).

3 RESEARCH OBJECTIVES AND HYPOTHESES

Hence, the aims of the study were:

To describe the level of ICT use by teachers among schools in Malaysia.

To determine teachers' perceived competency and perception of ICTs.

To describe the obstacles faced by teachers in ICT use, and

To identify teachers' training and support need.

In a study by Jennings and Onwuegbuzie (2001), teachers of younger age were found to be associated with more positive attitudes towards ICT. This is in agreement with the report by the U.S. National Center for Education Statistics (2000) which indicated that younger teachers score higher on their perception of ICT, and have translated their positive perception into higher degree of ICT use in education. Thus, it was hypothesized that teachers of younger age make more use of ICT in schools, compared to the elderly counterparts. On the other hand, Atan et al. (2002) found that users exhibit greater competence computer when they made frequent use of it. Hence, it was predicted that teachers who make daily use of ICTs are more competent in ICTs compared to those with a lower rate of adoption. Further, Preston (2000) revealed that lack of technical support as a key factor inhibiting the use of ICT in classroom. As pointed out by Bradley and Russell (1997), recurring faults, and the expectation of faults occurring during teaching sessions, reduced the teachers' confidence and caused teachers to avoid using technology. It is therefore predicted that teachers with a lower ICT rate of adoption demand more ICT training and support.

The aim was to find out the validity of these hypotheses at 95% level of confidence using p-Test. The constant is ICT use by teachers with three variables – teachers' age, their ICT competency, and their training and support needs. The hypotheses were formulated as below:

H1: Young teachers demonstrate a higher rate of ICT adoption in their profession.

H2: Teachers with higher ICT competency shown greater ICT adoption rate in their profession.

H3: Teachers who demands more ICT training and support have a lower ICT adoption rate in their profession.

4 METHODOLOGY

A survey was conducted to collect both quantitative and qualitative data on ICT adoption of teachers' in schools. The instrument used was a self-administered questionnaire consists of six sections. Section 1 is on the demographic information of the respondents, followed by Section 2 on teachers' ICT competency and Section 3 on the extent and frequency of ICT use in schools. Section 4 examines their perceptions of ICTs, the next section focus on the obstacles faced, and the last section on their training and support needs. The questionnaires were randomly distributed to some 250 secondary schools teachers of Mathematics and Science. All items in the first five sections were measured on a five-point, closed-ended Likert scale, while the last section with open-ended questions for teachers to add their inputs. A total of 212 completed questionnaires were received and data were analysed using SPSS version 15.

5 DESCRIPTIVE STATISTICS AND DISCUSSION

5.1 USE OF ICTS IN SCHOOLS

Respondents were asked to indicate how frequent had they used ICT in each case – for teaching and instructional support, classroom management, communication and personal development. Each item was measured on a five point rating scale from 1 (never) to 5 (daily).

