

The Profile of Technological Pedagogical and Content Knowledge of Information and Communication Technology Teachers

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Abstract

The aim of this research is to discuss about how the integration of technology, teaching method, and the teaching content that teacher should complete in teaching ICT material. The teaching method combination is used in this research. The sampling technique used is saturated sampling. This research is conducted to the ICT teacher at SMA in Kecamatan Pontianak Selatan with seven people. The instrument of this research is TPACK questionnaire and teacher interview guidelines. The data analysis is done first by using quantitative analysis, after that qualitative analysis is performed by using interactive mode technique. The result of the research shows the ability of the TIK teacher in applying TPACK with the high category. There are six component such as Technological Knowledge Profile (TK) for ICT subjects teacher in the high category, Content Knowledge Competence (CK) for ICT subject teacher in the high category, Pedagogical Knowledge Profile (PK) for TIK subject teacher in the high category, Pedagogical Content Knowledge Profile (PCK) for ICT subject teacher in high category, Technological Pedagogical Knowledge Profile (TPK) with the very high category, and Technological Content Knowledge Profile (TCK) with the high category.

Keywords: profile, TPACK

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1. Introduction

A teacher must be able to deliver the material well in learning. Learning is meaningful when there is a change in knowledge, skill, and new behavior in a person. A teacher has an important role in delivering the information that she/he knows. The material is delivered by a teacher with a good pedagogic skill. In addition to the material given and the teaching ability, the use of technology also has an important role in learning. In learning process, a teacher must design the learning program first. In other words, before teaching in the classroom a teacher should design a clear organizational material, the management class, the learning strategy, learning media, and the students learning evaluation (Fitriani., et al., 2017). The importance of work skills for students (Hendriyani.,at al, 2020; Asnur, at al, 2020).

The quality of information is the truth and the accuracy. Therefore, a teacher should has competence in this matter, namely content or the content of the correct material through a good pedagogic skill or a good teaching skill in order the learning process runs based on the meaningfulness in learning.

In order to apply this, it is important to have the Technological Pedagogical and Content Knowledge (TPACK) capabilities for the teachers, especially ICT teachers. TPACK is a skill needed by teachers to use appropriate technology, based on the analysis of material characteristics and analysis on the teaching/pedagogical aspects. The main concept of TPACK is the existence of good interaction and synergy between content/material, teaching/pedagogical ability and the use of technology. The intersection and relationship that occurs between

teaching/pedagogic ability and content/material is called Pedagogical Content Knowledge (PCK). The intersection and relationship that occurs between technology and pedagogic is called Technological Pedagogical Knowledge (TPK). The concept of TPK is a change in learning by utilizing technology to actively support learning. In addition TPK helps and facilitates the concept or teaching material. Technological Content Knowledge (TCK) is how the understanding of the use of technology and content/teaching material can help or influence other components. Pedagogical Content Knowledge (PCK) is a teaching ability that can adapt to the material to be delivered. Besides that, how the concept of material is conveyed so well that the interaction between teaching ability and learning material occurs. PCK reference is knowledge about pedagogy, learning practices and learning planning, as well as the appropriate methods for teaching a material. Based on these explanations, TPACK is a concept of integrating teaching abilities, delivering appropriate teaching materials and the accuracy of the use of technology in learning (Maryono: 2016). So that the potential possessed by the teacher is not only focused on the delivery of material to the students, but precisely in integrating the use of technology, teaching/pedagogy abilities and content / material.

As is the case in the ICT subjects where the computers are very active in every ICT learning, both in learning theory and practice. The profile of ICT teachers who are so great in learning becomes a factor in determining learning success. The teaching experience of a teacher is one of the important factors influencing teachers in mastering technology in learning and supporting the implementation of teaching and learning activities, so that the learning objectives can be achieved.

