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ICT Intervention for School Teachers in Digital Teaching & Learning Environment

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ABSTRACT

The digital revolution has significant implications in education, but the use of ICT in school education is still at a moderate level. Lack of support, lack of teacher's confidence and equipment constraints were among the problems highlighted. The DELIMa-Malaysian Ministry of Education (KPM) portal for the Malaysian school system has also not yet been fully utilized. Thus, this study emphasizes on transferring knowledge and technology to the teacher's community through ICT intervention in a digital teaching and learning (T&L) environment. The objectives of the study are to identify the requirements of the stakeholders, develop ICT infographic modules for intervention training; and evaluate the training effectiveness. The research methodology consists of four phases – requirements, design and development; implementation; and evaluation phases. This paper aim to discuss the results of the preliminary study conducted during the requirement phase to identify the challenges and needs of the schools' teachers in the current digital teaching and learning. The study analyzed responses from 173 teachers in Selangor, Malaysia. The problems and needs of the teachers are identified where problem factors show that Internet access (32.94%), students' participations (30.94%) and teachers' ICT literacy competency (30.59%) are among the highest percentage. ICT educational tools required are ranked based on frequencies, namely: Canva (74), Google Classroom (59), Jamboard (39), Padlet (34), Kahoot (30), Quizizz (27). Based on the findings, infographic modules for Canva and Jamboard are developed, and an intervention of ICT training for teachers is conducted to enhance their ICT literacy. It is hoped that this study will increase the readiness and competence of teachers in the use of ICT for digital T&L, improves their acceptance towards ICT and at the same time support the DELIMa-MOE initiatives in contributing a positive impact to Malaysia education system.

1. Introduction

The Digital Revolution (4IR) has significant advantages and implications in education and training. Many initiatives and applications of information communication and technology (ICT) have been implemented in the education system. Various studies have been conducted worldwide that indicate the tremendous advantages of using technology in education [1]. However, the integration and adoption of ICT in the teaching and learning (T&L) environment at schools is still at a minimum level

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and most of the time is only based on the basic requirements. The use of ICT among teachers is still at moderate level and some part still at a low level [2]. Among the challenges highlighted faced by teachers are lack of support, lack of confidence and limited equipment or network [3].

The spread of the COVID-19 pandemic challenges school administrations and teachers to master ICT in continually conducting teaching and learning digitally. ICT has the potential to transform future teachers in terms of the role, the methods of instruction and assessment; where the role will shift from being the sole knowledge provider to a facilitator or moderator; the methods of instruction with students from the traditional classroom to online forums; and the medium of assessment from printed ones to e-assessment [4].

The Malaysian government has provided various platforms and infrastructure to support digital learning so that T&L can be realized and continue to run even from home. One of the initiatives is DELIMa (Digital Educational Learning Initiative Malaysia) portal for teachers and students in the Malaysia school education system. The platform has suitable sources of reference and various support materials to help strengthen teachers' and pupils' skills and knowledge [5]. However, based on a discussion with teachers in Bangi Zone, it was found that only part of the DELIMa application is fully utilized, such as Google Classroom and there are still many underused applications that are not fully explored and utilized by teachers and school pupils.

Thus, this study emphasizes on transferring knowledge and technology to the teacher community through ICT intervention in a digital teaching and learning (T&L) environment. The objectives of this study are as follows:

- To identify the problems and requirements in adopting digital teaching and learning among teachers.
- To develop ICT infographic modules for conducting ICT intervention training of knowledge and technology transfer.
- To evaluate the effectiveness of the training to the teacher.

The purpose of this paper is to discusses the findings of a preliminary study conducted during requirements/analysis phase. The objective of the preliminary study is to investigate the problems or challenges face by the school teachers in the current digital teaching & learning environment. From the result, we recommend an intervention ICT infographic module based on high frequency ICT education applications or tools chosen by the stakeholders to increase the ICT readiness and competence of the teachers. Teachers' experience using the tool will affect their readiness, acceptance and ease of use towards the tool in teaching [6]. Thus they need to be train to use computers, online facilities, graphic and multimedia, electronic communication, video and animation in classroom environment [7].

The rest of the paper is organized into sections of related works; method explaining the research phases; results and findings; discussions; and finally concluded with the future works and conclusions.