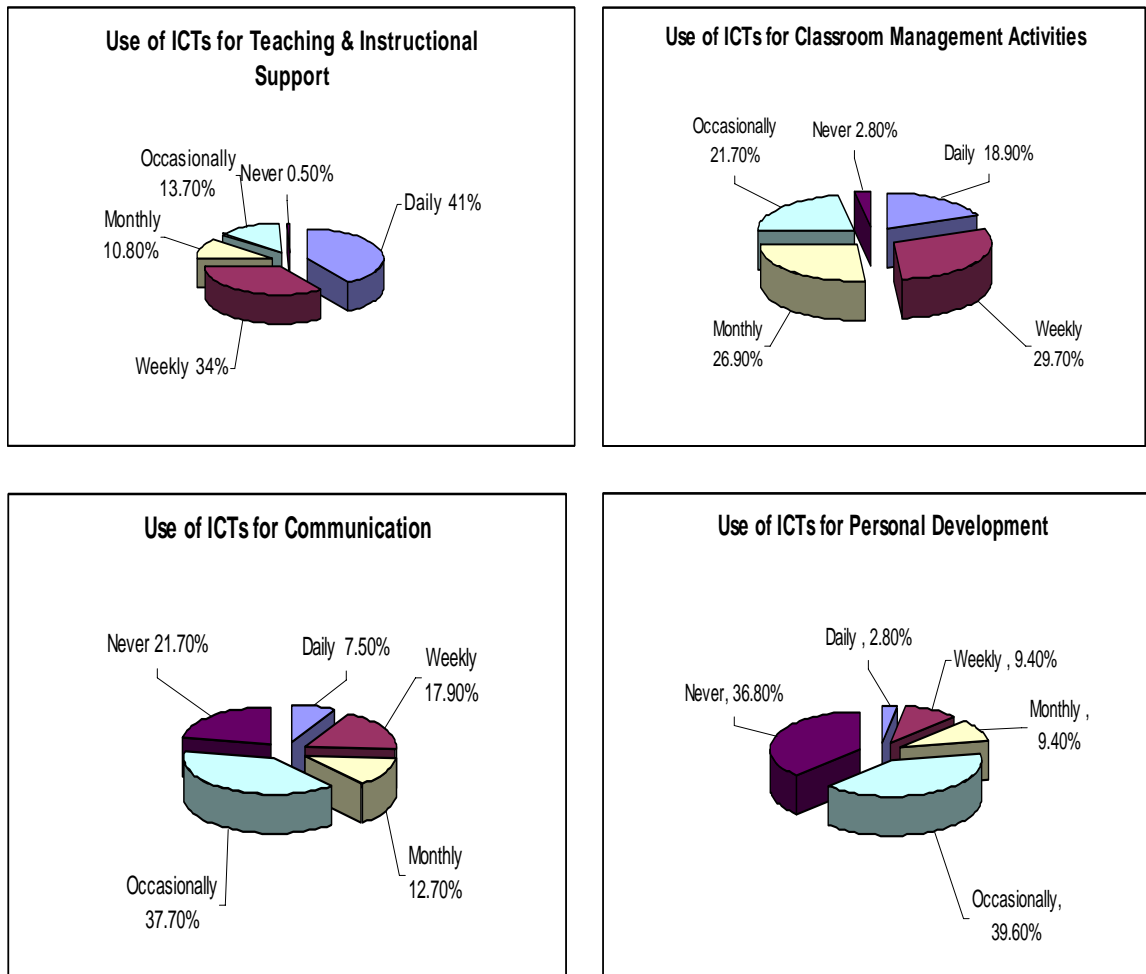


Figure. 1 Use of ICTs by Teachers in Schools

As shown in Figure. 1, respondents were reported to make frequent use of ICT, either daily or weekly for teaching and instructional support (75%) and classroom management activities (49%). Respondents however, reported less frequently use of ICT for communication with peers (26%), and for personal development (12%). This is contrary to the findings of The Gordon University Aberdeen (2004) which revealed that secondary school teachers at Scotland made use of ICT as much or more for professional development and communication as in the classroom. Thus, mechanisms need to be put in place to ensure that teachers utilize computer technology for further development and communication, such as seeking peer-to-peer advice or participating in online professional development.

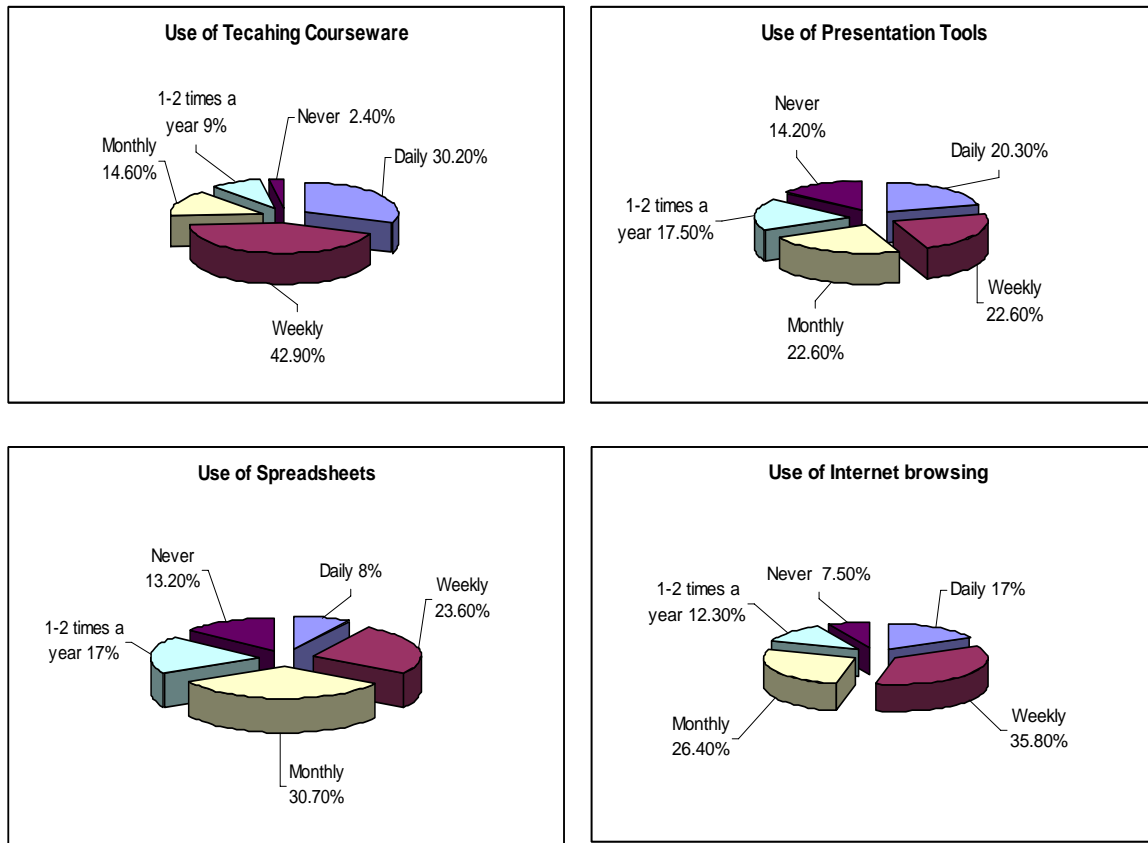


Figure 2a: Use of ICT Application by Teachers

When asked about ICT application most frequently used either on daily or weekly basis, higher ratings were given to teaching courseware (73%), presentation tools (43%), internet browsing (53%), and spreadsheets (32%) [Fig. 2a]. As shown in Fig. 2b, the corresponding Figs were lower for graphical visualizing tools (24%), hypermedia/multimedia (22%), simulation programmes (14%) and online demos (7%).

