Importance of Technological Pedagogical and Content Knowledge (TPACK) in Design and Technology Subject

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Abstract
Clinical supervision that contains the elements of Knowledge Technology and Content Pedagogy is not emphasized by the administration especially for technical and vocational teachers who teach new Designs and Technology subjects in schools throughout Malaysia. The purpose of this study is to identify needs PTPK element in clinical supervision among Design and Technology teachers (RBT) during the teaching process in the classroom. The sample of the study consisted of Senior Technical and Vocational Subject Teachers (GKMP TV) of 4 84 people in the state of Melaka. The study was carried out using quantitative methods through random sampling with the use of a questionnaire. Overall, the data shows that the element of knowledge of the content of the subject, giving the lowest mean of the pedagogical technology knowledge element. While the elements of technological knowledge, pedagogical knowledge, content pedagogy knowledge, content technology knowledge and content pedagogy technology are indispensable in the guidance process in the supervision of RBT teachers. The teacher's challenge enhances the latest technology competence, knowledge and teaching skills to become a necessity to meet the wave of a transformation of RBT subjects and achieve a high level of professionalism. Schools become a platform where teachers learn and teach students to enjoy.
Keywords: Design and Technology, Knowledge Framework for Pedagogy and Content Technology

Introduction

The noble human beings are the main model of all their students in the school premises. The great role that teachers take is to have the interest and excitement of the students to stay within the student learning environment. Great teachers are teachers who can attract their students to the teaching that goes on or outside the teaching premises as well as the students understand what is being said. The focus of the pupils will shift if the teacher does not teach the lesson with a good mood. (Shulman 1987) saying that teachers who deliver knowledge in the teaching premises need subject knowledge and how to teach them to be interesting and understandable easily. Without the knowledge and pedagogy that attracts these subjects will be bland and unpopular. RBT teachers need to master knowledge and pedagogy so that students will remain in the classroom without tears. Teachers who can not master the knowledge cause a boring classroom atmosphere and ultimately the absence of students in the classroom (Palmer, 2017).

The quality of teaching of teacher teaching becomes a major measure of the success of pupils and a subsequent school of human capital that will be born in the future. Measurement of the teacher's quality model was developed by the scholar of Slavin (1987; 19 9 5) focusing on teaching quality, teaching level, teacher incentive and teaching time. Empirical studies conducted in Malaysia by Roslena (2013) show that the quality of teaching makes the teacher able to convey the knowledge, concepts and skills to the students in an awe-inspiring environment. Based on researchers Atkins and Brown (2002) quality teachers can deliver regular and systematic instruction along with easy-to-understand examples. Teachers can also relate the contents of the lessons taught with upcoming knowledge based on new concepts through the use of teaching aids to students (Taber, 2007). Measuring the quality of teacher teaching can be seen based on clear and specific teaching objectives and the evaluation to the level of understanding students can be implemented at the end of the teaching session.

Quality teachers play a role in identifying the level of suitability of the teaching and strength of the students in front of them. Good teachers can give lessons based on the level of understanding of pupils because if a high level of teaching is given to students who are at a weak level will cause them to be bored and lose their focus. According to Slavin (198 7), students need to be categorized according to their intellectual ability in order to gain, understand and focus on what they are learning. The 21st-century teaching and learning was introduced to enable teachers and students to collaborate in teaching and learning so that intelligent students can help classmates (KPM, 2012).

The ability of teachers to motivate students to learn new knowledge is a measure of the quality of teacher teaching. According to Slavin (1995), a method that motivates students to continue teaching is through teaching and teaching aids. Teachers need guidance and guidance to improve their skills and knowledge. Accordingly, according to Yusof et al. (2008) time constraints, no specific guidance and lack of materials and skills to make instructors unable to improve their skills. It is clear that there is a lack of clinical supervision on the elements of knowledge, technology and skills to guide teachers. Consequently, it is appropriate to develop a clinical supervisory instrument based on the requirements of this TPACK framework element.

TPACK

Changes in the curriculum are the main agenda in education to reach a global level of globalization. In cross-cutting the curriculum change, teachers are the main agents to be

focused on. Changes in education focus on quality teachers to teach and conducive environment of teaching environment (Mastuti & Aziah, 2011). Therefore, every change in the school curriculum is the teacher's most important role. According to Habib (2007), teachers shape and evaluate the curriculum change through the selection of teaching materials, meaningful aids, teaching strategies, activities to be implemented, and teaching skills.

