

Experiences of EFL Teachers on Technological, Pedagogical, and Technological Pedagogical Knowledge

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Abstract — A qualitative study was conducted in a Vietnamese city to survey the EFL teachers' experiences in three out of TPACK clusters. Qualitative data revealed that applying technology to English language teaching should depend on the teaching conditions, learners' context and teachers' own ability in applying it to their teaching practices despite its usefulness, whereas it was sometimes time-consuming in TK and TPK integration. While unnaturalness, monotony and their incompetence in pedagogical application were shared, most teachers showed their self-confidence in the integration of pedagogical skills to teach their students content in English classrooms. Limitations, implications and recommendations for further research are put forward.

Keywords — TK, PK, TPK

I. INTRODUCTION

1. Background of the Study

TPACK has been popular in the world, especially in the Western countries. The present study was conducted in a Vietnamese city where English has been much popularized. It was implemented with the participation of ten English EFL teachers who come from a province in Vietnam.

2. Aims of the research

The present study aimed to find out the experiences of Vietnamese EFL teachers about their TPACK in the Mekong Delta. In other word, the research investigated how they experienced during the process of their TPACK development.

3. Significance of the research

The present study fills in the gap of existing literature review. In other words, the findings obtained from the present study will provide useful and valuable information contributing to the body of literature and enhancing comprehensive development of TK, PK, and TPK in TPACK in EFL teachers as well as training programs. Furthermore, the present study will support true evidence on EFL teachers' experiences on TK, PK, and TPK.

II. DEFINING TERMS

Before defining TPACK framework, we should take a look at its formation and development. It took many years to develop TPACK which is a framework of teacher knowledge. Its framework was added with technology knowledge. Then, TPACK was earlier identified as PCK by Shulman (1986) who stated that pedagogy, content and knowledge should be defined and considered to be independent in teacher education and interaction. TPACK is referred as a philosophical approach that takes PCK as a basis to integrate technology, whose structure was completed within five years to develop a program with an emphasis on teacher professional development and faculty development. Although TPACK seems to be a new term, many researchers had done relevant studies previously. Keating and Evans (2001) were pioneers in applying TPACK concept. Margerum-Lays and Marx (2002) proposed a Pedagogical Content Knowledge of Technology. Beaudin and Hadden (2004) suggested techno-pedagogical skills in preservice teachers. Angeli and Valanides (2005) linked PCK with ICT as Information and Communication Technology (ICT)-related Pedagogical Content Knowledge. Pedagogical Technology Knowledge (PTK) suggested by Guerrero (2005), has the same meaning as TPACK. Guerrero (2005) defined PTK as instructional knowledge that is related to technology. PTK then was referred as a new domain covered in the schemes of organization of teacher knowledge. In the same year, Niess (2005) suggested Technology Pedagogical Content Knowledge. Conventionally, content knowledge (CK) and pedagogical knowledge (PK) were mutually exclusive. In other words, in teacher education programs, CK and PK are not closely interconnected (Shulman, 1986, 1987). Gess-Newsome (1999) argued that pure CK and PK are not sufficient for teaching practices, so pedagogical content knowledge (PCK) which is a new type of knowledge,

appeared. In the same vein, Shulman suggests that teachers should have an in-depth understanding about the way of integrating these multiple domains of knowledge. In other words, the framework suggested by Shulman puts an emphasis on PCK as the intersection of subject-specific knowledge and PK. In addition, the significance of teachers' needs for understanding many ways of representing subject matter is highlighted in this framework.