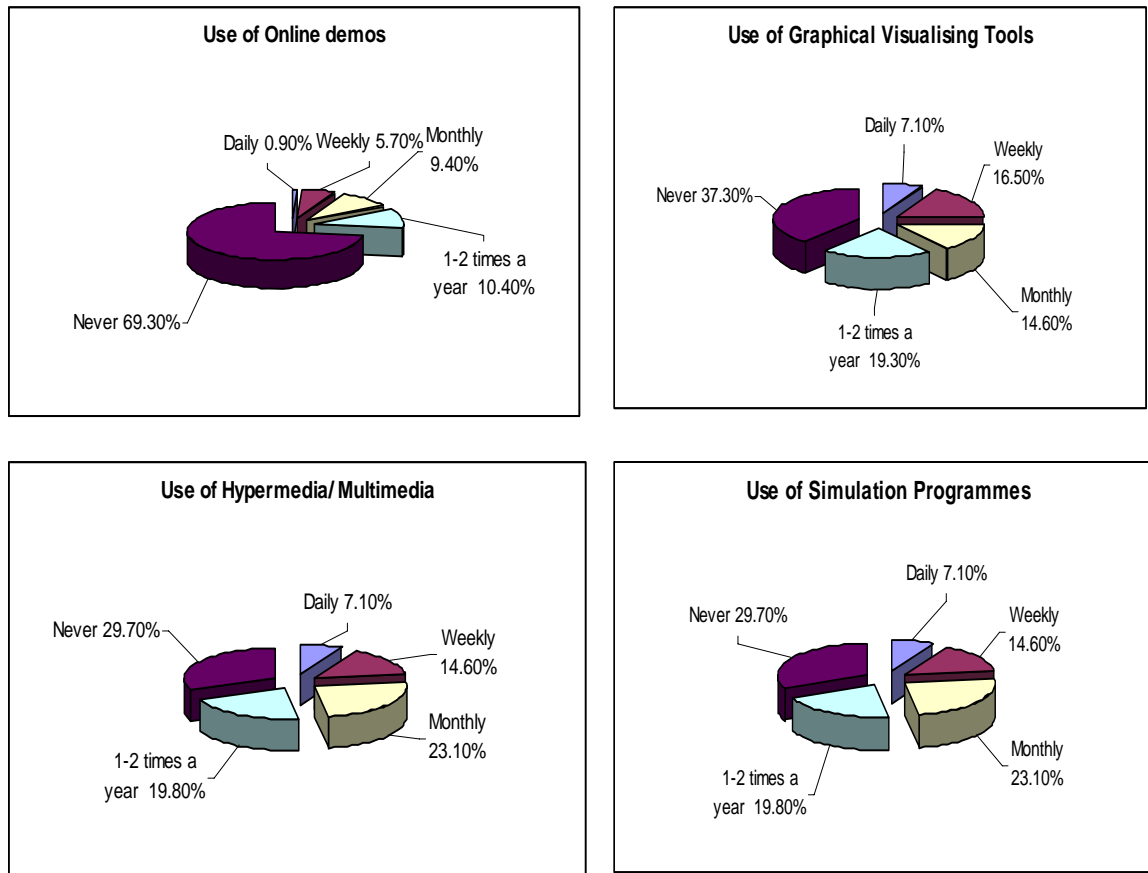


Figure 2b Use of ICT Application by Teachers

It might appear that teachers do not make use of graphical visualizing tools, hypermedia/multimedia, and simulation programmes because they consider the applications to be specialized software and require advanced skills from users. This suggests that teachers need training in a wider range of ICT applications for them to make full use of technology in teaching. Programmes like simulation for example, allow teachers to show experiments that would not otherwise be possible, and have great educational potential to enhance teaching (McFarlane and Sakellariou, 2002).

5.2 ICT COMPETENCY

For teachers' ICT competency, respondents were asked to rate their perceived competency in basic computer applications which include word processing, spreadsheets, presentation tools, e-mailing, internet browsing, statistical tools, and teaching courseware. Each item was measured on a five point rating scale from 1 (no capability) to 5 (excellent).

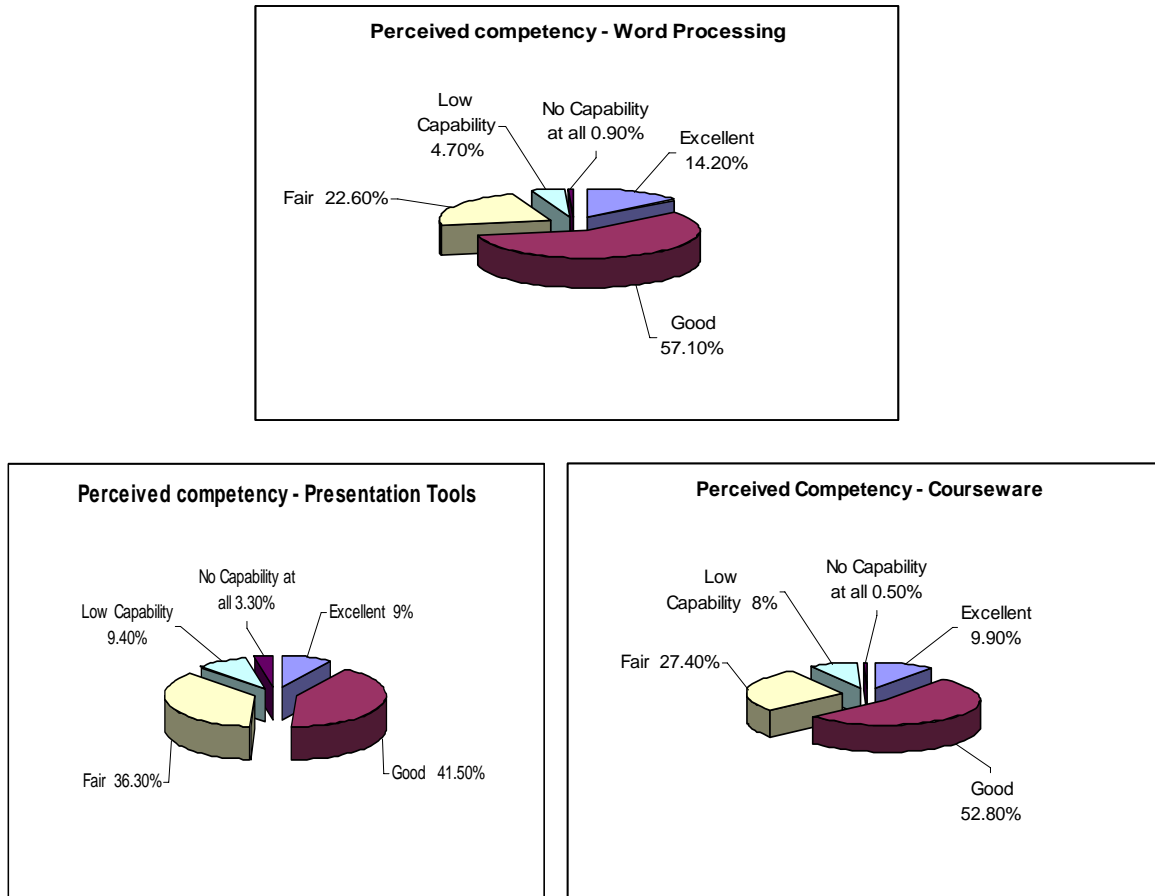


Figure 3a Computer competency of Teachers

Fig. 3a indicated that teachers considered themselves to be more competent, either excellent or good in the use of word processing (71%), teaching courseware (63%), presentation tools (50%). The results suggest that teachers' computer competency is possibly related to their frequent use of word processing, presentation tools and courseware in preparing teaching materials and presenting lessons. The result is in agreement with those of Cuckle et al. (2000) and Jegede et. al. (2007) who found teachers to be most competent in word processing compared to other applications.

