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TPACK Development in Teacher Education Programs: Malaysian Context

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Abstract
This paper reviews on the development of Technological Pedagogical and Content Knowledge (TPACK) in Teacher Education Programs from the perspective of Malaysian context. Through the findings of previous research, this paper discusses the current scenario of technology integration in Malaysia and issues related to technology integration in education. To conclude, Malaysia has future potential to further develop and establish technology integration using TPACK framework in the educational system.
Keywords: Technological Pedagogical, Content Knowledge, Teacher Education Programs.

Introduction

The use of technology in education is often discussed and has become a major research topic in the study of researchers in the recent few years. In the era of fast emerging technology, the technology itself is no longer be used as teaching tools but as a source of knowledge that can be applied to the subject being taught. This technology and other innovations in the field of education have led to the emergence of new teaching theories, theories of curriculum integration and new teaching models in all fields related to education (Garba, Kaur, Singh, & Yusuf, 2013, p. 61).

Looking at the perspective of the integration of technology in Malaysia education system, through the Government Transformation Plan (GTP), education policy has not yet implement TPACK framework as a framework within the integrated education curriculum in the Ministry of Higher Education. Nonetheless, technology in the existing education policy of ICT in Malaysia is designed as a tool for improving teacher performance in delivering teaching and learning in the classroom (Frost & Sullivan, 2010). On top of that, the integration of technology in education needs a careful planning in transforming changes in curriculum content and pedagogical training in addition to the existing access of ICT facilities in modeling the use of technology in their training (Garba et al., 2013, p. 60). Hence, teacher education program is seen as a platform that plays an important role in preparing future teachers to deliver the content of subject in education disciplines which is characterized by these technological changes (Finger, Jamieson-Proctor, & Albion, 2010).

TPACK

TPACK framework is a framework adapted from the Pedagogical Content Knowledge framework by Shulman, (1986) for the purpose of integrating technology in education. It was developed by Koehler & Mishra, (2006) in the purpose of technology integration in education as a way for teachers to understand how to integrate technology effectively in the subject they teach in their classrooms. TPACK framework has currently become a reference of many types of research in integrating technology for teacher education. It has emerged as a clear and useful framework for researchers working to understand technology integration in teaching and learning (Baran, Chuang, & Thompson, 2011).

The TPACK framework composed of seven knowledge bases, whereby the three main components of teachers' knowledge are the Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK). The other subcomponents which intersect between and among these cores of knowledge are PCK (pedagogical content knowledge), TCK (technological content knowledge), TPK (technological pedagogical knowledge), and TPACK (Koehler & Mishra, 2009). Figure 1 shows the diagram of TPACK framework which has potential in many types of research of technology integration in education.

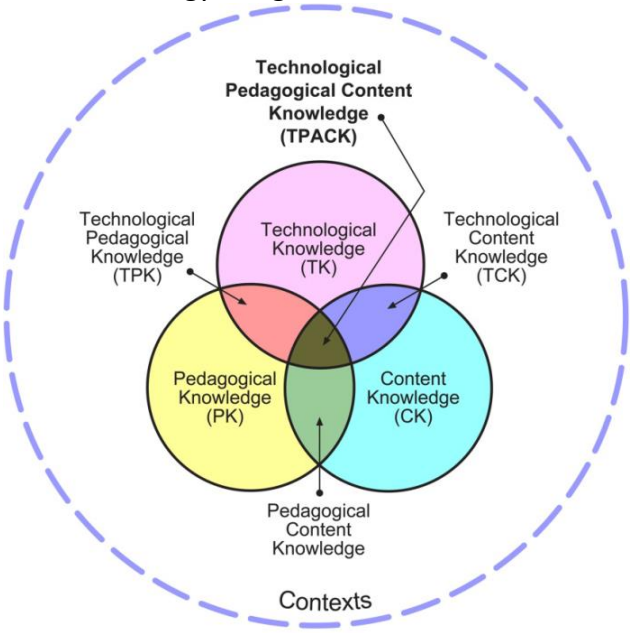

Figure 1. TPACK Framework by Mishra & Koehler (2006)

To understand more on each of the knowledge bases of TPACK, its components' definitions are being stated as below:

1. Technological knowledge (TK) describes the knowledge in the use of technological tools such as operating systems and software as well as the general use of such software sets such as word processors, spreadsheets, browsers, and e-mail. It also describes the knowledge of installing and removing peripheral devices, and software programs technically, and create archive documents (Mishra & Koehler, 2006, p.1028).