In the twenty-first century, the rapid development of computers and instructional technologies has changed the nature of education and force educational institutions to innovate themselves in accordance with the advent of recent technologies. Since the appearance of new technology, teachers' role as well as their qualified knowledge have been challenged. As long as educationally efficient technology integration is regarded, it would be safe to say that it is both dependent on the appropriate tools of technology, and on these tools of technology which teachers use. New educationally introductory technology does not vitally bring about successful teaching and learning experiences and teacher needs identification to know about effective technology integration is pivotal, also (Koehler & Mishra, 2005). Technological knowledge (TK) has become newly acquired teaching knowledge, and any effort to integrate meaningful technology in educational milieu requires a necessity for TPACK development. The development and implementation of TPACK in teaching leads to understanding about the relationship of technology, pedagogy and content (Koehler, Mishra, & Yahya, 2007). In other words, if a teacher considers the significance of technology use in the process of teaching, she will achieve a peripheral ancillary in her teaching practices. It is understood that integrating can be the intersection of various types of TK (Pierson, 2001). Lee and Tsai (2008) argues that although they sometimes attract students' attention by the Internet, they may not know fully about effect of technology integration in facilitating students' development. According to Koehler, Mishra, Kereluik, Shin, and Graham (2013), when teachers are not knowledgeable enough, their technology-related experiences can be useful to their teaching and their efforts may be limited. Angeli and Valanides (2005); Koehler, Mishra, and Yahya (2007) argued that the main reason for their lack of knowledge in technology integration may be due to their undergraduate pre-service teachers' training programs. Despite the increase of technological tools and opportunities to help pre-service teachers to practice technological skills, their experience is not very applicable in teaching with technology during their teaching practices (Kurt, 2012). Doering and Veletsianos (2006) added that if pre-service teachers do not get such experiences, they may not tend to use technology optimally. In teacher education programs, observations may be essential for pre-service teachers in understanding how technology can be fostered into teaching content and supporting them with the development of a critical knowledge for TPACK. In order to support, teacher education programs should enable pre-service teachers with perceived TPACK competences, which refer to what they understand about TPACK interactionally. Mishra and Koehler (2006) indicated that it is not enough to have knowledge on technology in integrating it into the process of teaching and learning. Although various pre-service trainings aim at helping teachers succeed in technology integration, they most make technology separate from PCK by teaching specific software and hardware. However, both possessing adequate CK and having enough TK do not enable teachers to apply their TK in order to provide the content effectively (Doering, Veletsianos, Scharber & Miller, 2009). Therefore, teachers must have the required CK, PK and TK as well as an ability in applying the knowledge that will exist among them interactively. Over two decades since earlier stage, Koehler and Mishra (2009) added technology to PCK. It then was constituted as TPACK model of technology integration into education. Above all, TPACK is semantically demonstrated.

1. What is TPACK framework?

TPACK framework shapes the development and assessment of professional development programs that is relevant to technology. This process is implemented by guiding the teachers and teacher trainers. In other words, TPACK component is the basis of the framework since its earlier formation. It is not simply adding technology use to the current teaching and content domain (Koehler & Mishra, 2005). Mishra and Koehler (2006) provided this conceptual framework by blending pedagogical uses of technology into TPK earlier developed by Shulman (1986).

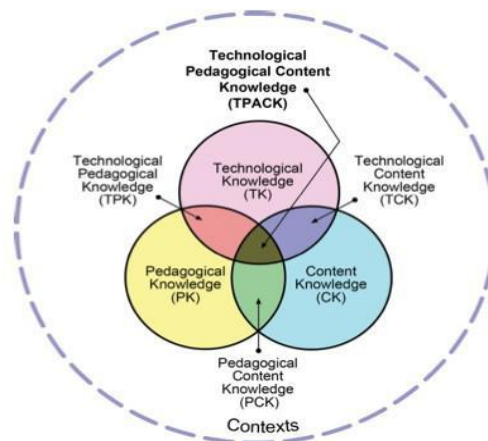


Fig. 1 Technological pedagogical content knowledge (TPACK) model
(Adapted by Mishra & Koehler, 2011)

In general, TPACK framework is one of the models to integrate effectively technology that in the process of teaching with a focus on teacher competencies. The fact that TPACK framework is formed based on TPACK which represents content, pedagogy, and technology, which are the most complex domain in the framework. As a result, it is a multifaceted process to define and assess TPACK. While defining TPACK, Mishra and Koehler (2006) approached it from content, pedagogy, and technology, they did not reflect this approach to the instrument they developed. Thus, TPACK component has a broader and deeper meaning. With this aspect, TPACK cluster be defined as combine knowledge that a teacher ought to have relating to how to use educational and technological knowledge together in teaching a certain content area for the integration of educational technology (Schmidt et al., 2009; Koehler & Mishra, 2005, 2008). On the other hand, TPACK component refers to TK of how to coordinate and combine the use of subject-specific activities and topic-specific activities using emerging technologies to facilitate student learning' (Cox & Graham, 2009). So and Kim (2009) defined TPACK component as the representation of subject matter and technology pedagogically. There are many studies related to TPACK that evidence the existence of seven components (Koh et al., 2010; Jamieson-Proctor et al., 2013; Archambault & Barnett, 2010). They argued that TPK could not be explored inseparably. In other words, the framework represents CK, PK and TK which should be linked with the TPACK framework. The other components of the framework are PCK, TCK and TPK. They exist in an interactional way among the rest (Koehler & Mishra, 2005; Koehler & Mishra, 2008, 2009; Mishra & Koehler, 2006).