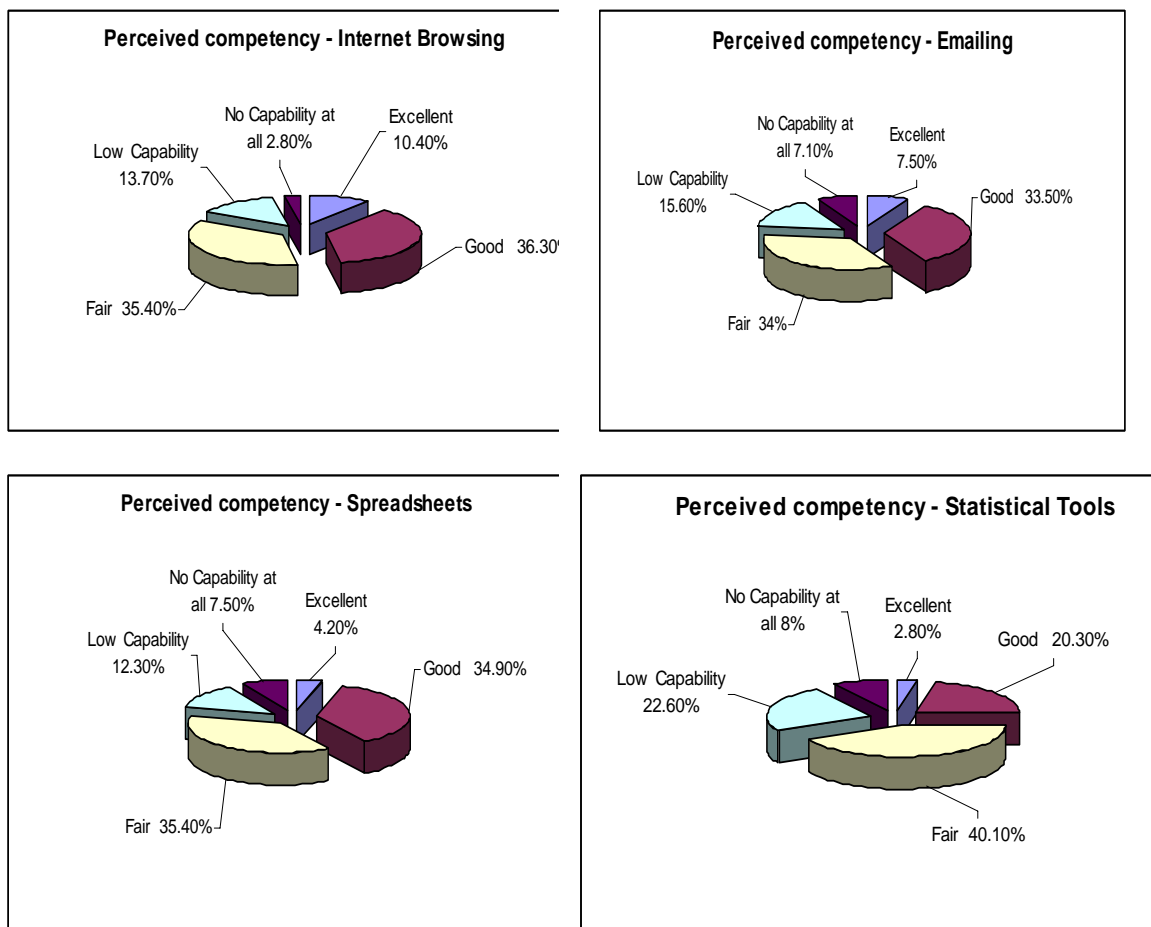


Figure 3b Computer competency of Teachers

On the other hand, a lower proportion of respondents perceived themselves to be broadly good in internet browsing (47%), emailing (41%), and spreadsheets (39%). As shown in Fig. 3b, most of the rating fell between the range of “fair” and “good”, i.e. moderate level of skills in these applications. It is however, not surprising for teachers to feel less competent as these applications are most likely not used in daily teaching and instruction, e.g. spreadsheets are normally used by teachers to manage student grades and results.

Overall, the results are consistent with the findings of Slaouti & Barton (2007) who concluded that ICT most commonly used by teachers was word-processing, PowerPoint and the WWW. According to their research, “Video conferencing and synchronous communications had again not been used, email had only been used by four of the group and most had made no use of databases or text reconstruction software.” It also appears that respondents feel least competent in statistical tools (31%), as shown in Fig. 3b. It might be that these are technical areas that need to be learned by teachers, and that current training courses do not address teachers’ training need in this area.

5.3 TEACHERS' PERCEPTION OF ICT ADOPTION IN SCHOOLS

In general, teachers broadly agree that use of ICTs makes them more effective in their teaching (75%), more organized in their work (80%) and better able to meet the varying needs of students (48%). In general, teachers broadly agreed that with the use of internet and technology, their lesson plans are richer (55%) [Fig. 4]. This is in agreement with the findings of Slaouti & Barton (2007) which reported that ICT can motivate students in their learning by bringing variety into the lessons, and at the same time, sustaining teachers' own interest in teaching".

