



Teacher's Technological Pedagogical Content Knowledge in Developing Learning Materials

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Abstract

The provision of appropriate learning materials is essential in curriculum enactment as the prescribed competences and learning method are usually advised in textbooks supplied to support its implementation. However, government-supplied textbook cannot always address schools' and students' different needs. Teachers are, therefore, required to have the skills to develop their own learning materials to meet curriculum. In Indonesia, higher order thinking skills (HOTS) and technology are required to be integrated in the teaching and learning activities of all subjects including English. It is, then, important to survey teacher's knowledge in materials development to help them acquire the required skills in developing materials in line with curriculum. This paper presents a survey study on junior secondary school teachers in Yogyakarta about their technological pedagogical content knowledge. A questionnaire was administered followed by an interview with selected teachers for further elaboration. The instrument was adapted from Schmidt *et al* (2009) and aimed to reveal teacher's knowledge on teaching and technology and how they apply this knowledge into materials development processes. The finding suggests aspects of teacher's knowledge that need further training and possible effective methods for their training as well as professional development design.

Keywords: *curriculum, materials development, teacher's knowledge*

INTRODUCTION

The framework for teacher technological pedagogical content knowledge or TPACK proposed by Mishra and Koehler's (2006) has significantly helped shape teacher education curriculum (Schmid & Hegelheimer, 2014) and teacher's professional development programs (Baturay, Gökçearsan & Şahin, 2017) in various English teaching contexts. Schmid & Hegelheimer for example initiated 'a collaborative project' between teacher trainees and practicing teachers in designing and implementing technology integration in classroom, at the end of which trainees were to reflect on pedagogical knowledge they developed resulting from the project. Baturay,

Gökçearsan & Şahin reported a government-based project called FATIH which granted schools technological tools (software and hardware) and trained a massive group of 120 thousands of teachers about technology integration in teaching. Those measures are a few examples of initiative for improving a nation's quality of education by means of technology as it is widely believed that "the use of technologies in education has had a great impact on one country's development" (Hemphill, 2013 cited in Baturay, Gökçearsan & Şahin, 2017). Using technology in classroom takes however more than the provision of hardware or software in schools. It involves teacher's awareness and knowledge system in planning and

realizing technological application in his or her teaching.

Technological pedagogical content knowledge (TPACK) built from Shulman's model of pedagogical content knowledge (1986 in Mishra and Koehler, 2006), denotes the combination or assimilation between and among technological, pedagogical, and content knowledge (Koh, Chai & Lee, 2015). The intersection of each of those variables results in seven knowledge categories including pedagogical content knowledge (PCK), technological content knowledge (TCK), technological pedagogical knowledge (TPK), technological pedagogical content knowledge (TPACK), technological knowledge (TK), pedagogical knowledge (PK), and CK (content knowledge).

TPACK is more than a sum of its parts namely technology, pedagogy, and content. In particular, Mishra and Koehler's (2006, p.1029) define TPACK as

the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones.

Concerning which component influences teacher's use of instructional technology, Mishra and Koehler go on saying that it is the type of technology that determines teacher's choice of what and how to teach. In fact, they argue, it is the emergence of the Internet that 'forced' teachers to think about instructional planning for technology integration. Put simply, for effective ICT integration,

teachers "should be equipped with necessary content, technology and pedagogy knowledge and knowledge of how these intersect" (Mishra and Koehler, 2006).

ICT use in teaching is even mandatory in educational practices in Indonesia. Based on the National Education Ministerial Regulation of Republic of Indonesia Number 16/2007 on Standard of Teacher's Academic Qualification and Competence, teachers must possess the competence to utilize ICT in their teaching (Table 3, p.18). Added to this is the fact that the effective national curriculum in Indonesia mandates the use of technology to enhance the quality of teaching and learning process. Not only should teaching delivery make use of technology, learning materials should also incorporate and promote learners' opportunity to interact and employ technological advances in their learning experiences. This has then brought the issue of providing learning materials that encourage use of ICT in learners' learning process including their English language learning.

The role of learning materials in the form of textbook or most known as coursebook in language teaching has been so immense that almost no curriculum implementation succeeded without a reliable textbook in place. Among five facets of curriculum like 'subject matter, learners, teachers, milieus and curriculum-making', Graves & Garton (2017 citing Schwab, 1973) state that learning materials and activities are integral part of developing curriculum of a country, a realization of the purpose and value of a curriculum. Given the dichotomy between English as foreign language and English as second language, Madya (2007, p.205) states "the instruction of English as foreign language in Indonesia requires learning resources which at least include student textbooks and exposure of English from environment that serves as

immediate input for language learning". Therefore, when a curriculum is to take effect, a textbook or main course book is a compulsory component to make it a success.