2. Technology Knowledge (TK)

TK is composed of the knowledge and skills in books, boards, and digital technologies (Mishra & Koehler, 2006). In the same vein, Schmidt et al. (2009) argued that TK includes skills required for various digital technology use in learning milieu such as computers, internet, interactive whiteboards, mobile devices and software applications. TK domain is useful to the operation of digital devices, some software and how to deal with technical problems in relation to hardware and software problems according to the TPACK framework. Schmidt et al. (2009) stated that although technology should include both traditional and digital technologies, most of TK items in the instrument only present digital technologies. As seen, the term "technology" is over-general as it does not specifically mention like creating audio or video recordings, publishing on a computer, using blogs, social networks and designing web-based sites. TK in Koh et al.'s (2010) study was too general to expect similar meaning for all participants more or less, namely "I have the technical skills I need to use technology". Although TK items were involved in a multitude of dimensions, these items in Lux et al.'s (2011) study were written without considering technological affordances of technologies. For instance, it decides where technology can be beneficial and disadvantageous to achieve an objective. Some studies looked closely at certain technology knowledge (TK) items. For example, a study by Archambault and Barnett in 2010 found that only three TK items were confirmed, and they were all about fixing problems with technology. Another study by Koh and others found only two specific TK items. However, other researchers, like Archambault & Barnett, Lee & Tsai, and Hsu & others, showed that TK is important, even though they didn't explore all seven parts of the TPACK framework. There are still questions about how many specific TK items were included in many of these studies. But in a survey by Chai and others in 2011, they listed six valid TK items, like using social media and creating web pages, which showed how technology can be helpful. In the same year, Sahin's survey found 15 specific TK items, like fixing technology and using different computer

programs. Overall, these studies showed that having clear TK items is important for creating a good TPACK survey.

3. Pedagogical Knowledge (PK)

It includes teachers' knowledge about practices, processes and methods that are needed for teaching (Koehler, Mishra, & Yahya, 2007). PK also covers an understanding of the way learners get to learn, classroom management strategies, lesson planning, and student assessment. Thus, teachers are required to comprehend cognitive, social and developmental theories of learning so that they can equip themselves with essential skills in managing their students in the classroom.

4. Technological Pedagogical Knowledge (TPK)

There are diverse definitions on TPK. According to Margerum-Leys and Marx (2002), this knowledge encompasses an understanding of how applicable the strategies in pedagogy are in various technologies and how changeable this technology is in the instruction of teachers in classrooms (Schmidt et al., 2009). In the same vein, Mishra and Koehler (2006) provided a sufficient definition on TPK. It is existing knowledge of technologies for activities in education. It also the knowledge of how technologically changeable teaching is. In addition, TPK is known as the ability in choosing suitable tools for strategies in pedagogy. TK is also knowledge about strategies in applying technologies' features. TK also measures the ability of using certain current technologies for the purposes of education, and ability to using strategies for technological tools. The definition on TPK may be the most specific in the TPACK framework. Cox (2008) defined as an understanding of the technologies that may be used in a given pedagogical context, including the affordances and limits of those technologies, and the way that those technologies affect or are affected by the teacher's strategies in pedagogy. Jimoyiannis (2010) defined TPK as the knowledge of how supportive technology can be specific strategies in pedagogy that are applied in the classroom. TPK is also determined as specified components for science, namely ICT-based learning strategies, fostering scientific inquiry with ICT, supporting information skills, student scaffolding, and handling students' technical difficulties. In Lux et al. (2011) and Hsu et al.'s (2013), TPK items were validated, but the six other components of TPACK were not successfully validated. On the contrary, all components were explored successfully in Schmidt et al. (2009); Chai et al. (2011); Akman and Guven (2015); Chai, Chin, Koh, and Tan's (2013b) surveys.

III. LITERATURE REVIEW

1. Related studies

Numerous researchers in non-Vietnam contexts have carried out many research studies related to TPACK that are briefly illustrated in sources, methods and their key findings in the following table. Then, they are summarized before their gaps are shown and addressed in the present research.