But in reality, there are still ICT teachers in the High School Kec. Pontianak who is less than optimal in the learning process, due to the inadequate facilities in the learning process, the school in question is Wisuda High School Pontianak and Sultan SyarifAbdurahman High School Pontianak. While schools with learning and facilities adequate are Santu Petrus Catholic High School, Pelita Cemerlang High School Pontianak, YPK High School Pontianak, Immanuel Christian High School Pontianak and 10 High School Pontianak. So that students in Wisuda High School Pontianak and Sultan SyarifAbdurahman High School Pontianak are difficult to understand the material/concepts delivered by the teacher/instructor. The results of the pre-observation have been carried out on 22, 25 and 26 October 2018. In the delivery of material in the subjects of Information and Communication Technology (ICT), the teachers are required to have the ability to organize teaching materials in preparation for the development of student capacity. The subject is one of the subjects that contain material in the form of theory and practice. Therefore, the selection of the appropriate teaching methods is based on the characteristics of teaching materials that provides

learning success. The varied learning models/methods can enhance optimal learning. The revised edition of the 2013 curriculum demands the scientific learning. The students are more active in building knowledge, skills and learning attitudes. The examples of learning models that become references in the curriculum are discovery learning, problem solving and project based learning. It is important for the teachers to understand the effective and efficient learning models. The learning should be done on the basis of students' initial abilities, students' thinking and learning abilities in uniting the learning process. By seeing these conditions, the teachers must have the characteristics of excellence in pedagogy, content and technology so that learning success can be achieved. The teacher profile reflects the excellent characteristics to advance the world of education.

The Technological Pedagogical and Content Knowledge (TPACK) profile of ICT teachers in the high school area in the District of Pontianak City shows that the teachers are able to integrate technology, teaching ability and the quality of the delivery of material into the learning process (Vindo: 2018). The optimal learning can be obtained if a teacher has a certain amount of knowledge, including the ability to formulate learning goals, make the evaluation tools, choose the subject matter that is relevant to the learning objectives and relevant to the evaluation tool, design learning experiences, and the ability to deliver students to master the subject matter (Rahmadhani., et al: 2016). Related to the success of learning and the ease of students in obtaining and managing learning information, it requires the teacher to master TPACK. The need for a description of the profile of ICT teachers in the southern district, whether the teacher teaches material in accordance with their competencies and how effective is the learning process in the classroom.

2. Literature Review

2.1 TPACK

TPACK is the knowledge needed by teachers to use the right technology, which is based on the analysis of the character of the material and the analysis on aspects of teaching (Sholihah., Et al: 2016). TPACK is important for the teacher to achieve a maximum learning process. The ability of integrating the technology, pedagogy/teaching, and content are applied in accordance with the context. The interaction between the three components has the power and attractiveness to foster active learning. Once, learning centered on the teacher, but now learning is centered on the students. The students can build their knowledge by mastering TPACK by the teacher. The framework needed for the teachers is an understanding of the effectiveness of learning integration. TPACK emphasizes the relationship between technology, the material content and the pedagogical approaches that interact with each other to produce learning based on Information and Communication Technology. TPACK a

type with Elearning can occur flexibly (Verawadina, at al, 2020).

The use of Technology Pedagogical and Content Knowledge (TPACK) as a teacher development to integrate Information and Communication Technology in the classroom teaching has changed how educational technology is being taught in teacher education programs (Chai &Koh: 2017). In general, many teacher education programs have refocused the education technology. A learning program with a design where the teacher assigned the student to synthesize the knowledge related to the proper use of technology (TK), pedagogical knowledge (PK), and content knowledge/character material (CK) and TPACK knowledge sources that are interconnected, namely pedagogical content knowledge (PCK), pedagogical knowledge of technology (TPK), and content technology knowledge (TCK) to produce TPACK for certain content topics.

The teachers must be familiar with various pedagogical approaches and appropriate ways of using ICT to support the development of the twenty-first century skills of their students (Valtonen, et al., 2017). The need for deepening related to hardware and software skills (Hendriyani, 2019). Knowledge of the technology pedagogical content Framework (TPACK) provides a theoretical model for learning the ways in which teachers use ICT in education. The rapid technological progress of the twenty-first century has changed the ways in which we teach and learn. As a result, the student and the teachers must be equipped to integrate technology into classroom practice, especially for certain subject matter (Tanak: 2018).