2. Related Works

In Malaysia, a study is conducted to evaluate Malaysian teachers' levels of ICT integration and its impact on teaching and learning [2]. The results show that the teachers' ICT integration is at a low level, while their pre-integration of ICT is at a moderate level. Study by Nikolopoulou *et al*., [3] also found that the lack of funds, internet access and the large number of students in the class are the main barriers to the use of computers in schools. While Baturay *et al*., [8] showed that access to the internet and computers had no relationship with the intention to accept technology, but there was

a significant relationship between computer competence, attitudes towards computer-assisted education and the intention to accept technology. Findings by Hasin *et al*., [9] revealed that a majority of the responds perceived the use of ICT positively, despite the lack of facilities and expertise, and the need for relevant ICT intervention training is raised by them.

During the COVID-19 pandemic, the increasing of requirements of teaching and learning in schools to be conducted online created challenges for the school administration to increase the readiness of teachers to use and apply digital teaching and learning. Meanwhile, teachers need to change their perceptions, lack of confidence, lack of trust or fear to face this challenge in performing their duties with complete dedication. In 2020, The Ministry of Education Malaysia, through the Digital Learning (MoE-DL), introduced the DELIMa (Digital Educational Learning Initiative Malaysia) portal into the school education system. The platform collaborates with Microsoft, Google and Apple [10] and offers digital or online 4IR learning applications and services to teachers and students. These include resources and enabling technologies such as Google Classroom, Microsoft 365 and Apple's Teacher Learning Center [11].

A study by Baturay *et al*., [8] showed a significant relationship between computer competence and attitudes towards computer-assisted education with the intention to accept technology. This is supported by Yunus *et al*., [12] which revealed that both the students and the teachers possessed high positive attitudes towards the use of ICT tools in literature lessons but the implementation and usage do not demonstrate the attitude. Furthermore, Abdul Razak *et al*., [7] shown that the instructors have demonstrated positive attitudes towards ICT application in EFL classroom as they claimed that the technology helps in creating conducive environment for effective teaching and learning. Technology acceptance research in teaching and learning has become an attractive trend, which mark the issue of learning technology acceptance or rejection could be essential [13]. study on the use of educational portals was also conducted by Pynoo *et al*., [14] to find out the factors that influence teachers' acceptance of technology. They suggested guidance to education policy makers and schools in introducing education portals.

A Computer self-efficacy is defined as judgment of one's capability to practice a technology to complete a particular job or task [15]. Study by Joo *et al*., [16] show that teacher self-efficacy, perceived ease of use, and perceived usefulness of using technology affected teachers' intention to use technology. While Haron *et al*., [17] found-out that technology acceptance factors include performance expectancy, effort expectancy, social influence and facilitating condition. Study by Nikolopoulou *et al*., [3] agreed that teachers' confidence in technology and pedagogical training in ICT resulted in a higher probability of using computers in the classroom. Thus, in today's education, teachers need to master and have ICT literacy because they have no choice but to utilize online educational technology and applications [18]. Study by Razak *et al*., [19] suggested some implications and recommendations that include providing training programs for teachers and forums with experts of the fourth industrial revolution.

4. Method and Material

The research methodology based on instructional design (ID) and adopted Design Development Research (DDR) methodology [20,21] by distributing the phases into four main phases as following:

- Analysis phase
- Design and development phase
- Implementation phase
- Evaluation phase

4.1 Analysis phase

The phase is to identify the problems and requirements in adopting digital teaching and learning among teachers. involves discussion and preliminary research in the form of a survey of stakeholders (teachers, school principals and administrators, and district education officers). A preliminary study is conducted on the current digital teaching and learning environment to identify the problems and needs of teachers, and also pupils' problems from the teacher's perspective. Simultaneously to identify and determine the ICT skills and technology required by the teachers. This paper discusses this phase in detail.

4.2 The design and development phase

The phase involves creating and designing the digital learning content of the ICT intervention modules. The infographic modules are designed, compiled and produced in an interesting way to promote ease of use. Additionally, during this phase, the research instruments survey is also developed in a form of online questionnaires to assess the extent of teachers' acceptance in utilizing ICT in their T&L. Instruments for pre and post-evaluation of effective training are also being developed for use during the evaluation phase.