Table 1: Summary of Related Studies

Sources	Methods/ Approaches	Key findings
So & Kim (2009)	Mixed-methods	Although pre-service teachers were good at understanding about PK on problem-based learning, they did not have adequate repertoires in applying that knowledge to technology integrated lesson.
Özgün-Koca, Meagher & Edwards (2009)	Mixed-methods	Pre-service teachers were confident enough to applying technology to their future teaching although they were relatively suspicious of its suitability in the roles of concept development.
Lee & Tsai (2010)	Survey	Teachers of more teaching experience were less confident in Web use and the Web integration into instructions.
Chai, Koh & Tsai (2010)	Survey	There was a big difference in the pre-service teachers TPACK components after attending the ICT course designed, whereas their PK was the largest among all components.
Gao, Chee, Wang, Wong & Choy (2011)	Qualitative	Pre-service teachers' TPK level was increasingly developed.

Graham, Borup & Smith (2011)	Survey	There was a significant increase in student-teachers' CK and PK.
Tee and Lee (2011)	Design-based research	Ineffective teaching could not be enhanced by technology, thus, in technology use, their teaching should be reassessed and examined in terms of the taught subject nature.
Hofer & Grandgenett (2012)	Survey	Pre-service teachers' TPK was low, but their TCK and TPACK levels were in significantly high scores.
Ghaida (2012)	Survey and lesson design artifacts	ICT as a tool for instruction and productivity and 'enjoyment was increasingly significant.
Tantrarungroj & Suwannathachote (2012)	Experiment	Having undergone learner autonomy strategies via online project-based learning, pre-service teachers got higher score in the posttest for self-efficacy in designing digital media and TPACK compared to their pre-test scores.
Meng, Sam, Yew & Lian (2012)	Survey	In terms of gender, Mathematics pre-service secondary teachers' TPACK got highly effectively when they applied GPS in their teaching.
Ozturk (2012)	Project-based learning (PBL)	Pre-service teachers were highly required to engage systematically in real teaching contexts to develop their effective TPACK.
Alev, Karal-Eyuboglu & Yigit (2012)	Survey	There was a significantly higher TPACK level of teachers in terms of longer teaching experience.
Jang & Tsai (2012)	Mixed-methods	Pre-service did not have a clear idea on the way to integrate technology into teaching.
Jang & Tsai (2013)	Quantitative	Gender as well as work experience were influential factors for science teachers' TPACK at middle schools
Hasniza, Niki, & Faekah (2013)	Mixed method (survey and interview)	Pre-service teachers were equipped with TK, necessary and sufficient to apply during their practices.
Lau (2013)	Survey	Private higher educational institutions still have rooms for enhancement in on ICT based educational system.
Nordin, Davis & Ariffin (2013)	Mixed-methods	CK level got the highest scores, while their TK was rated lowest before and after field experience. There was also a significant growth in TK, PK, PCK, TCK and TPACK.
Lin, Tsai, Chai & Lee (2013)	Survey	A positive correlation among TPC and various TPACK sub-domains was observed. It was also found that female science teachers perceive higher self-confidence in PK, whereas their lower self-confidence than males in TK level was showed. Furthermore, significant and negative correlation among female in-service science teachers' TK, TPK, TCK, and TPC perceptions in terms of age was observed.
Maeng, Mulvey, Smetana & Bell (2013)	Case study	Findings indicated that science teacher educators' CK and TK development contributed to preparing teacher-candidates for inquiry instruction supported by technology, facilitation in transiting to the instruction of student-centeredness, and TPACK development.
Shively & Yerrick (2014)	Case study	Pre-service teachers do not get enough exposure of technology tools.
Cengiz (2014)	Survey	Such intervention became an effective way in identifying and developing TPACK domains as well as ITOE in physical education teacher-candidates.
Banas & Yerk (2014)	Survey	TK, PK, TPK, PCK, and TPACK self-efficacy of pre-service teachers became a measurable factor in technology integration. A paired samples t-test used to compare items indicated a significantly high scores, while PCK was greatest of all TPACK self-efficacy