With the existence of information technology that is used extensively in educational schools, TPACK (pedagogical content of technology, and knowledge) is a unified theoretical framework adopted by a number of researchers to study, assess and advance teachers' ability to integrate IT into learning (Su., At al, 2017). By using correlational and latent profile analysis, the results show that: (1) two profiles can be distinguished; (2) TPACK and other ICT-related characteristics are positively correlated; and (3) pre-service teachers in profiles with strong TPACK, attitudes, and self-efficacy scores also report high scores on the support they receive at their teacher training institutions. Just as in ICT subjects where computers are very active in every ICT learning, both in learning theory and practice (Rukun, 2017). The implications for the role of teacher training institutions are discussed with a special focus on how to close the gap between the two profiles identified (Tondeur, et al., 2017). Teacher education programs must provide opportunities to develop their TPACK so that they can effectively integrate technology into teaching (Canbazoglu., At al, 2016).

The subjectives knowledge assessed by TPACK can be augmented by the inclusion of an objective index of pedagogical knowledge, technology and content to form a more complete picture of learning design (Drummond &

Sweeney: 2017). With TPACK, teachers also positively influence their ease of use of technology and the perceived usefulness of technology in the classroom. Finally, the teacher feels the ease for usingthe technology (Joo., At al, 2018). To maximize student learning, TPACK is used in course design, learning activities and assessment (Maor: 2018). TPACK provides insight for future social studies teachers and education departments who want to integrate technology into learning (Hilton: 2016).

To use ICT effectively in teaching, instructors must be trained in technology, content and pedagogical knowledge (Julio: 2016). Technology, pedagogy, and content knowledge (TPACK) are frameworks that propose a set of domain knowledge that is essential for the effectiveness of teaching with technology (Scherer, et al., 2017). The relationship between teacher's personal characteristics and TPACK is also moderated by the teacher's value beliefs. How to foster teacher value beliefs about technology integration (Cheng &Xie: 2018). This indicates the relationship between the teacher's personal characteristics with TPACK.

Pedagogical Technology and Content Knowledge (TPACK) framework is a conceptual tool commonly used in studies that consider integrating technology into the classroom (Mark., At al., 2016). The four domain knowledge within the TPACK framework can be distinguished, which is symbolized as core, Tech, TPACK-P, and TPACK-C. The performance and action based self-assessments are found to produce the same results except for pedagogy related to knowledge domains, specifically for pedagogical knowledge (PK), pedagogical knowledge of technology (TPK), and TPACK (Akyuz: 2018).

3. Method

The research method uses a combination method (mix method) with the form of Concurrent (Mixed Model). This study uses a sequential explanatory design research model.

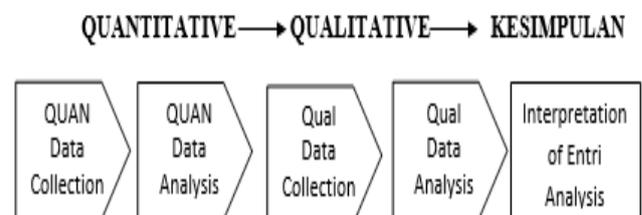


Figure 1: Research Design

Based on the picture it is seen that, the initial data was collected through a questionnaire. These results are described by quantitative data analysis. To prove the truth of the data, a qualitative data collection process was carried out with interviews and the results obtained will be compared with the results of quantitative data based on the results of the questionnaire. So that it can be known

the truth about the Teacher Profile in mastering the TPACK concept for ICT subjects in South Pontianak High School.

The teachers of ICT subjects in South Pontianak High School used as a population of 6 people. The sampling technique used is saturated sampling. Data collection techniques used are indirect communication techniques, direct communication techniques and documentation.

4. Results and Discussions

In detail, the results of the description of the data obtained quantitatively and qualitatively can be seen in each of the following results tables. So that quantitative data can be proven by the presence or absence of the truth of quantitative data.