4.3 The implementation phase

The phase involves in the organizing of ICT intervention training, which is to conduct knowledge and technology transfer workshops using ICT infographic modules that have been developed. This training can be used as LADAP (In-Service Training for teachers and schools) as one of recognized certification for Malaysian teachers. The training is divided into three sessions which are: session 1- theory and practical (hands-on), session 2 - task/exercise to the participants, and session 3 - task/exercise evaluation. The sessions will apply gamification approach where task/exercises is part of the gamification elements of challenges and rewards [22]. Gamification is a motivating and effective methodology for the acquisition of content and skills necessary for future teaching [23]. Thus, teachers could gain experience in conducting classes effectively and in accordance to the Standard of 21st Century Learning (*Pembelajaran Abad ke-21*- PAK-21).

4.4 The evaluation phase

In this phase, an evaluation is conducted to find out the effectiveness of the ICT intervention training during the knowledge and technology transfer workshop. A survey will be conducted at the end of the workshop session where participants will give their responses and feedbacks for the whole ICT intervention training including the infographic modules that has been developed and used during the training. Analyses of the survey is done in term of acceptance of the technology and also the effectiveness of the workshop conducted.

5. Results and Findings

This section will discuss the results and findings of the preliminary study during the initial stage of the research. The preliminary study is conducted during the requirement phase to gather

information about digital/online teaching and learning from the stakeholders – which involved the Hulu Langat District Education Department, the administration of the school such as principals, and teachers in Bangi Zone, Selangor, Malaysia. The survey used questionnaires and is conducted online.

The objective of the preliminary study survey is to identify the problems, needs and requirements of the school teachers in the acceptance of technology to conduct digital/online teaching and learning environment.

Study sample: The preliminary study received 178 responses from school stakeholders in Bangi Zone. Out of these 178, five are discounted from three similar respondents who filled the form multiple times. Thus 173 responses are computed, analyzed and discussed in the results and findings.

5.1 Demography results

Demography results of the respondents gathered are in term of gender, age, school, subjects teach and level of ICT literacy. Table 1 shows the ICT literacy level of the respondents, and the percentage is visualized in Figure 1. Figure 1 shows that the level of ICT literacy of the respondents are 4.05% high, 80.35% medium and 15.61% low. Means that more than 90% of teachers have moderate and low ICT literacy.

Table 1
ICT literacy level

ICT Literacy	Number of respondents	Percentage (%)
Low	27	15.61%
Medium	139	80.35%
High	7	4.05%
Total	173	100%

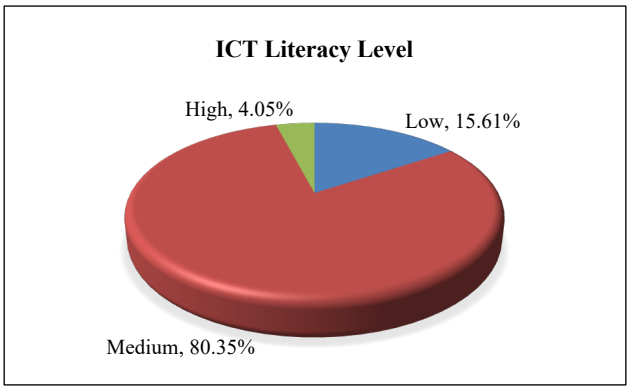

Fig. 1. Percentage in term of ICT literacy

Figure 2 show the distribution of gender and age ranges for the respondents in percentage. For gender: the respondents are 89.61% female teachers and 10.39% male teachers. For age ranges, the highest percentage is among 40-50 with 45.33% while only 4% teachers are within the age of 20-30 years old. Findings show 26% among ages of 30-40 years old and 24.67% among 50-60 years old.