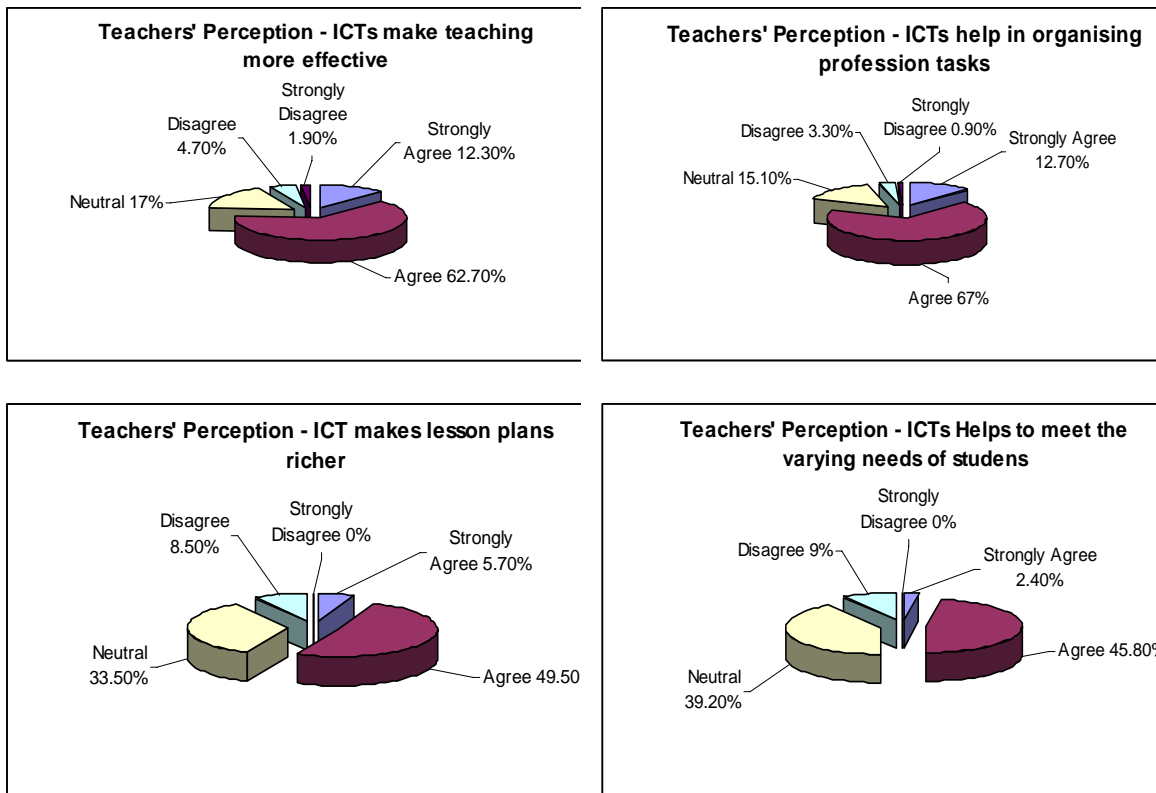


Figure 4 Teachers' Perception of ICT

A further positive sign is 85% of them indicated that they would like to integrate more computer applications into their teaching. It appears that teachers' perceptions toward ICTs are encouraging, where most of them showed positive perceptions on computer use in teaching and instruction. It is believed that teachers can see the value of the ICTs in enhancing teaching and learning, and they are positive towards further integration of technologies into classroom instruction.

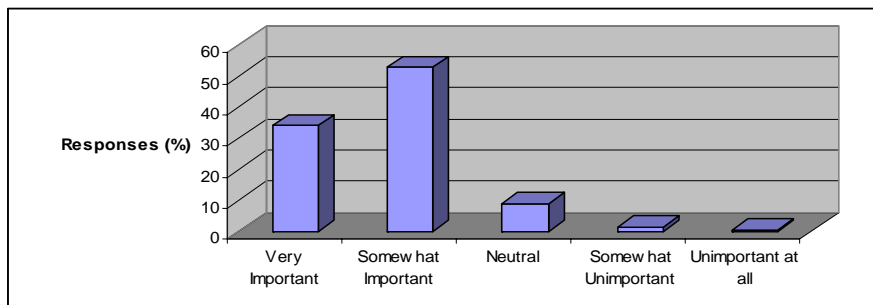


Figure 5 The importance of ICTs in teaching

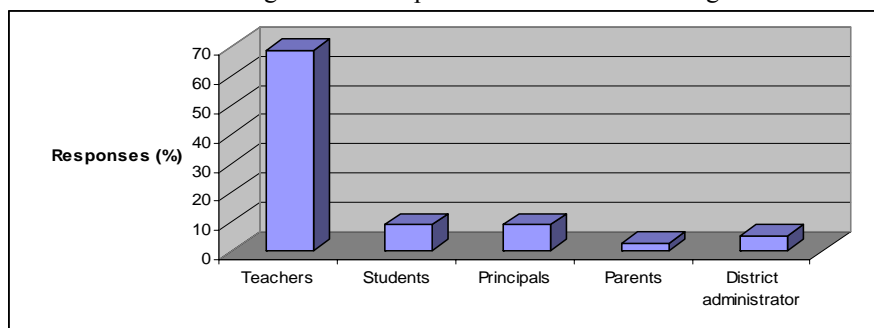


Figure 6 Who should have a greater voice in deciding how ICTs are being used in schools?

Overall, a high 87% of the teachers perceived ICTs as an important tool to accomplish their professional tasks (Fig. 5), and 69% of them felt that among the various stakeholders, teachers as classroom practitioners should have a greater voice in deciding how ICT is being used in schools (Fig. 6).

5.4 ICT TRAINING AND SUPPORT NEEDS

In addition, most of the teachers considered themselves as having limited knowledge to make full use of ICTs, or to integrate ICTs fully into teaching.