Unfortunately, English textbooks in Indonesia generally have low quality (Collins, 2005 in Madya, 2007). While stressing on accuracy lacking in textbooks used in Indonesia generally, Collins addresses the need of Indonesian teachers and educators to carefully select and use available English learning materials. In addition, Lie (2001 in Madya, 2007) states that English textbooks in Indonesia suffer from poor representation of diverse culture and ethnicity of Indonesians. This suggests that despite the prominence contribution of textbook in English teaching, Indonesian schooling badly needs improved quality of textbook. The development of English textbooks in Indonesia however depends largely on whether curriculum necessitates the writing of a new one. This was also true in the past as National Education Ministerial Regulation No. 5/2005 on the Use of Textbooks states that textbooks shall be used for at least five years before they are revised (Madya, 2007), making a textbook revision and development a rare national agenda. This has, fortunately, now changed. Since the enactment of Curriculum of 2013 there have been at least two major changes in the curriculum-based textbooks used in secondary schools between 2014 and 2018.

The curriculum of 2013, the recent change and presently used curriculum in Indonesian public schools, determines a set of competencies in understanding and producing spoken and written English texts. With its focus on the teaching of texts, the curriculum has recently embraced more language functions as part of the subject matter being taught and continued teaching 12 different texts, varying from description to argumentation

type of text in increasing level of education (Graves & Garton, 2017). In fact, according to Putra (2014), Indonesia has adopted genre-based teaching into English instruction since 2004, marked with the then newly released Competence Based Curriculum (CBC) that replaced Curriculum of 1997, a used-to-be 1994 curriculum. CBC was once developed to embrace the notion of semiotics, language literacy as well as the long-held communicative paradigm into English classroom.

However, the curriculum implementation has so far brought negative result (Sukyadi, 2014). Some factors like teacher's poor understanding of different genres and teaching-learning cycle-based activities appropriate for teaching genres, teacher's different language proficiency, and lack of examples or appropriate models of texts in use that suit the immediate context of Indonesia are found to play role (Sukyadi, 2014; Widodo, 2016). Widodo further adds that the gap between the type of school-leaving national exam and the teaching stages in English classroom makes it harder for students and teachers to attain the competency targeted by the Government.

While a curriculum success lays on the hand of many facets of language pedagogy, this paper focuses on challenges coming from providing learning materials and teacher's perceived skills in developing teacher-made ones as an attempt for providing better-suited learning materials like coursebook that responds to curriculum goals, that is integrating ICT in English teaching and learning process to promote the mastery of the target language as well as to give learners experiences to interact with the advent of today's technology. In addition, the effective curriculum in Indonesia highlights the importance to equip learners with the 21st century skills that

involve the development of the four Cs – creative, critical thinking, collaboration, and communication skills. Supporting, Voogt and Roblin (2012) found that ICT-based learning has characterized today's educational practices, often labeled as 21st century learning. They argue that "ICT could be used as a cognitive tool, metacognitive tool, and epistemic tool to support critical thinking, creative and inventive thinking and authentic problem solving, which are also common elements of twenty-first century learning" (in Koh, Cai, & Lee, 2015, p.459). The mandate necessitates technology integration into teaching and learning activities, whose realization needs teachers and schools to be prepared. Technology integration as defined by Hew & Brush (2007) is indeed not limited to using technology in providing learning materials but embracing any instructional objectives. However, it is the focus of the paper to discuss the technology knowledge of pre-service English teachers (PSETs) and in-service English teachers (ISETs) in engaging with materials development processes, as it intersects with other types of teacher knowledge proposed by Mishra and Koehler (2006, p.1029).

The curriculum prescription

According to National Education Ministerial Regulation No. 11/2005 Article 1 and 2, Clause 1 on School Subject Textbook, textbook is defined as a kind of reference which is compulsory to be used at school containing learning materials written based on national standard of education and that textbooks, as a primary reference, are used by teachers and students in the learning process. It is thus clear that textbook or coursebook must be used during any lesson including English teaching and learning process at schools.

It goes without saying that textbook or coursebook has significant impact on effective instruction. As

Richards (2001) suggests, textbooks "provide structure and syllabus for teaching, help standardize instructions, maintain quality, provide a variety of learning resources, are efficient, can provide effective language models and input, can train teachers, and are visually appealing". However, these benefits often result in teachers' high reliance on textbooks. Textbooks are regarded as the sole source for teachers to provide any kinds of learning materials, including reading materials. Tomlinson (2008) also argues that coursebook as a main learning materials influences language acquisition as often the case in English as a Foreign Language (EFL) context like Indonesia. Coursebook has often served as the main and even only provider of input for language learning. Like many other expanding circles, Madya also denotes that "[...] reading materials [in Indonesia] are in general very limited, especially reading materials other than presented in those textbooks" (in Choi dan Spolsky, 2008:10). The scarcity of non-printed or online reading materials is also supported by Putro & Lee (2018, p.12) who explored reading profiles among Indonesian undergraduate students arguing that 'textbooks and printed reading materials are still the primary sources of reading, while online materials are used as supplementary reading'.