Table 1: The Combination of Two Types of ICT Teachers Profile Data in the Field of Technological Knowledge (TK)

Id	Teacher	Acquisition Score	Maximum Score	Quantitative Results	Qualitative Results
				%	Qualitative Data
1	A	70	80	0,87	Teacher does not understand in repairing damage to the computer
2	B	63	80	0,78	Teacher is easy to understand in the use of technology
3	C	65	80	0,81	Teacher can understand the components in a computer
4	D	75	80	0,93	Teacher often uses MS Word 2007
5	E	65	80	0,81	Teacher often makes their own modules
6	F	61	80	0,76	Teacher understand the use of the internet
7	G	59	80	0,73	Teacher uses the applications related to the internet

This shows that the ability of ICT teachers in South Pontianak High School in mastering the use of technology has had a good knowledge but is not yet optimal. This is because not all ICT teachers come from ICT Education Study Program graduates. The need for deepening related to hardware and software skills is needed to the teacher. In learning, the teacher is able to

implement the ICT learning that is carried out. From the results obtained percentage shows similarity that Technological Knowledge (TK) has a good category with the explanation that shows the ability of teachers to master the use of good category technology and has been able to apply in ICT learning by utilizing the internet as a learning support.

Table 2: The Combination of Two Types of ICT Teachers Profile Data in the Field of Content Knowledge (CK)

Id	Teacher	Acquisition Score	Maximum Score	Quantitative Results	Qualitative Results
				%	Qualitative Data
1	A	22	30	0,73	Teacher has done the activities related to the ICT
2	B	23	30	0,76	Teacher is aware of the latest technological developments
3	C	22	30	0,73	Teacher is very understanding about the basic components of computers
4	D	25	30	0,83	Teacher understands the use of scanner and digital printers
5	E	18	30	0,6	Teacher often looks for the latest books
6	F	23	30	0,76	Teacher follows the development of the technological age
7	G	25	30	0,83	Teacher makes modules as the reference material for ICT lessons

This shows that the ability of ICT teachers in South Pontianak High School has a good ICT material knowledge. From the results obtained percentage shows the similarity that Content Knowledge (CK) has a good

category. This shows the teacher always follows the current technological developments. Learning resources are not only based on other books but teachers make modules as reference material for teaching.

Table 3: The Combination of Two Types of ICT Teacher Profile Data in the Field of Pedagogical Knowledge (PK)

Id	Teacher	Acquisition Score	Ideal Score	Quantitative Result	Qualitative Results
				%	Qualitative Data
1	A	40	45	0,88	Teacher often evaluates with questions
2	B	37	45	0,78	Teacher makes a lesson plan first before doing
3	C	36	45	0,8	Teacher makes a lesson plan because it is an obligation
4	D	39	45	0,86	Teacher uses projector while studying
5	E	36	45	0,8	Teacher gives freedom to the students in working on problems
6	F	32	45	0,71	Teacher searches for resources from the internet of existing teacher colleagues
7	G	36	45	0,8	Schools that do not have computer laboratories are given laptops or computers, two people get one laptop to study

This shows that the ability of ICT teachers in South Pontianak High School has good pedagogic/teaching knowledge. This is evidenced from the results of qualitative data that all ICT teachers at SMA Pontianak Selatan come from LPTK graduates, although some are not from ICT Education study programs. The pedagogy

skills have been honed and average teaching experience is over 3 years. The teacher makes lesson plans, chooses appropriate learning strategies in learning and applies the form of question evaluation. From the results obtained the percentage shows the similarity that Pedagogical Knowledge (PK) has a good category.

Table 4: The Combination of Two Types of ICT Teachers Profile Data in the Field of Pedagogical Content Knowledge (PCK)

Id	Teacher	Score Obtained	Ideal Score	Quantitative Results	Qualitative Results
				%	Qualitative Data
1	A	27	30	0,9	Teacher delivers the material that is in accordance with the available material
2	B	22	30	0,73	Teacher always prepares the syllabus and lesson plan themselves
3	C	22	30	0,73	Teacher has a good knowledge of students
4	D	26	30	0,86	Teacher always uses Ms. Word in the learning process
5	E	21	30	0,7	Teacher uses the internet media as learning media
6	F	20	30	0,66	Teacher combines material knowledge that is mixed in practice
7	G	22	30	0,73	Teacher gives remedial

This shows that ICT teachers in South Pontianak High School have applied PCK well, it can be seen that each PCK item is in the high category. From the results

obtained the percentage shows the similarity that Pedagogical Knowledge (PK) has a good category.