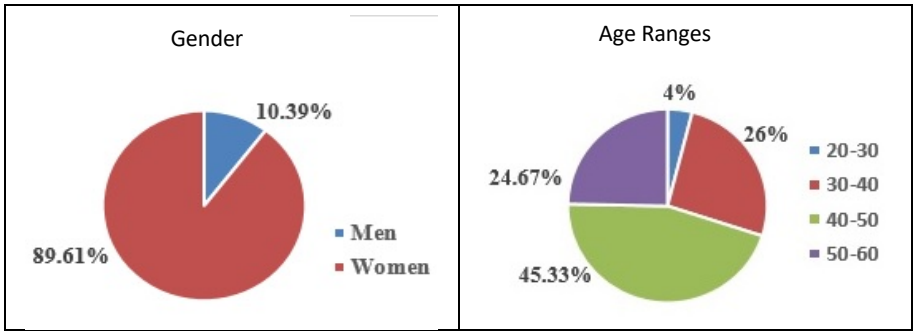

Fig. 2. Percentage of gender and age ranges

5.2 Problem factors face by teachers

An open question is given for respondents to list-out problems faced by them to conduct digital teaching and learning online. Each respondent can fill-in more than one problem. Based on the results, the factors are distributed into time constraint, Internet access, software/hardware specification, Students' participations, Teachers' ICT literacy competency, technical problems, teacher readiness, timetable and resources. Based on the findings, there are five factors occurred more than once and listed in Table 2. Factors occurred only once is taken out from the list.

Table 2
Factors frequencies

Factors	Frequencies	Percentage (%)
Time constraint	8	4.49%
Internet access	56	32.94%
Software/hardware specification	8	4.71%
Students' participations	52	30.59%
Teachers' ICT literacy	49	28.82%
Technical problems	5	2.94%

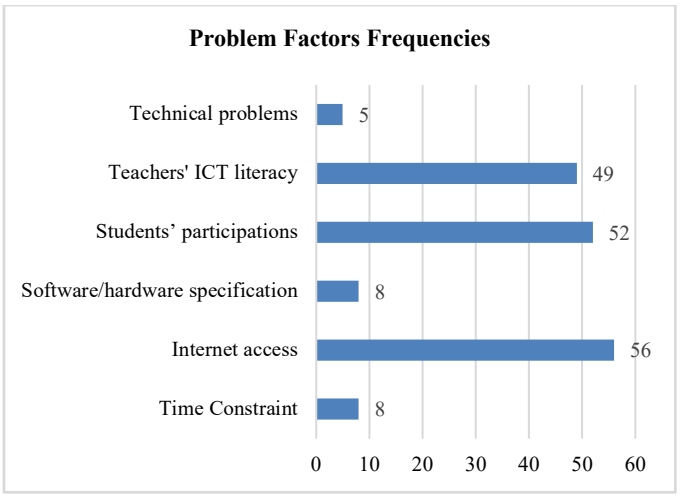

Fig. 3. Frequencies of problem factors faced by teachers

The highest factor is Internet access (56), which is similar to the study done by Nikolopoulou *et al.*, [3]. The second factor is students' participations (52) followed by ICT skill and literacy of the teachers (49). These factors contribute to 32.94%, 30.59% and 28.82% respectively. Figure 3 shows the frequencies of problem factors faced by teachers in conducting digital teaching and learning.

5.3 ICT Application Tool for Education

Based on the study, the needs of ICT tool or application for education were also identified. Table 3 shows the frequency of the six (6) highest choices of ICT educational applications that were chosen by the respondents: Bangi Zone teachers, Selangor. All of these applications are also included in the application provided in the DELIMa-KPM initiative.

Table 3
ICT application/tools for education

ICT application tool	Frequency	Percentage (%)
Canva	74	28.14%
Google Classroom	59	22.43%
Jamboard	39	14.83%
Padlet	34	12.93%
Kahoot	30	11.41%
Quizizz	27	10.27%

Figure 5 visualize the ranked of ICT application tool in percentage/frequencies from lowest to highest voted by the respondents. The highest tool selected is Canva (74 frequencies: 28.14%), followed by Google Classroom (59 frequencies: 22.43%) and Jamboard (39 frequencies: 14.83%). Based on the findings, we chose Canva as our initial focus in the ICT intervention training. The Google Classroom is an enabling technologies which is commonly used by the teachers as their main platform for conducting teaching and learning, so we chose the next top three and add Jamboard as our second tool to focus in this study.