Bao (2008) classifies textbooks or coursebooks into three categories. The first is imported textbook, or known as global coursebook, usually written by native speakers of English and published in English speaking countries. This so-called foreign textbook has a strong hold in Asian market as it is often associated with better accuracy and authenticity of language use. Contrast to imported one, in-country or domestic coursebooks are produced in reference to national curriculum of a country. In Indonesia, in-country coursebooks are further divided into two – that published by government

and that by commercial publishers. Center of Book Publication is responsible for publishing and producing coursebooks for compulsory use in public schools in Indonesia. This is often the case in other Asian countries like Japan or China (Richards, 2015). Richards mentions that coursebooks written and published for public schools in some Asian countries exemplify 'market- or need-based publishing' (p. 601). In Indonesia, coursebooks published by the government are supplemented by commercial ones published by publishers, like Erlangga (Bao, 2003). While students and parents are not obliged to buy the commercially published coursebooks, they often prefer to do so for considered to have better quality. Still, in general Bao still finds flaws like poor translation from mother tongue to English resulting in vague content or inappropriate English use in domestic coursebooks in South East Asia. The last type of coursebook is regional coursebook which is written by a local writer but accepted and used regionally.

Teachers can be a potential local writer of their own learning materials or coursebook. In fact, teacher-developed learning materials bear several benefits. Teachers can develop materials for their own specific audience like a group of students that they are teaching and can thus suit the coursebook with their learning style, proficiency level, required competence set by the curriculum (Richards, 2015), and other specific need that will be context-specific which cannot be addressed in published materials or commercial coursebooks, either imported or domestic ones. Teacher's skills in developing coursebook may not however be well-trained despite recommendation to use locally-made coursebook. Richards, (2015, p.616 citing Kumaravadivelu, 2012) argues that "textbooks should be local, rather than international in origin, although this is probably not practical in

many situations except in the case of textbooks for public/state education systems which are normally developed and published at the local level".

In Indonesia, teacher's skills in developing learning materials are stated in the National Education Ministerial Regulation of Republic of Indonesia Number 16/2007 on Standard of Teacher's Academic Qualification and Competence. It says that teachers are required to have four competences – pedagogic, professional, personality and social. The pedagogic competence alone has ten sub-competences with a number of indicators, among which is the third sub-competence that reads "develop curriculum or syllabus relating to the subject taught" (Table 3, p.18), whose indicators include "a) determine appropriate learning experiences to achieve learning goals, b) select learning materials relevant to the set learning experiences and goals, c) arrange learning materials in a way that is congruent with the chosen teaching and learning method as well as learners' characteristics, and d) develop indicators and instruments for learning assessment". It is the second and third indicators of the third sub-competence that regulate teacher's competence in dealing with providing learning materials for learners. While not clearly stated as writing their own learning materials, the indicators use the word 'select' and 'arrange' that demand teachers to do adaptation by means of choosing the related learning materials and sequence or modify them based on learning activities and goals set before. This means that English teachers in Indonesia are required to have skills in selecting and adapting learning materials that support effective English instruction at schools.

Choosing appropriate learning materials or a coursebook can however be a daunting task. Richards (2015) mentions

that teacher's decision is influenced by some factors such as teacher's own English mastery, teacher education background and previous teaching employment, teacher's belief about textbook use and criteria for teaching, and preference of teaching method or technique. In addition, in selecting a coursebook, teacher needs to consult to a set of criteria. The criteria, proposed by too many experts, can somehow discourage instead help teacher select as they can be interpreted in different ways by different teacher since "many of the lists of evaluation criteria [in the literature above] are specific to a context of learning and cannot be transferred to other contexts without considerable modification" (Tomlinson, 2012: 147). To help evaluate criteria for materials selection, Tomlinson & Masuhara (2004:7) give guiding questions for choosing an appropriate set of criteria including "a) is each question an evaluation question, b) does each question only ask one question, c) is each question answerable, d) is each question free of dogma, e) is each question reliable in the sense that the other evaluators would interpret it in the same way?"