Hsu (2014)	Qualitative	TK developed and determined by pre-service teachers was essential in courses on technology integration.
Lee & Kim (2014)	Survey	Pre-service teachers had troubles understanding PK, and their TPACK learning was combined rather than integrated with PK, TK and CK.
Koh, Chai, Hong & Tsai (2014)	Survey	What was understood about lesson design practices and design dispositions of teachers was pivotal to promote professional development for integrated information as well as communications technology when their TPACK was ignored.
Hiçde, Uçar & Demir (2014)	Survey	There was a difference between pre-service science and physics teachers' W-PCK with respect to their habits of using the Internet.
Julie and Benevides's (2015)	Qualitative	Small percentage of pre-service teachers (17%) feeling confident about using technology to address the need of each student.
Julie & Tina (2015)	Course	Over 51 % of respondents believed that understanding technology would improve their teaching.
Julien & Ming (2015)	Course	Evidence from the reflections was qualitatively beneficial for TPACK framework.
Colvin & Tomayko (2015)	Qualitative	The result indicated that the qualitative proof from their self-reflections was vital for a better TPACK model. It was also evidenced that TPACK radar diagram may fit the pre-service teachers' needs.
Redmond & Peled's (2015)	Questionnaire	Pre-service teachers be provided opportunities so that they can apply TPACK theory in their lesson. Pre-service teachers were less confident in TK and TPK. Regardless of location, their experience and confidence in TPACK was a little different.
Oz (2015)	Mixed-methods	TPACK was found significantly high. Regarding sex, there was a difference about females' TK and PK dimensions that had higher scores in TPACK. Qualitative results found that faculty members used TPACK more than cooperating teachers.
Liu, Zhang & Wang (2015)	Survey	Independent sample <i>t</i> tests to consider the relationships between in-service K12 teachers' sex and the TPACK domains indicated that male teachers' CK was higher than that of female teachers, lower in PCK.
Lin, Yu, Wang & Ho (2015)	Questionnaire	Specialists and trainers of technology were provided with data in material enhancement for suitable professional training and resolve the needs of teachers within their training on technology profession in such a way that link PK and emerging technology utilization in instruction.
Corkett & Benevides (2015)	Questionnaire	Young teachers did feel discomfort in technology integration into their lessons after their lesson research and completion that focused on app utilization in a classroom of inclusion.
Akman & Guven (2015)	Questionnaire	In the research, the relationship between other Components and teachers' TK and student-teachers were low and middle, whereas the relation level between CK and PK has were higher.
Ersoy, Yurdakul and Ceylan (2016)	Quantitative	Level of ICT increase of student-teachers fluctuated their competencies of TPACK, but there was not a significant difference between sex and competence of TPACK.
Jita (2016)	Mixed methods (questionnaire and interview)	By interview, there is a limited use of ICT due to the prohibition of cell phone use in.
Nordin & Ariffin	Case study	Pre-service teachers felt confused about PCK, TPK TCK and

(2016)		TPACK. They could not find the differences of the technology-related domains and the PCK.
Luik, Taimalu & Suviste (2017)	Questionnaire	Findings indicated that although pre-service teachers were good for technology integration into teaching, they lacked PK.
Jwaitfell, Abu-Omar & Al-Tarawneh (2018)	Survey	Male teachers' readiness were lower than female teachers in CK, PK, PCK, TPK and TPCK. In addition, there was not a significant difference in teachers' readiness in terms of experience.
Dinçer (2018)	Quantitative (Questionnaire)	Pre-service teachers were low in technology literacy.

So and Kim's (2009) mixed-methods study investigated the perceived difficulties that faced student-teacher in their application of content, technology and pedagogy knowledge to integrate lesson design into technology. Data collected from questionnaires and lesson design artifacts from ninety-seven pre-service teachers who attended a project on collaborative lesson design. Data analysis indicated that although they understand PK about PBL (problem-based learning) theoretically, their lesson design did not match among technological device, presented content and strategies in pedagogy. In other words, although pre-service teachers were good at understanding about PK on PBL, they did not have adequate repertoires in applying that knowledge to technology integrated lesson.

Özgün-Koca, Meagher and Edwards (2009) conducted a mixed-methods research to explore emerging TPACK when they employed advanced technology to design and conduct environmentally-rich activities in their teaching. Survey and assignments from a group of twenty student-teachers in a course on Mathematics teaching methods at a Midwestern college, who were going their first semester had been implemented before data analysis based on TPACK framework lens. They were all introduced to inquiry-based learning designed by the researchers who used open-ended questions. Data analyzed from the attendants were to consider the participants' trajectory of beliefs about the appropriateness of high-tech application in teaching Maths. Findings showed that the teacher candidates' understanding about technology changed from considering it as tools for reinforcement into tools for enhancing students' understanding. Student-teachers had enough confidence in applying technology to their future teaching although they were relatively suspicious of its suitability in the roles of concept development.

Various studies in educational technology have revealed that teachers' technology use is pivotal in their teaching thanks to the popularity of Web technology that has led to online pedagogy.