The curriculum changes that struck require specialized research into the knowledge of the subject matter taught. The model introduced by Shulman (1987) in which specialization is given to the understanding of the subject matter and the usefulness of the teacher. However, this model has been improved by Mishra and Koehler (2006) where the elements of Content Pedagogy Knowledge Technology or TPACK have been introduced. Mishra et al (2010) states in 21st-century teaching, teachers need to master TPACK which includes knowledge, skills and technology in order to transform teachers more effectively during learning. In order to realize the curriculum change, all teachers need to adapt to the latest technological changes and requirements in order to align with the 4th Industrial Revolution where the use of Information and Communication Technology (TMK) is an important intermediary between teachers and students with the global world. The widespread change in digital technology makes teachers need to accept it as a major challenge in the Education world (Mishra et al. 2010).

Addressing the current 4th industry revolution, teachers need to equip themselves with a transformation in knowledge and technology to educate Z generation today. This is because the technological revolution basically causes changes in the way of life, work and connect with each other (Schwab, 2015). Teachers as role models to pupils need to bring about changes in themselves so that they can guide students into global technology globally and able to compete completely. The 4th world of industrial revolution not only sees what we do but more to who we are in the outside world (Schwab, 2015). As such, teachers need to be innovative in their teaching in line with the latest technology world. The teaching of teachers closely related to technology, knowledge and pedagogy is based on their competence within the TPACK framework.

TPACK is a framework that combines knowledge and pedagogy with the use of information technology to enable teachers to develop pedagogical knowledge and skills as well as to enhance student learning (Harris & Hoffer, 2009; Hofer & Harris, 2010; Graham et al, 2012). Mishra and Koehler (2006) have developed a TPACK framework which consists of seven essential elements: (1) CK = content knowledge, (2) PK = pedagogical knowledge, (3) PCK = pedagogical content knowledge, (4) = technological knowledge, (5) TPK = technological pedagogical knowledge, (6) TCK = technological content knowledge and (7) TPACK = technological pedagogical and content knowledge.
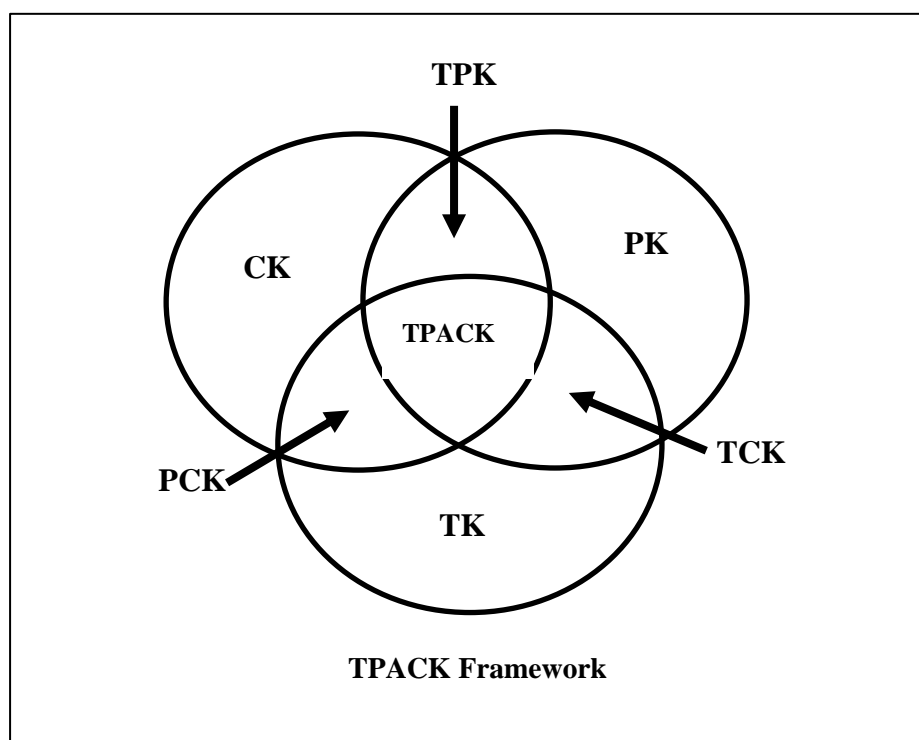
Figure 1: TPACK Framework (Mishra & Koehler, 2006)

These seven elements emphasize the integration of knowledge, skills and technology that can be used by teachers in the premises of teaching in schools. Teachers feel depressed to learn something new about integrating technology into their teaching (Mishra et al., 2010). Some studies have shown that the level of technological integration with teachers' knowledge and skills has not succeeded (Bauer & Kenton, 2005; Gulbahar, 2007; Keengwe, Onchwari & Wachira, 2008).