In Indonesia, the selection is however done by Center of Books, an office under Ministry of National Education that selects textbook written by local writers (usually a collaborative team of teachers and lecturers) and regulates the publication for use in public schools. While selection task seems no longer teacher's concern, selected textbooks do not always match with the curriculum demands or teaching requirements related to task variety, input provision, or exam preparation (Widodo, 2016; Sukyadi, 2016). This has thus made textbook adaptation an inevitable task for teachers in Indonesia. In addition, citing Madsen & Bowen (1978), Tomlinson (2012) stresses the importance of learning materials adaptation for maximizing the interconnectedness of materials being

used with the teaching specifics like the context, the instructional procedure, types of learners, learning goals, the characteristics of the language being taught as well as the teacher's personality and teaching style. Tomlinson continues to argue that "the good teacher is constantly adapting materials" (p.144). Few teachers have, however, the required skills of adapting learning materials which is part of materials development competence. This is similar to what Forman (2014, p.87) argues that "local teachers' development of materials is seriously limited by large class sizes, associated marking, and heavy teaching loads, as well as by low pay which in most cases obliges teachers to take on additional private work".

Materials development comprising the skills of evaluating, selecting, adapting, and developing learning materials suffered from a minimalistic view of seeing materials writing as part of teaching methodology, not an approach on its own (Tomlinson, 2012). In particular, Tomlinson argues that materials development covers both generating and/or utilizing materials for language instruction, during which processes comprising 'materials evaluation, adaptation, design, production, exploitation and research' are intertwined and shaping materials being produced or their usage in classroom. Regarding materials adaptation, Richards (2015) suggests some procedures to do. First, localizing the content of textbook represented in topic, cultural content, local issues or even context-specific linguistic features that may interfere or facilitate language learning can be done to address learners' needs in a particular context. The next is reorganizing which has to do with re-order the sequence of tasks or activities in textbook to adjust the required local curriculum or specific institutional and learning goals. Another step to adapt is through modifying tasks or in Richards'

term (2015, p.624), personalizing tasks, which depends on learners' language proficiency or cognitive ability. The last two techniques to adapt as suggested by Richards are adding tasks if necessary and adjusting tasks to prepare for test/exam. Those proposed steps are similar to adaptation techniques advised by Tomlinson (1998). His techniques are grouped into "plus, minus and zero". 'Plus' technique includes "addition and expansion", 'minus' technique is applied through 'deletion, subtraction, and reduction', while the 'zero technique' is used in 'modifying, replacing, reorganizing, resequencing, and converting' textbook.

METHODS

The need for locally-made or teacher-generated learning materials is increasing as complaint over incongruence between global coursebook and local's syllabus and test is often expressed by teachers or textbook users (Armani, 2011, Tomlinson, 2012). Whether teachers are sufficiently trained for developing materials, especially those integrated with technology, is however little researched. The study in this paper thus seeks to describe teacher's knowledge related to developing materials enhanced with technology. For the sake of establishing common perception about what technology is, Baran & Thompson (2009) lend their definition on technology. To them, technology is

a broad concept that can mean a lot of different things. For the purpose of this questionnaire, technology is referring to digital technology/technologies—that is, the digital tools we use such as computers, laptops, iPods, handhelds, interactive whiteboards, software programs, etc.

The study did a survey utilizing a TPACK-based questionnaire, adapted from Schmidt, Baran, & Thompson (2009) to 26 English teachers and 46 pre-

service English teachers in Indonesia. The 26 teachers teach English in 24 schools, both public and private junior secondary schools, in a province of Indonesia. The questionnaire, developed and validated through a survey (Schmidt, Baran, & Thompson, 2009) was initially designed to measure pre-service teacher's knowledge system but adapted into assessing both future and practicing teachers in this study. It has two parts; the profile and the TPACK, asking the subjects to choose whether they strongly disagree (SD), disagree (D), agree (A) and strongly agree (SA) with 28 statements. The statements are grouped into seven categories following Mishra and Koehler's knowledge frame.

Using a simple descriptive statistics revealing the percentage of each category in the questionnaire, the reported study focuses on the TPACK profile of the research subjects. It revealed teachers' TPACK to that of the student teachers', highlighting their perceived self-knowledge in relation to integrating technology in teaching-related tasks during trainees' teacher education program and teachers' current teaching routines. In this study, teacher trainees are in their third year and thus have been trained to plan and teach an English lesson in microteaching and teaching practicum contexts, develop learning materials and media as well as assess learning using different techniques and instruments. With these in mind, the survey was to compare technological-related knowledge based on Mishra and Koehler's model (2006). The technological knowledge (TK), technological content knowledge (TCK), technological pedagogical knowledge (TPK) and technological pedagogical content knowledge (TPACK) were then selected to be foci of analysis in this study, making up 17 statements out of 28 in the questionnaire.