Table 5: The Combination of Two Types of ICT Teachers Profile Data in the Field of Technological Pedagogical Knowledge (TPK)

Id	Teacher	Score Obtained	Ideal Score	Quantitative Results	Qualitative Results
				%	Qualitative Data
1	A	15	15	1	Teacher uses the presentation slides in delivering the material
2	B	15	15	1	Teacher uses the Internet as a medium for learning
3	C	14	15	0,93	Teacher delivers materials using picture as learning media
4	D	14	15	0,93	Teacher is more dominant in using office applications such as PowerPoint and Word in learning
5	E	15	15	1	In delivering the material, teacher usually uses the question and answer method
6	F	7	15	0,46	Teacher uses presentation materials and projectors
7	G	12	15	0,8	Teacher also uses the peer tutor method in presenting the material

This shows that ICT teachers in South Pontianak High School have applied TPK well. From the percentage obtained shows the similarity that the Technological Pedagogical Knowledge (TPK) has a good category.

Table 6: The Combination of Two Types of ICT Teachers Profile Data in the Field of Technological Content Knowledge (TCK)

Id	Teacher	Score Obtained	Ideal Score	Quantitative Results	Qualitative Results
				%	Qualitative Data
1	A	20	20	1	The ability to use the technology by teacher makes it easier for the students to understand the material presented
2	B	17	20	0,85	Learning media used by teacher in the form of videos, either sourced from the teacher or other references
3	C	15	20	0,75	Teacher uses the MS. Word application, Microsoft PowerPoint, CorelDRAW, and Photoshop
4	D	19	20	0,95	The assignments given by the teacher is presented in front of the class related to the ICT
5	E	20	20	1	Teacher is aware of the latest of the technological developments
6	F	15	20	0,75	Teachers follows the development of technology from time to time
7	G	17	20	0,85	In delivering the material the teacher usually uses the question and answer method

This shows that ICT teachers in South Pontianak High School have been able to integrate the technological knowledge and content or material knowledge of ICT content or materials. In other words, the teacher has made use of technology in learning and developing the subject matter that he/she supports well. From the results obtained the percentage shows the similarity that the Technological Content Knowledge (TCK) has a good category.

Table 7: The Combination of Two Types of ICT Teachers Profile Data in the Field of Technological Pedagogical and Content Knowledge (TPACK)

Id	Teacher	Score Obtained	Ideal Score	Quantitative Results	Qualitative Results
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				%	Qualitative Data
1	A	24	30	0,8	For schools that have labs, teachers often use projector in delivering the material
2	B	21	30	0,7	The schools that do not have a lab, take turn in practicum
3	C	22	30	0,73	Teachers use the right method so that the material can be delivered to the students
4	D	22	30	0,73	Teachers work together and communicate with other teachers in integrating material, pedagogic, and technology
5	E	18	30	0,6	In practical learning teachers do not always use new or varied strategies
6	F	21	30	0,7	Pedagogic or the way or the method used by the teachers are very necessary so that the material can deliver more comfortable learning atmosphere
7	G	23	30	0,76	The teachers use the facilities available at school in the form of projectors in the delivery of subject matter

This shows that ICT teachers in South Pontianak High School have been able to apply their TPACK well. In other words, the teacher has made use of technology in learning and developing the subject matter that he supports well. From the results obtained the percentage shows the similarity that TPACK has a good category.

5. Conclusions

Technological Pedagogical and Content Knowledge (TPACK) Profile of ICT teachers in SMA Pontianak Subdistrict obtained an average of 79.9 including into the High category. This proves that the teacher is able to integrate the technology, pedagogy and material into the learning process. The results of the formulation of sub-research problems can be concluded as follows: Technological Knowledge Profile (TK) of ICT subject teachers gets an average of 81.3 with a high category. Profile Knowledge Content (CK) of ICT subject teachers gets an average of 74.8 with a high category. Pedagogical Knowledge (PK) profiles of ICT eyes teachers get an average of 80.4 in the high category. Pedagogical Content Knowledge (PCK) profiles of ICT subject teachers get an average of 75.9 in the high category. Technological Pedagogical Knowledge (TPK) profile of ICT subject teachers has an average of 87.4 with a very high category. Technological Content Knowledge (TCK) profiles of ICT subject teachers get an average of 87.9 with a very high category.

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