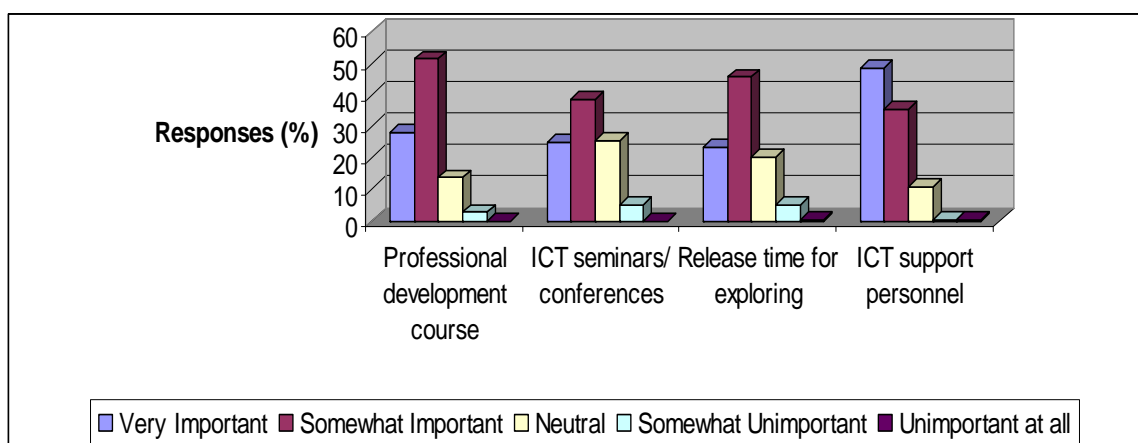


Figure 7 Perceived needs for ICT training and support

When asked to indicate the important channels for improving their ICT skills, respondents had given higher ratings to the need of school-based professional development (80%) and ICT seminars/conferences (64%) [Fig. 7]. The result suggests that school leaders should initiate industry-teachers partnerships to deliver ICT training programmes that are appropriate to teachers needs. Other than courses organized by the central agency, more effective ICT training could be obtained locally through smart partnership with industry and institutions of higher learning. As Ya'acob et. al. (2005) has suggested, training should be offered to teachers on a continuous, rather than a one-off, basis so that their IT knowledge is upgraded over time.

5.5 MEAN SCORE OF ICT USE

When analysed according to age group, result indicated that elderly respondents (aged over 45 years) made more frequent use of ICT in schools ($M = 3.22$; $S.D. = 0.57$) on a five-point rating scale [Table 1].

Table I ICT Use by age groups

	Mean	Std. Deviation
Age		
Below 35	2.74	0.51
35 – 45	3.00	0.53
Over 45	3.22	0.57

The main reason could be, senior teachers having vast teaching experience, sound classroom management skills and good knowledge of the curriculum, can easily digitize their materials with ICTs, hence more flexibly apply ICTs in classroom instruction. This also suggests that they feel comfortable with ICT and see its value in education, and have tried to enrich their lesson and make teaching lively with texts, sounds and images. The result is in agreement with Novak and Knowles (1991) who found that younger beginning teachers struggling to survive and settle into their new role as teachers do not emphasize the usage of computer as they view computers as 'extra', and not as a tool to enhance teaching.

5.6 MEAN SCORE OF ICT COMPETENCY

Teachers' perceived competency was also analysed according to their age groups (Table 2). On a five point rating scale, young teachers aged below 35 recorded a higher mean of competency (M = 3.68; S.D. = 0.55) than the other two groups. The result is consistent with a report by the U.S. National Center for Education Statistics (2000) which revealed that new teachers, having grown up with computers, have greater computer skills to enhance their teaching and instructional practices.

As shown in Table II, teachers' computer competency tended to increase with increased hours of training. Mean competency was found to be highest for those who had received more than 20 hours of training in ICT (M=3.66; S.D.=0.56). Furthermore, teachers who make daily use of ICTs are more competent in ICTs than all the other groups (Table 2). Mean competency was reported to be highest for those who made daily use of computer (M=3.44; S.D.=0.77).

Table II Perceived computer competency

	Mean	Std. Deviation
Age		
Below 35	3.68	0.55
35 - 45	3.45	0.67
Above 45	2.95	0.77
Prior ICT Training		
None	3.32	0.70
1-5 hours	3.39	0.80
6-10 hours	3.39	0.58
11-20 hours	3.45	0.63
More than 20 hours	3.66	0.56
Frequency of use		
Occasionally	3.34	0.58
Monthly	3.36	0.71
Weekly	3.41	0.62
Daily	3.44	0.77

5.7 MEAN SCORE OF ICT PERCEPTION AND PEARSON CORRELATION COEFFICIENTS

Results also indicated that the more time teachers spent using computers, the more positive their perception toward ICT. As shown in Table III, those who made daily use of computer held a more positive perception of ICT (M=3.69; S.D.=0.33).

Table III Teachers' Perceptions of ICT

	Mean	Std. Deviation
Frequency of Use		
Daily	3.69	0.33
Weekly	3.49	0.32
Monthly	3.43	0.24
Occasionally	3.19	0.44

When analysed using Pearson Correlation Coefficient, results showed that there is a moderately positive correlation between teachers' perception and ICT use ($r = 0.56$). The result suggests that a more positive perception had led to increased use of computer in education. This is in agreement with previous studies which found teachers' attitude toward computers as a key factor in predicting the frequency of technology use (Becker, 2000; Zhao and Frank, 2003). As far as age was concerned, there was a higher degree of correlation, $r = 0.6$ between the perception and ICT use among teachers aged above 45 years (Table IV). When teachers were grouped according to the academic level taught, a higher degree of correlation, $r = 0.64$ was observed for those teaching Form 1 – 3.

Table IV Pearson Correlation Coefficients - Teachers' Perception Vs ICT use

Age	Perception * ICT use
Below 35	0.55
35 – 45	0.35
Above 45	0.60

It also appears that a positive perception of computer in education was positively related to the ability to apply ICTs (Table V). The results suggest that a higher ability to use ICT means there will be more positive perception of computer use in education. This may mean that in order to change teachers' perception and increase their computer usage, it is vital to develop their computer skills, and providing them with hands-on experience of ICTs. The result is consistent with the findings of previous study which concluded that teachers who are more competent in using computers have also more favorable attitudes towards computer (Sa'ari et.al. 2005; Jegede et. al., 2007). As far as age was concerned, there was a high degree of correlation, $r = 0.57$ between competency and perceptions of computer technologies among teachers above 45 years old as depicted in Table V.

Table V Pearson Correlation Coefficients - Teachers' Competency Vs Perception of ICT

Age	Teachers Competency * Perception of ICTs
Below 35	0.33
35 – 45	0.42
Above 45	0.57

When teachers were grouped according to the academic level taught, there was a higher degree of correlation ($r = 0.57$) between competency and ICT adoption for those teaching form 1 – 3.