FINDINGS AND DISCUSSION

Subjects of this study were the participants of a two-day in-service teacher training held by the researcher's department as a community development initiative. The participants were randomly selected from different schools. The profile of the respondents is described in Table 1. The participants in this study

have mostly taught more than 15 years and thus are believed to already have established firm teacher knowledge. In addition, the fact that most teachers have been certified as 'professional teachers', they are required by the Law to demonstrate the required competences of teachers.

Table 1. Demographics of the participants (in-service teachers)

Gender	Number	Percentage
Female	19	73%
Male	7	27%
Teaching experience in years		
<5 years	0	0%
5 – 10 years	3	11.5%
10 – 15 years	5	19.2 %
>15 years	18	69.2 %
Certified		
Yes	19	73%
No	7	27%

Meanwhile, the future teachers in this study are mostly in year 3 and are selected from the classes the researcher taught. The participants have at large taken all the five required pedagogical subjects in year 3 that make them appropriate respondents in this study for beginning to develop teaching constructs, resulting from their 3-year period of study

and experiences in those classes with me. That they have all taken the subject of Materials Development shows the rationale for taking them as participant in this study as their self-perceived knowledge in relation to the process of materials development can inform the reform of teacher education practice and curriculum.

Table 2. Demographics of the participants (pre-service teachers)

Gender	Number	Percentage
Female	36	73%
Male	10	27%
Now sitting in year		
Year 3	42	91.3%
Year 4	4	7%
Subjects taken		
English Language Teaching Methodology	37	80.4%
Language Learning Assessment	37	80.4%
English Instructional Technology	37	80.4%
Materials Development	46	100%
Microteaching	39	84.8%

The first category of technology-related knowledge system surveyed is technology knowledge (TK). TK is associated with technology literacy that involves knowing how to operate or

work with simple and complex technology, which are products of dated or recent technology advent (Mishra and Koehler, 2006). Seven statements are posed under this category.

Table 3.a. Teacher’s Technological Knowledge (TK)

No.	Statement	SD	D	A	SA
1	I know how to solve my own technical problems.	3	14	10	1
2	I can learn technology easily.	3	11	11	1
3	I keep up with important new technologies.	0	4	18	4
4	I frequently play around with the technology.	0	11	12	3
5	I know about a lot of different technologies.	2	15	8	1
6	I have the technical skills I need to use technology.	3	7	16	0
7	I have had sufficient opportunities to work with different technologies.	4	10	12	0

Two statements out of 7 mark teacher’s familiarity with vast arrays of technological tools. First is statement number one and the second is number 5, for having highest number of disagreements. Among 26 teachers, more than a half strongly disagreed and disagreed with the first statement, leaving 10 teachers agreeing with it and only one strongly seconding the statement. Meanwhile, practicing teachers in this study claimed to know little about different technologies with only one being confident for knowing a lot about different technologies.

Supporting, among six hindrances of technology integration found by Hew & Brush (2007), factor related to resources and skills i.e. “the lack of specific technology knowledge and skills, technology-supported- pedagogical knowledge and skills, and technology-related-classroom management knowledge and skills” significantly affect the rate of teacher’s technology use for classroom purposes. According to them, many teachers in their study found the

absence of knowledge about technology innovation had dragged them away even from trying a piece of tech-based teaching procedure, especially when schools did not provide sufficient and continuous training in using it. Being poorly trained in using IT also made the teachers inconfident in implementing it in the class for fear of technical problems occurring during its use. In addition, Hew & brush stressed out that many teacher under their investigation claimed that they were not accustomed in teaching using IT and thus were not experienced in planning instructional activities around technology use. This might explain why the teachers in the present study find themselves know little about solving technical problems (statement no. 1) and about technology (statement no. 5), despite their frequent encounter and being updated with IT (statements 4, 5, & 7). It is the lack of technical skills they need to use technology that made them perceive themselves as lacking the resources and skills necessary for technology integration.

Table 3.b. Pre-Service Teacher’s Technological Knowledge (TK)

No.	Statement	SD	D	A	SA
1	I know how to solve my own technical problems.	0	7	31	8
2	I can learn technology easily.	0	12	18	16
3	I keep up with important new technologies.	0	9	27	10
4	I frequently play around with the technology.	0	9	28	9
5	I know about a lot of different technologies.	1	14	26	5
6	I have the technical skills I need to use technology.	0	11	29	6
7	I have had sufficient opportunities to work with different technologies.	0	19	23	4

A different story is recorded in pre-service teachers' response toward TK. In general, most of the 46 teacher candidates support the statements with the first statement, "I know how to solve my own technical problems." having the highest number. This shows that their age has given them an advantage as digital native in the today's advent of technological advances and thus being skillful in coping with technical obstacles in using technology in classroom. In addition, responding to statement number 5, more than half of the population feel that they are familiar with various kinds of technology. This indicates those future teachers are well-acquainted with technology use in their life. Their highly-frequent interaction with tech-related

activities are seen in statement number 3 and 4, with 37 PSETs confessing they experiment a lot with technology and like to keep pace with technological advent.