In Malaysia it is based on a study by Desa et al. (2013) determining the effectiveness of teaching, teachers look at the mastery of subject matter taught in detail and deeply with the help of related teaching aids. To ensure quality teaching, teachers need to have the resources available to enable them to obtain quality information. However, the integration of technology in teaching can enhance student understanding in school learning. The study by Mustafa (2016) has a great implication in which the TPACK framework can influence the level of teachers' understanding thus increasing the professionalism of Integrated Living Skill teachers. He suggested that the focus of mastery focus on TPACK so that teachers can meet the challenge of emerging new technologies with network applications and enhancing collaboration.

Completely, the distinguished researchers listed the seven key components of the TPACK framework as in Table 2 below:

No	Element	Description	Scholar
1	Technology Knowledge (TK)	Knowledge of various technologies ranging from low technology (pencil, paper to the internet, interactive whiteboard, computer equipment, software)	Schimdt et al (2009)

2	Pedagogical Knowledge (PK)	Deep knowledge of the process, training or method of teaching and learning is the purpose and value of education	Harris et al. (2007)
3	Content Knowledge (CK)	Kandungan is a subject that needs to be learned and taught	Koehler et al. (2007)
4	Technology Pedagogy Knowledge (TPK)	Knowledge of pedagogical activities that teachers can relate to using technology	Cox & Graham (2009)
5	Technology Content Knowledge (TCK)	Knowledge of how to represent the concept of technology within a subject matter	Cox & Graham (2009)
6	Pedagogy Content Knowledge (PCK)	The ability of a teacher to modify his / her knowledge of the contents to the appropriate form for the teaching approach	Lilia & Subahan (2002)
7	Technology Pedagogy and Content Knowledge (TPACK)	How to teach a particular ingredient by using the best technology in a way that suits the needs and wants of a student	Harris & Hofer (2011)

Source: Mustafa et al. (2016) pp. 153
Figure 2: Elements in TPACK

In conclusion, the teachers in the service should always make changes in themselves in terms of subject knowledge taught the latest teaching skills and the digital technology that has led the students to be happy and waiting for teachers to be in the teaching premises. Teachers should always be prepared with the methods, strategies, teaching approaches in addition to the information and communications technology they are incorporating in their teaching. Therefore, this study looks at the TPACK framework elements required by teachers to improve their professionalism in teaching from the perspective of a supervisor or GKMP TV.

Research Objective

The objective of this study was to determine the needs of the TPACK framework elements required by the Senior Technical and Vocational Subject Teachers (GKMP TV) during conducting clinical supervision on Design and Technology (RBT) teachers in Malaysia

Methodology

The quantitative positivism paradigm becomes the subject of this study. This study uses a quantitative approach with survey research method in the form of descriptive analysis. The questionnaire was used as a measuring tool for information related to the needs of the elements in the TPACK framework to guide the RBT teachers continuously by GKMP TV. The questionnaire was developed based on the demographic arrangement and TPACK framework using 5 Likert scales and was given through two language validity experts and 3 content experts based on Berliner (2004). Then the questionnaires were piloted through the reliability process with a pilot study on 60 GKMP TVs.

The data obtained were analysed using the Statistical Package for Social Science (SPSS) version 25 and the Alpha Cronbach 0.959 (Creswell, 2003). Sampling by zone cluster is North (Kedah), South (Johor), Central (Selangor), East (Pahang) and Borneo (Sabah). According to

Krejcie and Morgan (1970), 1989 population survey requires a sample of 320 plus 20% by Fraenkel and Wallen (2006) bringing the total to 484 people. Questionnaire forms were given using the online application and the findings were analysed using the mean and standard deviation.

Research Findings
TPACK element
Based on the content knowledge requirement by RBT teachers shown in table 1. The table gives a decision in which RBT teachers need a very high element of Knowledge Pedagogy (TPACK) Knowledge Framework (min = 4.431). This decision also illustrates that clinical supervision needs a TPACK integration element from its aspect of Technology Content Knowledge (mean = 4.550) element.