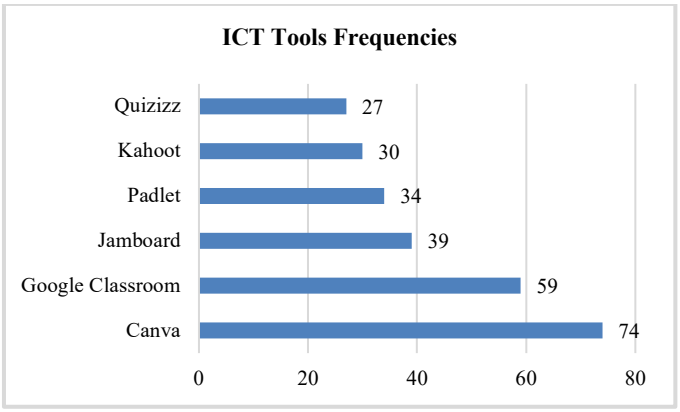

Fig. 4. Frequencies of ICT tool selected by teachers

Other than these findings, the teacher also asked about the problems faced by the students in digital/online teaching and learning. We also asked the respondents for suggestions to improve both challenges faced by them and their students. Among the feedback are enhance the teachers' ICT literacy and skill by providing ICT tutorial and training while improving the internet and digital facilities for the teaching and learning session and environment.

6. Discussions

The demographic results show that 95.96% teachers has moderate and low ICT skills and literacy. Analysis on the problems demonstrate that the teachers' ICT literacy is among the highest challenge that need to be address other than internet access and students' participation. Hence this study will

conduct an ICT intervention training to improve teacher literacy and skills as suggested by Abdul Razak *et al*., and Razak *et al*., [7,19]

Based on the finding show in Table 3 and Figure 5, the ICT tool needed are Canva, Google Classroom and Jamboard among the top three listed by the teacher. Hence we develop two infographic modules for Canva and Jamboard as reference and guide for the teacher in using and applying them in the digital teaching and learning environment. Figure 5 show the modules that have been develop. Next phase is to conduct ICT intervention trainings using these infographic modules and get feedback from the participants.

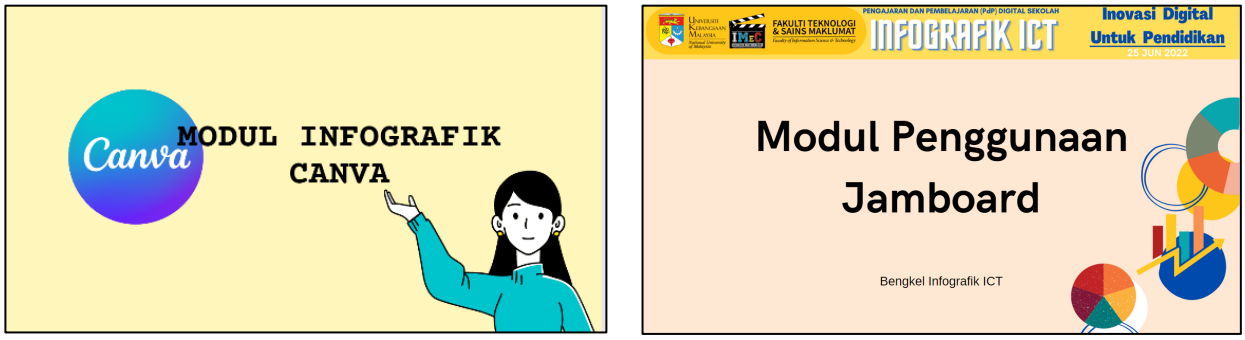

Fig. 5. Canva and Jamboard infographic modules

7. Future Works and Conclusions

This paper contributes in understanding the problems faced by the teachers as the main focus. Additionally, the teachers' need is also identified in term of educational technology tool that they would like to master in conducting digital T&L. Thus the study will provide training programs for teachers as suggested by Razak *et al*., [19].

The study has a significant impact to the education community to helps in increasing the readiness and the competence of the teachers in using ICT for digital teaching and learning. In such will improve teachers' acceptance towards ICT. However to enhance the effectiveness of the implementation of ICT in teaching and learning environment, the teachers must identify the suitable approach, the factors that hinder the approach as well as students' level of interest in using the approach [24].

The study of each technology provided in the DELIMa platform has not yet been done comprehensively to find out the extent of acceptance and willingness of teachers to use it in the classroom. Hence this study supports the national initiative in utilising the DELIMa platform provided by the Malaysian Government in contributing a positive impact to the education system for teachers and students. The results of the study can be used by Malaysia Ministry of Education to evaluate the effectiveness of use and improve the implementation of the DELIMa platform. The study also support PAK-21 standard and skills [25] which includes elements of communication, collaboration, critical thinking, and creativity [26] that support the aspirations of the Malaysian Ministry of Education (Kementerian Pendidikan Malaysia).

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