The next category is technological content knowledge described as "an understanding of appropriate technology use for teaching content" (Cox, 2008 in Mishra and Koehler, 2008). In this category, the story repeats. Teachers found them doubt themselves for knowing about technologies useful for understanding and delivering the topics mandated by the curriculum. Surprisingly, many of the trainees state that they can select technological appliances that can assist them in teaching and making sense of the materials.

Table 4.a. Teacher's Technological Content Knowledge (TCK)

No.	Statement	SD	D	A	SA
19	I know about technologies that I can use for understanding and teaching topics/materials required by the curriculum.	1	13	11	1

Table 4.b. Pre-Service Teacher's Technological Content Knowledge (TCK)

No.	Statement	SD	D	A	SA
19	I know about technologies that I can use for understanding and teaching topics/materials required by the curriculum.	0	9	27	10

The statement above indeed posits two different processes – understanding and teaching curriculum-mandated materials. Probed further, one of the ISETs who strongly disagreed that she knows about technologies used to understand and teach learning materials clarified to the researcher that she often got confused which software or application that can help her teach more effectively. Despite her 15 years of teaching and being a certified teacher, her use of technology to understand materials is limited to searching or browsing examples of taught materials so she can understand and explain them to her students better. When asked about her knowledge of teaching-relevant IT tool, she admitted her high reliance on

PowerPoint, a Microsoft Office feature, to display teaching materials, above other technological tools like the Internet, multimedia and the like. The ISET's use of simple pieces of technology is explained by Collis and Moonen (2001 in Kafyulilo & Fisser & Voogt, 2015) as an effect of technological factors in teacher's lasting up-take of technology in classroom. The two factors are 'ease of use and effectiveness'. According to them, there are certain qualities that present technology as easy and feasible to use to users, that include 'convenience, adequacy, reliability and user friendly of the technology'. Meanwhile, being effective means the tendency to bring concrete advantages and observed improvement in instruction and interaction. With regard to

these, the teacher with 15 years of teaching history might have found ease in utilizing the Internet and PowerPoint for attaining her goals – understanding and teaching learning materials better.

Meanwhile, the PSETs, in majority, self-reported that they are familiar with various technologies useful to enhance their understanding of and improve their way of teaching the stated learning materials in the curriculum. The notion of teaching, to them, may have been understood simply, as a matter of presenting materials. Yet, when asked further, two of the PSETs that stated strongly agreed with the statement acknowledged the complexity of teaching job that includes developing lesson plan, learning materials, and assessment procedure related to the topics listed in the curriculum. They explained that they have taken Microteaching and thus felt confident about their knowledge and skills in making use of IT to prepare and deliver their teaching during the completed Microteaching class or the teaching practicum at school. Other PSETs that also strongly agreed with the statements explained that though they have not taken Microteaching they have learned to develop learning materials from Materials Development class and plan a lesson from EIT class. These have equipped them with the basic principles added with their already strong background and familiarity with technology.

This finding seems to resonate the study Hsu, Liang, and Su (2015) did. In their study, a group of in-service pre-school teachers were trained to implement game-based pedagogy. The group was later divided into two, having different sequence of content training. One was taught about game-based TK from the very beginning while the other learned about PK concerning strategies of using game in the class. As a result, the first group revealed higher degree of TPACK

as they admitted to have felt so confident about the required knowledge about game that they showed more various instructional strategies in using game in their observed teaching performance. Hsu, Liang, and Su concluded that TK laid foundation that leads to higher TPACK lever. This might explain why the PSETs in the study expressed high level of TPACK though some have not attended the pedagogy-based Microteaching class that mainly prepares them with various classroom management strategies. Their confidence may root from their attendance in the content-subjects like EIT, ELTM, and Materials Development, offered in earlier in their study, which promotes their self-reported TPACK level. This study thus confirms the conclusion drawn by Hsu, Liang, and Su that the content sequencing in teacher training matters and affects the attainment level of TCK, PK and its combination, TPACK.

Technological Pedagogical Knowledge (TPK)

In this category, teacher is said to have a construct of technological pedagogical knowledge related to knowing the “existence, components and capabilities of various technologies and conversely, knowing how teaching might change as the result of using particular technologies” (Mishra and Koehler, 2006). In this study, the participants are reported to have good understanding about features of technology that can affect their instructional practices. In addition, most teachers reported here claimed to adapt the application of technology for adjusting with the curricular requirement, as seen in statement 24. This particular statement, while showing teachers materials development skills, also highlights the nature of teacher’s professional development, expressed in their

enthusiasm to learn different kinds of technology.