Lee and Tsai's (2010) survey enabled a TPACK-W framework to comprehend teachers during digital technology integration into their pedagogical practice. This research aimed at exploring teachers' TPACK-W self-efficacy by developing a new questionnaire that was additionally used for the assessment of their attitudes on Web-based instruction. Data collection was made by survey method employed in the research from 558 participants who were teachers from various Taiwan elementary, middle and high schools. EFA and CFA was used to analyze data that revealed reliability and validity in this research were acceptable. It was suggested that teachers of more years of teaching experience were less confident in computer use or technology tools. It was revealed that the teachers with more years of teaching were less confident in Web as well as their ways of Web integration into their own instructions.

Chai, Koh and Tsai (2010) conducted a study related to TPACK which aimed at exploring the perceptions of pre-service teachers' development on TPACK. Survey method was employed by a questionnaire adapted from Schmidt, Baran, Thompson, Mishra, Koehler, and Shin (2009) to suit the research context, whose factor analysis had been validated by experts from the US after it was delivered to 124 teacher-candidates for piloting with Cronbach coefficient reliability alphas of .80 for each TPACK domain. A total number of 889 Singaporean pre-service teachers from secondary schools who were recruited and assigned to teach two subjects that were relevant to their majors at the Postgraduate Diploma in Education in Singapore. The shows that there was a big difference in their TPACK components after they attended the ICT course. This result was consistent with Brown and Warschauer's (2006) study in conclusion that ICT courses could improve the teachers' perceptions of the competencies in using ICT in teaching and learning.

Gao, Chee, Wang, Wong and Choy's (2011) qualitative research used interview sessions to ask fourteen pre-service teachers who were purposefully selected thanks to their wide knowledge on TK and skills, to express how they believe in the use of pedagogy and ICT, their learning and teaching experience. It reported

the result in the development of pre-service teachers and their translation of TPK into teaching practices. Qualitative method kept more focus on considering pre-service teachers' development process and their TPK application by self-reflecting entire program of teacher preparation. Data was collected by observing and video-recording of each participant within their teaching assistantship. It was demonstrated that they achieved a success in both TPK and changed positively their beliefs in ICT use. Nevertheless, there was a great change compared with their initial ICT practice in the beginning placements. The findings indicated that most of them were willing to use ICT in their field. It was also found that learning how to teach with ICT is not a linear translation of beliefs, knowledge and skills into practice.

A recent study by Graham, Borup and Smith (2011) targeted to employ TPACK framework to understand the way pre-service teachers decided on ICT use in their teaching practices. Among 137 students who were elementary teacher candidates joined the four sections, just 133 at Brigham Young University agreed to participate in this study. They enrolled in the pre and post-course assessment and received three design tasks, which were administered online in order to survey during the first week of a course on educational technology, before they were required to describe the way they would teach some major curriculum standard in supportive of technology for three tasks on content teaching design. Based on student rationales, the researchers codes as themes as coding subcategories of knowledge, namely CK, PK, PK and the four intersections of TPACK constructs. Findings indicated that there TK remained constant, while an increasingly developed CK and PK levels were observed.

A design-based research by Tee and Lee (2011) investigated the way that assisted in-service teachers in TPACK cultivation for deeper understanding, via problem-based learning approach that was guided by SECI framework. Self-progress surveys was employed to collect data which was also collected via in-service teachers' reflections, artifacts from students, audio-recorded course design and log entries. It was believed that their TPACK has developed in some extent, based on survey data. After comparative qualitative data analysis in two groups, it was founded that teachers became better at TPACK use. Teachers were provided with safe opportunities to have a better understanding that it depended on the subject nature, teachers should reassess and consider their teaching practice in selecting technology since technology was not alone able to enhance inefficient teaching.

Hofer and Grandgenett's (2012) mixed-methods and descriptive research was conducted to investigate student-teachers' TK development during their teacher preparatory program and the most naturally developed knowledge area. All participants who enrolled in an 11-month M.A course in Education in middle program that lasted three semesters, got a B.A degree in Mathematics and Biology, were given admission to the spring-term M.A program. Data was gathered from questionnaires developed by Schmidt et al.'s (2009) TPACK that included seven sub-domains, namely TK, CK, PK, PCK, TCK, TPK and TPACK. All collected from surveys, reflections, and lesson plans during three semesters was compared. It revealed that teacher candidates' TPK was limited, whereas their TCK and TPACK levels were in significantly high scores.