2. Pedagogical knowledge (PK) explaining knowledge about teaching and learning methods which include educational purposes, values, and aims. It is a deep knowledge of the training process of teaching and learning and how they relate to classroom management, lesson plan development, and implementation, and student assessment. It also includes knowledge of teaching methods in the classroom and strategies for evaluating student understanding which requires the understanding of cognitive, social, and developmental theories of learning and how it is applied to learners (Mishra & Koehler, 2006, p.1026).
3. Content knowledge (CK) describes the actual knowledge of a subject to be learned or taught. It includes an understanding of the subjects taught, key facts, concepts, theories and procedures in the respective field (Shulman, 1986; Mishra & Koehler, 2006).
4. Technological Content Knowledge (TCK) explains knowledge of the subject being presented using technologies which cover on ways to create new presentations for specific content (Schmidt et al., 2009).
5. Technological Pedagogical Knowledge (TPK) describes knowledge of technology use in producing different types of teaching methods and ways of which technologies can be used in teaching, and in understanding that teachers' teaching method could change by using technology (Schmidt et al., 2009).
6. Pedagogical Content Knowledge (PCK) includes knowledge of teaching methods being described through that particular subject content. It combines knowledge of content and pedagogy in order to produce better teaching practices in a whole teaching process (Shulman, 1986).
7. Technological Pedagogical Content Knowledge (TPACK) describes knowledge of using technologies in delivering teaching methods for subject matter contents appropriately. According to Schmidt, Baran, & Thompson (2010, p.124), TPACK can be defined as:
   i) Knowledge required by educators for integrating technology into their teaching in any content area. It needs their understanding of the interactions between the core components of knowledge (CK, PK, TK) by using relevant teaching methods and technologies in teaching.
   ii) Covers the integration of the domains in the framework which are CK, PK, and TK.
   iii) Able to develop an instrument which measures all interactions of CK, PK, and TK.

DISCUSSION

The integration of technology in education is a necessity in the sense that current education is heading towards the 21st-century education. Recent studies show that teachers are not able to integrate technology in teaching and learning successfully to produce effective teaching. As in Malaysia educational context, ICT is only utilized in some schools, especially those in urban areas that provide ICT facilities and access for the purpose of teaching and learning, including schools which involved with the Smart School Project (Awang, Ismail, Flett & Curry, 2011).

Recognizing the importance of integrating technology in education in achieving the goals of Vision 2020, The Ministry of Education has launched the 'Smart School' project in January 1997 as one of the seven flagship applications of the Multimedia Super Corridor, which is managed

by the Multimedia Development Corporation. This project involved 88 schools being chosen as model schools. In line with that, 8000 schools were equipped with computers and related applications, software and courseware were introduced (UNESCO, 2008). The aim of the Malaysian smart school project is to provide good ICT access for teaching and learning. However, it is seen that the structure of the smart school is not significant with the structure of Teacher Education Programs for pre-service teachers, and seems to lack of partnership collaboration between the school and Teacher Education Program (Hasniza, 2014). This statement is supported by Engida, (2011) claiming that teacher education programs do not prepare teachers to teach with technology adequately because there is a lack of national policy on teacher training institutions in terms of pedagogical interactions of ICT. She also claimed that there is a lack of theories and conceptual frameworks that could actually contribute and guide research and action in the area of teaching with technology. Although technology is on the rise in society and schools, many teachers are not effectively incorporating technology into their teaching and learning process (Crompton, 2015). Along with that, Martin, (2015) in his study, claimed that pre-service teachers lacked knowledge, skills, and experiences in integrating technology into their teaching and learning even they realized its importance.

In order to produce future teachers who have skills in integrating technology, these skills should be learned while preparing them in teacher training institutions. Findings of previous research showed that pre-service teachers are still having difficulties in integrating their content with technology as the resource. A wide range of technologies can be applied as a source of instruction but not being integrated due to the lack of technology skills during their teacher training program. Preparing pre-service teachers with opportunities to observe models related to the use of technology in the classroom as well as opportunities for hands-on teaching experience in the educational setting will enable them to enrich their skills on TPACK (AACTE, 2008). Hence today's teacher education programs should be providing pre-service teachers with ample preparation in shifting instructional approaches enriched with innovative educational technologies.

In a study of Chai, Koh & Tsai (2010), a course entitled "ICT for Meaningful Learning" was designed using the postulations of the TPACK framework in order to prepare Singapore pre-service teachers for technology integration. The course comprises of 12 two-hour sessions, and its components provided pre-service teachers with three TPACK knowledge sources. The finding showed that the designed course which uses specific technology tools teaching approach support pre-service teachers' development of TPACK components which are TK, PK, CK, and TPCK. This study has been done due to the claim that many teacher education institutes offer a stand-alone technology course for teacher preparation which focuses only on ICT skills which do not adequately prepare pre-service teachers to integrate technology into their future teaching. This statement is supported by Engida, (2011) mentioning that although computing skills are important, skills-based courses are not enough for preparing teachers to teach with technology, because they are usually taught in isolation from a subject-specific context. In fact, in a national study by Hasniza, (2014), effective use of ICT in delivering the teaching meaningfully requires the teacher to understand how ICT connects with pedagogy and content. As an alternative to more traditional stand-alone courses, Hersh (2013) suggests that the use of

technology should be embedded in content-specific and methods coursework to increase teacher candidate confidence in their technology implementation skills.