Table 5.a. Teacher's Technological Pedagogical Knowledge (TPK)

No.	Statement	SD	D	A	SA
20	I can choose technologies that enhance the teaching approaches for an English lesson	2	8	16	0
21	I can choose technologies that enhance students' learning for an English lesson	2	6	17	1
22	The workshop has caused me to think more deeply about how technology could influence the teaching approaches I use in my classroom	0	1	20	5
23	I am thinking critically about how to use technology in my classroom	0	7	17	2
24	I can adapt the use of the technologies that I am learning about to different teaching activities	1	6	17	2

Statement number 20 & 21 in Table 5.a. reflect the ISETs' awareness of various options in utilizing technology that matches certain teaching methods and a particular learning objective. As shown in the table, 16 and 18 practicing teachers self-reported that they agree with the statements of having the ability to choose appropriate technology for different teaching method and teaching goal. This is mirrored in the next statement where as many as 96% of the population felt that the professional development workshop on the use of technology to develop learning materials that they attended has promoted the expected attitude towards, in addition to knowledge and skills of technology integration for classroom purposes. Attitude is associated with like and dislike in term of using instructional technology and often determines teacher's preferences when having to choose between applying technology or not in their classroom procedures (Hew & Brush, 2007, p. 229). As they further argued that such attitude directs teacher's learning about technology and using technology, it is vital to establish a positive attitude on technology integration at school, without which teachers would

otherwise be reluctant to gain knowledge and skills in the related field.

It can not however be generalized that once teachers have the required knowledge and skills in using technology they will successfully integrate technology into their teaching. As Watson (2001) stated

the training for those teachers who have received it (i.e. the new training programmes) has contributed to an increase in their use of computers, but only rarely do the pedagogic expertise to help them make the most effective use of ICT in their lessons.

Very often, the knowledge and skills about technology does not suffice for teachers to plan and deliver a lesson that is not only technological appropriate but also effective. Effective here means that technology integration should result in an improved learning, that worths the effort spent on preparing and making it happen. Teachers who are not only technologically knowledgable but also pedagogically trained will be able to vary their level of technology use from replacement and amplification to transformational purpose (Hughes, 2005). Hew & Brush (2007) illustrate that such

teachers will move from simply using PowerPoint that replaces paper or display board to present written texts to assigning students to use videomaking software to enhance their task accomplishment. Technological pedagogical trained teacher will enable students to make use of technology that transform their learning such as exploring website to collect data

for students' research or using softwares to analyze and report data and investigation. To Watson (2001), transformational-based technology is argued to be the ideal standard of technology integration at school where 'higher-order learning' referring to Bloom's taxonomy (1956) should be more than those of 'lower-order learning'.

Table 5.b. Pre-Service Teacher's Technological Pedagogical Knowledge (TPK)

No.	Statement	SD	D	A	SA
20	I can choose technologies that enhance the teaching approach(es) that I used when teaching English in a microteaching performance.	0	2	33	11
21	I can choose technologies that enhance students' learning and thinking in achieving the goal(s) of an English lesson	0	8	31	7
22	I am thinking critically about how to use technology in my microteaching performance.	0	9	28	9
23	I can adapt the use of the technologies that I am learning about to different teaching activities.	0	10	26	10

A similar self-claim on having the knowledge to select technology that goes in hand with learning procedure is shown in the responses from the teacher trainees. As many as 44 respondents supported the statement number 20 while 36 out of 46 stated that they agreed with that they are able to adapt technology use to teach different lessons (in their microteaching performances). This shows that the trainees have grasped the benefit of technology for their learning experience of teaching.

Discussed next is the TPACK. Technological Pedagogical Content Knowledge is "a form of knowledge that expert teachers bring to play anytime they teach" (Mishra and Koehler, 2006, p.1030). Polly, Mims, Shepherd, and İnan (2010 in Baturay, Gökçearsan & Şahin, 2017) argue that teachers need to be well-informed

about how technology and content interact. Most importantly, they should be well aware of the pedagogical benefits derived from the use of different types of technology and skilled at making use of them for instructional efficiency and effectiveness.

In this study, the INSETs reported themselves having good grasp of TPACK as in general half of the population claimed to be able to select appropriate technologies and use them to teach depending on the characteristics of the content being taught and the methodological procedure advised by the running curriculum, as well as to help their colleague do the same. Almost the same finding is shown from the trainees. From the researcher's personal interaction with the participants, it is observed that though

they are not teaching yet, most of them have experienced teaching for private courses, either as a freelancer or an instructor in an English course.