Ghaida, Fisser and Voogt's (2012) study aimed to explore the potential of blended support for effective leaning in support of the Design Team. Survey was used conducted with the participation of 78 pre-service science teachers who attended seminar in education. They were divided into two groups. The researchers used ICT, pedagogy knowledge, and content to coach them, where the later they applied a blended condition that teacher-candidates had surfed from a portal online where numerous tutorials and examples were available, giving them more chances to contact a variety of experts. They worked in teams to create ICT solution that would be used for practical problem facing them during the training at school. Data collected from pre-test and post-test design were collected for attitudes toward ICT skills, ICT and TPACK which indicated that students' significantly higher scores in both groups. In other words, a higher increase in the participants' TK and TPK levels, their attitude toward ICT as a tool for instruction and productivity, and ICT enjoyment were showed by the condition of blended support. This indicated that student perception of the blended condition in helpful of design teams as an expected method to promote their TPACK. The research resulted that technological tools were helpful for better teaching and learning process.

Tantrarungroj and Suwannathachote (2012) did a study to see how confident future teachers felt about creating digital projects and how well they understood the tools needed for that. They looked at 242 future teachers from Chulalongkorn University in Thailand. Before the teachers learned for seven weeks, they took a test to see what they already knew. After the lessons, they took the same test again. The results showed that

those who had learned to work on projects online and used different ways to learn by themselves scored much better on the second test compared to the first one.

A group of researchers named Meng, Sam, Yew, and Lian studied how a special way of learning called lesson study (LS) helped future math teachers learn better. They used a tool called The Geometer's Sketchpad (GPS) to do this. The study involved 46 future math teachers who were taking a class on how to teach math at a university in Malaysia. The results showed that when these teachers used GPS in their lessons, they became much better at using technology, math knowledge, and teaching skills together.

Ozturk's (2012) investigate pointed to find a web-based instructing movement which was planned for TPACK advancement in pre-service history educator instruction in Turkey. Project-based learning (PBL) approach was utilized. The respondents were the 27 pre-service instructors. They all gotten instruction in history and the arrangement of instructional method. It is brought about that understudies were required to efficiently connect wealthy instructing encounters inside the genuine educating settings so that advancement of TPACK in pre-service instructor instruction would be compelling.

Alev, Karal-Eyuboglu and Yigit (2012) talked about the advancement on innovation and PCK of material science teacher-candidates through educating movement plan through web 2.0 instruments. Survey and educating exercises outlined by student-teachers were utilized for information collection. A add up to of twenty fourth-grade imminent pre-service instructors who gone to a so-called course on Technology-Assisted Material science Instructing which endured forty-two hours and utilized web 2.0 innovation for instructing material science were this investigate orderlies. Beneath the lecturer's direction, the members were required to in-pair plan exercises and arrange them with other bunches. Collected information were analyzed by inductive substance investigation, whereas pre-service-teachers' items were analyzed based on criteria to survey ICT-TPCK. Comes about demonstrated that bunches and blogs were chosen most of the members, while fair six of all proposed wikis. Be that as it may, it is concluded that teacher-candidates were not clear in strategy on the integration of web 2.0 innovations into instructing.

Jang and Tsai (2012) claimed that teachers' capacity in instructive innovation application has been progressively created. Few inquire about on the connections between intuitively whiteboard (IWBs) utilize and the affect on teachers' TPACK) have been conducted. This consider pointed at exploring Taiwanese basic arithmetic and science teachers' TPACK around display IWBs utilize. An basic school was the put where approval and advancement of TPACK survey happened. The comes about appeared that critical contrasts on TPACK of essential school instructors who utilized IWBs in comparison with those who did not were found. There was not a critical distinction in their TPACK with regard to sex. On the opposite, instructors who had longer a long time of benefit illustrated essentially higher TPACK than those who had shorter length of educating.

Concurring to Jang and Tsai (2013), TPACK has gotten to be one of the commonly utilized hypothetical concepts for the advancement of instructor information in integration of innovation into instructing. The purposes of this investigate were to explore center school teachers' TPACK employing a unused contextualized show of TPACK. Information assembled through the TPACK survey that was managed through e-mail to 1292 center school instructors who were arbitrarily chosen inside Taiwan some time recently their criticism connections were detest for completed surveys. An free tests t-test was utilized as there were two groups (i.e., sex) to create a comparative investigation for TPACK. Besides, ANOVA was utilized to compare TPACK in two bunches. Discoveries demonstrated that there was a factually critical contrast among auxiliary science teachers' TPACK sex and work involvement. In terms of TPACK sub-components, the TK level of male science instructors was altogether higher than female teachers' was. Besides, experienced science instructors appraised their CK and PK altogether higher than science teacher-candidates did. In any case, science instructors with shorter work involvement appraised their TK and TCK altogether higher than instructors with longer a long time of benefit. The ponder appears how sex as well as work involvement were compelling components for science teachers' TPACK at center schools.