6 HYPOTHESES EVALUATION

As shown in Table VI, the use of ICT by teachers recorded an overall mean of 3.0583 (S.D.= 0.83) over a five-point rating scale. This suggests that teachers in general, had demonstrated a reasonably positive attitude towards ICT use in schools.

Table VI Mean and standard deviation of the constant (ICT Use) and variables (teachers' age, ICT competency, training and support needs)

	Mean	Std. Deviation	N
ICT Use	3.0583	.83109	212
Age	2.0142	.84584	212
Competency	3.3540	.71557	212
Training Needs	4.2928	1.62698	212

As for teachers' computer competency, an overall mean of 3.3540 (S.D. = 0.71) on a five point rating scale, indicates that teachers generally feel competent in utilizing ICT tools in school. However, it is interesting to note that respondents still demand for high training and support in ICT (M=4.2928; S.D.=1.62) on a five-point scale. The standard deviation which is greater than one suggests most of the respondents indicated high needs, whereby a small portion of the sample indicated very low needs.

Table VII Pearson Correlations and 1-tailed Significance Test of the constant (ICT use) and variables (teachers' age, ICT competency, training and support needs)

		Extent	Age	Competency	Needs
Pearson Correlation	ICT Use	1.000	-.161	.507	.127
	Age	-.161	1.000	-.117	.021
	Competency	.507	-.117	1.000	.039
	Training Needs	.127	.021	.039	1.000
Sig. (1-tailed)	ICT Use	.	.010	.000	.033
	Age	.010	.	.044	.378
	Competency	.000	.044	.	.286
	Training Needs	.033	.378	.286	.

Table VIII Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.161 ^a	.026	.021	.82224	.026	5.566	1	210	.019
2	.517 ^b	.267	.260	.71496	.241	68.751	1	209	.000
3	.528 ^c	.279	.269	.71075	.012	3.481	1	208	.063

Table VIII shows the summary of models from the study to predict the relationships between ICT use and the three main variables - age, ICT competency and training needs. Model 1 consists of predictors that are ICT use and age. Model 2 predicts ICT use against age and competency. Model 3 predicts ICT use against age, competency and training needs.

The ANOVA test in Table IX shows the three models formed for regression and residual analysis to be significant (Sig.), from 0.000 to 0.019 (less than 0.05). Furthermore, F test conducted for these three models shows positive value of 5.566 for Model 1, 38.057 for Model 2, and 26.833 for Model 3.

Table IX ANOVA analysis of the constant (extent of ICT adoption) and variables (teachers' age, competency and ICT professional training needs)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.763	1	3.763	5.566	.019 ^a
	Residual	141.977	210	.676		
	Total	145.740	211			
2	Regression	38.906	2	19.453	38.057	.000 ^b
	Residual	106.833	209	.511		
	Total	145.740	211			
3	Regression	40.665	3	13.555	26.833	.000 ^c
	Residual	105.075	208	.505		
	Total	145.740	211			

Table X shows the components in the three models. Model 1, 2 and 3 which suggests that age has a negative relationship with the extent of ICT use among teachers. This finding is valid as the significance is less than 0.05. This result however, is opposed to hypothesis 1 in the study. Senior teachers were found to be highly positive towards ICT use in their teaching and professional work, and had translated this into a greater use of ICT in schools. This suggests that teachers of elderly age are very open to new technology like ICT which is contrary to the findings in other developing countries (Jennings and Onwuegbuzie, 2001).

Table X Standardized coefficients, Beta and t-Test results for each model

Model		Standardized Coefficients Beta	t	Sig.
1	(Constant)		23.102	.000
	Age	-.161	-2.359	(.019)
2	(Constant)		4.819	.000
	Age	-.103	-1.720	.087
	Competency	.494	8.292	(.000)
3	(Constant)		3.738	.000
	Age	-.106	-1.779	.077
	Competency	.490	8.255	(.000)
	Needs	.110	1.866	.063

As for competency against the ICT use in Model 2 and 3, confidence level of 95% is fulfilled. Both demonstrate positive relationship. This agrees with hypothesis 2 in the study that is, a higher competency results in higher ICT use in school. Lastly, the training and support needs variable is only significant at the level of 90%. It shows a positive relationship with ICT use, and this violates hypothesis 3 in the study. It is interesting to find that teachers who have been using ICT extensively in their teaching and professional tasks still demand for a wider range of training and support in this area. The eagerness to learn more and acquire further support is high among the teachers. This is in agreement with the findings of Gray and Souter (2004) who reported that Science teachers in Scotland were reasonably confident in their use of ICT, but felt that they needed much more ways of support and professional development in order to maximise the use of ICT in the classroom.

7 BARRIERS TO ICT USE IN SCHOOLS

Teachers were also asked to indicate their reasons for not using a broader range of ICTs in classrooms. 205 teachers responded and the obstacles faced were ranked in order of importance, as shown in Table XI.

Table XI Main obstacles hindering ICT use in Education

Obstacles	Rank
Lack of technical support	1
Lack of time	2
Limited knowledge on how to make full use of ICTs	3
Limited understanding on how to integrate ICTs into teaching	4
Lack of software or websites that support state standards	5

The results suggest that lack of technical support was perceived by teachers as the key barrier to the further uptake of ICT in schools. This is consistent with the findings of a study by Cox et al. (1999) which reported lack of technical support as the school-level barrier in the uptake of ICT in teaching. As pointed out by Cuban (1999), the lack of available technical support is likely to lead to teachers avoiding ICT, for concern of a technical fault occurring cannot be rectified, and lessons being unsuccessful.

Mechanisms therefore, need to be put in place to ensure that teachers have adequate access to technical support. It is suggested that a teacher with ICT competency be appointed as ICT coordinator in each school to provide technical and pedagogical support to teachers. This is crucial in order to support teachers to make full use of ICT in classroom, and not losing time fixing configurations or other technical problems.