This simple comparison of teaching job is thus drawn by the participants when responding to the statements.

Table 6.a. Teacher's Technological Pedagogical Content Knowledge (TPACK)

No.	Statement	SD	D	A	SA
25	I can teach lessons that appropriately combine technologies and approaches in English language teaching.	1	8	15	2
26	I can select technologies to use in my classroom that enhance what I teach, how I teach, and what students learn.	0	9	16	1
27	I can help others to coordinate the use of content, technologies, and teaching approaches at my school and/or district	0	10	16	0
28	I can choose technologies that enhance the content for an English lesson required by the curriculum	1	10	14	1

While the present study does not investigate the relation between teacher's level of TK, CK, PK, TPK and TPACK, it can be observed that the teacher's confidence in their TPK relates to that of their TPACK. As seen in table 5a, more than half of the surveyed teachers in the study reported to agree that they have the required TPK as listed in the statements number 21 to 24. Likewise, most of those teachers also self-reported that they agreed with the statements in table 7.a, showing that they can choose and use the right technological tools for enhancing their lesson and can even teach their peers to do the same. Only one teacher disagreed strongly with statements number 25 and 28. This teacher, happens to be the same one who doubted herself for having sufficient knowledge about different technological tools for classroom use. When asked further, she mentioned her lack of experience in using sophisticated technology in her classroom. She re-explained that her

reliance on Microsoft Office features like PowerPoint and Word does not suffice her to say that she has the ability to orchestrate higher-order thinking learning that technology is capable of providing given teacher is trained for doing so.

This self-assessed level of knowledge at the same time reflects attitude that is somewhat positive for acknowledging the benefits of tech-based classroom along with her awareness of what it takes for teachers to be able to make the most of technology. While such attitude, to Hew & Brush (2007) is considered as a potential barrier for technology integration, Kafyulilo, Fisser & Voogt (2016, p.1538) label it as 'personal factor' that influences teacher's willingness to engage with technology as well as sustained effort in learning about and using technology for instructional objectives. This personal factors includes knowledge and skills, attitude and belief, engagement and time availability.

Table 7.b. Pre-Service Teacher’s Technological Pedagogical Content Knowledge (TPACK)

No.	Statement	SD	D	A	SA
24	I can teach lessons that appropriately combine technologies and approaches in English language teaching.	0	9	33	4
25	I can select technologies to use in my microteaching performance that enhance what I teach, how I teach, and what students learn.	0	4	33	9
26	I can help my friends to combine the use of content, technologies, and teaching approaches.	0	12	30	4
27	I can choose technologies that enhance students’ understanding of the content of the targeted materials required by the curriculum.	0	10	30	6

The table above reports PSETs’ self-assessed level of TPACK as compared to that of ISETS. Clearly, none disagreed strongly and only around 9 to 12 trainees doubted themselves for having good level of TPACK as stated in statements 24, 26 and 27. It is statement number 25 that has the highest level of agreement. Only 4 trainees disagreed with their ability to select the right kind of technology for use in their microteaching performance. Microteaching class is often associated with pedagogical subject in teacher education. It teaches and provides future teachers an effective way to learn

CONCLUSIONS

In this study, the TPACK framework has provided a basis to describe pre-service and in-service teacher’s skills in developing learning materials. Since the effective curriculum and the Law on teacher competence mandate the implementation of ICT in classroom, teachers need to have the skills to evaluate, select and if necessary adapt or develop their self-made learning materials that promote the use of technology in teaching and learning process. Technology-related constructs in the framework were selected to reveal

about and reflect upon effective teaching practice (Bell, 2007). In doing a microteaching performance, PSETs are taking the same roles as teachers and perform similar teaching tasks, use technology for similar instructional purposes. The seemingly transferable tasks between their jobs in Microteaching and in real teaching make the PSETs under this study shared high confidence of having the ability to choose the right software and hardware that assist them in teaching and to be a tutor for their peers in term of technology utilization.

self-perceived belief of the trainees and the teachers in relation to ICT integration in their instructional tasks, one of which is developing learning materials. This study reveals that while teachers seem to have showed less confidence in constructs of technology knowledge and technological content knowledge, they indicated more confidence in technological pedagogical knowledge and technological pedagogical content knowledge. On the other hand, the trainees identified themselves as the millennial generations for having a firm confidence on technological knowledge and technological content knowledge that

asses one's familiarity and fluency with understanding about and operating technological products, both software and hardware. Meanwhile, the trainees generally also self-claim to have strong technological pedagogical knowledge and technological pedagogical content knowledge.

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