Higher educational institutions in many countries have not yet include Technological knowledge in the integrated model of teaching which currently focused on Pedagogical and Content Knowledge (PCK). Rocha, Mota, & Coutinho, (2011) mentioned the importance of curricular integration of ICT in the educational policies level occurred as a recurring question nationally and internationally. In spite of that, Rocha et al., (2011) claimed that TPACK framework has shown to be one of the most relevant theoretical frameworks for the design of effective training programs for teachers, thus it is crucial to integrate the technology into the curriculum. In response to this, Martin, (2015) in his study claimed that there is a heavy reliance upon the traditional, stand-alone technology courses to provide all of the technology knowledge needed by pre-service teachers since that many universities have not yet moved to full technology integration Consequently, the effectiveness of TPACK-driven ICT programs have not yet been widely reported especially in an Asian context (Chai, Koh, & Tsai, 2010).

In the early stage of TPACK development in Teacher Education Programs in Malaysia, teacher educators have started to do research in this area. Researchers in the field of education began to carry out studies on the effectiveness of the various structures of the courses and emphasized on the technology approach in teaching and learning process for teachers. A research conducted by Md Zain, (2013) found that the concept of media integration in the Media Integration Analysis Worksheet (MIAW) based on the three knowledge domains (TPACK) will foster student-centered teaching allowing for individual differences in learning styles to boost teachers' performance. Hasniza, (2014) studied Pre-service Teachers' TPACK and Experience of ICT Integration in Schools in Malaysia and New Zealand. The findings showed that field experience which is the context of TPACK framework being studied is important to support pre-service teachers in developing their teaching competencies using ICT and interweaving TPACK into their teaching practices. Some studies have also attempted to specify TPACK for online instruction. A study to design, develop and evaluate an online e-learning tutorial system to instruct pre-service special educators in Malay braille code was conducted by (Lee, Mohamed, & Altamimi, 2014). 77 pre-service special needs educators and learners' satisfaction and confidence in evaluating this system were perceived. The findings stipulated that the system (http://ekodbraille.ses.usm.my) is feasible in supporting braille code instruction online independently. Raman, (2015) has carried out a study on pre-service teachers' confidence on TPACK in Universiti Utara Malaysia. The findings showed that the pre-service teachers have a high level of competency, confidence and lastly TPACK.

Technology integration that affords students relevant learning, engaging instruction and technical skills that will assist them in their future is essential (Frazier, 2011). As in Malaysian context of integrating technology in teacher education programs, most of the technology courses offered in the programs are skill-based courses which being taught as a stand-alone course. The best example to evident this scenario is Sultan Idris Educational University (UPSI) since that it is the only higher educational institution that focuses on education field and offers the most teacher education programs of all.

To date this university offers 29 teacher education programs (University Recruitment Unit, 2016), yet, the TPACK-based curriculum has not being implemented in all courses being offered to pre-service teachers. The three primary foci for developing TPACK in teacher preparation programs are through a dedicated educational technology course, content-specific teaching methods, or practicum courses; or through the duration of coursework in a teacher preparation program (Hofer & Grandgenett, 2012, p. 87). In line with this, the current curriculum of TEP in UPSI has been improvised to suit the educational environment of digital natives, whereby the practical use of technology and ICT usage has been stated as one of the course learning outcomes (CLO) in every course of the respective programs. There are a few compulsory courses that provide basic and enhance technology skill-based courses which are a stand-alone course. However, realizing the importance of producing future teachers with skills to integrate technology into content and pedagogical knowledge, the curriculum of TEPs in UPSI has been revised and a few courses of technology integration have been implemented (Quality and Academic Development Unit, UPSI). The technology integrated courses which related closely to TPACK implementation is namely Instruction, Technology and Assessment 1 (KPD 3016) and Instruction, Technology and Assessment 2 (KPD 3026). Pre-service teachers are required to fulfill both courses during teacher training in order to graduate. This is one step ahead as an initiative of the University to produce qualified teachers who are well prepared and highly skilled in integrating technology in teaching and learning in facing the real world of 21st-century education.

Conclusion

From the educational perspective, technology is no longer seen as a tool in assisting teachers to implement better teaching method in the classroom. Instead, it has become a source of knowledge for teachers in delivering the content of a subject being taught to the students. Hence, technology integration in teacher education programs is vital in preparing future teachers for the 21st-century education. Malaysia itself is moving towards the transformation of technology in various fields including education. To drive the transformation, Ministry of Education in Malaysia has taken measures to improvise the educational system and curriculum of higher educational institutions including teacher education programs. It is expected that teacher education programs in Malaysia will finally implement TPACK-based curriculum as in whole in order to produce teachers who are knowledgeable and highly skilled in technology integration in the future.

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