As depicted in Table XI, lack of time was reported by the teachers as another strong ICT barrier in schools. The result is in consistent with the finding of Preston et al. (2000) who revealed the lack of time to explore ICT and prepare ICT resources as a teacher-level barrier in implementing ICT in schools. Teachers are sometimes unable to make full use of technology because they lack the time needed to prepare ICT resources for lessons. Time is also needed for teachers to become more familiar with hardware and software.

8 TEACHERS' INPUT ON ICT USE

Teachers who responded to this survey have also given some valuable insights on how ICT usage in schools could be improved. Among others teachers demand for internet access, local area networks, wireless Internet to be made available in schools to allow them to explore information besides books and courseware; They also expressed the need to have a centralized database or a ICT network for teachers to facilitate sharing of materials, to post important announcement, events and school results. In general, factors like lack of time and technical support, limited knowledge to integrate ICT fully in teaching were identified as the key factors affecting uptake of ICTs in schools. School-based professional development and ICT conferences were perceived by the teachers as important channels for improving their ICT skills.

The following are the ways in which teachers think they can get more involved with ICT decisions within their school and district:

- Provide suggestion box and recommendation to be read by principals during staff meetings, with proper follow up actions.
- Questions and answers about ICTs through e-mails.
- Discussion through school web site.
- Organize staff development programs regularly to share knowledge and skills on ICT.
- Conduct monthly meetings on discussions regarding ICT use (ATK ICT).
- Teachers cooperate among themselves, within school and district, and always meet to discuss issues arise.

Respondents were also asked to indicate areas where they would like to learn more, and results were summarized according in the order of importance. As summarized in Table XIII, respondents' prior

concerns was to improve their skills in making charts and graphs, enhancing documents with pictures, followed by their enthusiasm to obtain lesson plans and learning activities from internet sources.

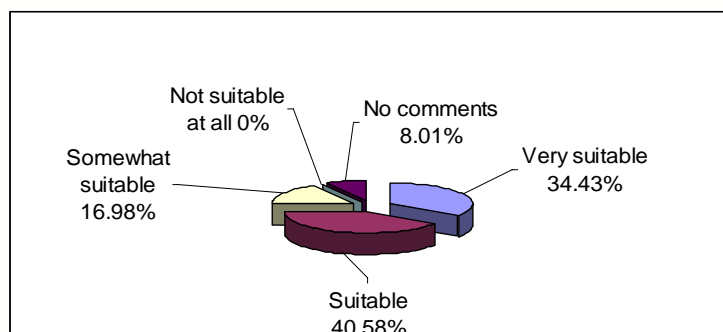
Table XII Areas where Teachers want to learn more about

Obstacles	Rank
Making charts and graph, and enhancing documents with pictures	1
Obtaining lesson plans and activities from electronic/internet sources	2
Make slide presentations to share information with students	3
Use internet to participate in discussions about teaching and learning	4
Create a website to share classroom activities	5

9 RECOMMENDATION

Overall, a high 75% of the teachers considered a collaboration portal to be suitable in promoting further use of ICT in school (Fig. 8). In response to this finding, it is proposed that a nationwide website namely, the e-Blackboard, be introduced to all teachers in order to extend the use of ICTs among teachers.

Fig. 8 Suitability of a Collaboration Portal for teachers



The e-Blackboard can be hosted by a leading school or third party where all teachers would be given an account to access to. With e-Blackboard, teachers will be able to upload teaching materials, record grades, and attendance, develop online assessments, and make announcements. Teachers in the same subject can be enrolled under one subject code to allow them to share information and materials, thus creating collaborations among schools. Furthermore, school principals and board of directors can also track teachers' works at any time, any where. Teachers can access e-Blackboard at any where and any time, too. Any announcements made can reach both schools and teachers efficiently. One most important fact is that all teachers can go electronic in this digital age, where materials can be produced, updated and replicated easily.

More specifically, the e-Blackboard can be designed to display various sections, e.g. syllabus and curriculum, lesson plans, teaching materials, discussion forum, question bank, research articles communication, announcement, and external educational links. Sharing of resources, and expertise on the e-Blackboard means less duplication of effort, e.g. in the preparation of lesson plans and worksheets. Furthermore, discussion on the forum provides better networking opportunities to teachers, which mean greater social contact and support. By sharing teaching and related materials, teachers would be able to collect more information than it is otherwise possible. Additional information obtained enable teachers to enrich their teaching, hence improving the quality of the lessons presented. Announcements, notices and exchange of messages posted on the e-Blackboard can take place immediately at a minimal cost. External educational links can also be added to allow teachers to share on-line interactive or multimedia educational websites in order to enhance teaching and learning. Additionally, questions banks can be utilized to include remedial or enrichment exercises from different sources to meet the varying needs of students. In short, sharing of resources and good practice on the e-Blackboard will greatly promote communication and collaboration among teachers. On top of this, the e-Blackboard can be configured to enable parents to

remotely access their children's school records to keep track of their progress. Parents and the community can encourage teachers' ICT use by sponsoring talks, organizing national seminar for teachers to present and discuss their thoughts. To promote rapport between teachers-parents, additional Parent Link can be added to foster mutual support and shaping the overall character of ICT in teaching and learning. However, to develop a successful e-Blackboard site for teachers, critical security policies covering authentication and passwords, backup procedures, installation of firewalls, and use of licensed software have to be in place beforehand.

10 CONCLUSION

This study investigated teachers' ICT use in schools, their perceived competency, perception of ICTs, and their training and support needs. From the study, it appears that most of them are positive with the use of ICT use in school, and they appreciate the use of ICT in enhancing teaching and learning. Result also showed that they are positive towards further integration of technology into classroom instruction. Training therefore, should be offered to teachers on a continuous, rather than a one-off, basis so that their IT knowledge is upgraded over time. It is indeed hoped that the benefits from the use of ICTs can be fully realized and optimized in teaching. From the results, it would appear that mechanisms need to be put in place to ensure that teachers utilize computer technology for further development and communication, and training need to be designed to increase teachers' familiarity with a wider range of ICT applications. Teachers' should also be given the opportunity and encouraged to reflect on, and make decisions about their own ICT development needs on ongoing basis.

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