From the findings of this study, clinical supervision of RBT teachers by GKMPTV needs to focus on the elements obtained. In conclusion, GKMPTV describes that RBT teachers need to improve the teaching of RBT based on the elements found in this framework.

Figure 1: Important of TPACK Elements for Design and Technology Subject Teacher.
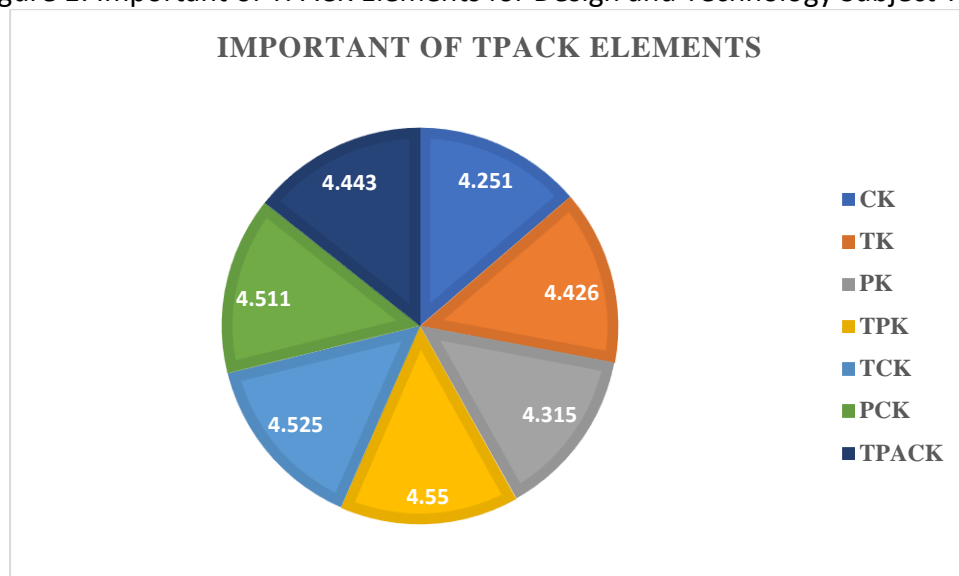
Note: mean 1.00-2.00 = low; mean 2.01-3.00 = moderate; mean 3.01 -4.00 = high; 4.01-5.00 very high

Result
The results show that the mean of the technological element of pedagogical knowledge is the highest of 4.550 and the lowest is the content knowledge element of 4.252. The overall mean of this study is 4.431 which is very high. Overall the results of the study show that the elements of the Knowledge Pedagogy Knowledge Technology framework are an important thing that makes the teaching of RBT teachers in the teaching premises attracts students. The TPACK element contained in the Shulman Model and TPACK framework by Mishra and Koehler (2006) is a key criterion in clinical supervision of teachers in training and in school services. This decision is similar to the empirical study conducted by Village et al. (20 13) and Mustafa (2016) in Malaysia. This is because teachers' competence in teaching RBT subjects can be enhanced and in line with KPM's needs to improve teaching professionalism through teaching in schools.

Conclusion

From the results of the study found that the elements necessary TPACK in clinical supervision of teachers, especially related to technology and pedagogical skills of teachers with min 5550. In other words, clinical supervision should be focused on how teachers get integrated knowledge of the course content by using technology to attract students to understand and interesting to students. Although, in 4251 low content knowledge but is still at a very high level where teachers need to constantly increase knowledge through discussion or surf the internet.

TPACK elements include teachers competence through the mastery of subject content, pedagogy, technology and a combination of them. If the teachers are able to master the subject content and be blended with the appropriate pedagogy as well as through the latest technology sophistication the teacher can attract students to the teaching of this RBT subject. Therefore, for RBT teachers in schools all over the country need to master the elements contained in this framework so that they have high confidence and motivation. Attractive teacher teaching can enhance individual affective, cognitive and psychomotor domains individually, thus generating creative and critical students in life. In conclusion, integrating elements within the TPACK framework in clinical supervision can guide RBT teachers to be further transformed through the Professional Learning Community (PLC) to enhance their professionalism.

Contribution

The importance of the TPACK framework can be translated in the form of clinical supervisory instruments for RBT teachers in schools with new elements for the use of Senior Technical and Vocational Subject Teachers. The development of knowledge theory by Shulman (1987) and the TPACK Framework (Mishra & Koehler, 2006) are applied in the development of RBT teachers' supervisory instruments across all secondary schools in Malaysia.

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