A study conducted by Hasniza, Niki and Faekah (2013) examined the pre-service teachers' use of ICT during field experience and their TPACK development mastery before and after completing the field experience in New Zealand and in Malaysia. In this study, mixed methods were used. This study surveyed 107 respondents and interview three students before and after their completion of field experience. Four major findings were explored. Firstly, entire mean quantitative score for TPACK domain indicated all positive response. Secondly,

TK was the lowest mean score among the seven clusters of TPACK. Next, pre-service teachers were found to perceive TK necessary and sufficient to apply within their practicum. To sum up, it was suggested that three knowledge domains were significant are equally dominant.

In order to consider the opportunities and challenges that students encountered, Lau's (2013) study was conducted with the participation of 10 respondents from various Malaysian states for the pilot test using convenient sampling techniques and used 60 participants for the final test by questionnaire survey. The research context was in one of the private higher education institutions in Malaysia. The present study aimed more to find out to what extent that the modern technologies have been used by the education group based on the TPACK model. The finding showed that there were still room to enhance the private higher educational institution on ICT-based educational system.

Nordin, Davis and Ariffin's (2013) research attempted to address what pre-service teachers' perceptions of their TPACK levels before and after they got experience in their field; and whether or not there was a significant difference of TPACK after field experience in schools. Research instruments were TPACK scale, which was adapted from Schmidt et al. (2009) and Archambault and Crippen (2009) was delivered to 107 student-teachers in a university program motivating intensive research in New Zealand before and after they experienced in their field. Furthermore, three participants were selected for interviews before and after they had experience in their own fields. These attendants' CK level got the highest scores, while their TK was lowest before and after field experience. Paired-sample t-tests indicated significant growth in TK, PK, PCK, TCK and TPACK. Data analyzed from three interviews and observations performed complex changes in their level of TPACK that was relevant to their school experience. Further research was suggested with a comparative research survey in order to prepare the teachers before their middle schools in Malaysia.

As known, ICT application in instruction became a strong emphasis in teachers' contemporary education. A focus on their TPACK perceptions conducted by Lin, Tsai, Chai and Lee (2013) addressed their perceptions of technology applications to teaching. Data collection implemented with the participation of 222 teacher-candidates and in-service teachers in Singaporean context were done. TPACK with the seven sub-components, including TK, CK, PK, TCK, TPK and TPACK was examined by using structural equation model analysis. Findings showed that a positive correlation among TPC and various TPACK factors was observed. It was also found that female teachers perceive higher self-confidence in PK, whereas their lower self-confidence than males in TK level was showed. Furthermore, significant and negative correlation among female in-service teachers' TK, TPK, TCK and TPC perceptions in terms of age was observed.

From Maeng, Mulvey, Smetana and Bell's (2013) research, it presented technology-enhanced inquiry instruction and TPACK development among science teacher-candidates at secondary schools. Before teaching practices, twenty-seven pre-service teachers were provided with general guidelines for technology integration in supportive of science instruction, which belonged to M.A teaching program lasting two years, based on reform. Twenty-six participants of all get involved in technology use for inquiry instruction during student teaching. Data gathered from many sources, such as observations, lesson plans, interviews, and reflections characterized attendants' integration of technology for supporting inquiry instruction and their decision-making that was relevant to technology used to support inquiry. The results showed that participants' technology incorporation was suitable for the content and context in facilitating for non-experimental and experimental inquiry experiences. It was selective and appropriate technology use, including the presentation of an engaging introduction, data collection facilitation, data analysis facilitation, and facilitation in communication and result negotiation that shaped participants' TPACK development. It was suggested that digital image used in facilitation of whole-class inquiry seemed to be promising earlier for teachers in inquiry instruction. Findings indicated that science teacher educators' CK and TK development contributed to preparing teacher-candidates for inquiry instruction supported by technology, facilitation in transiting to the instruction of student-centeredness, and TPACK development.

A case study carried out by Shively and Yerrick (2014) to examine the collection of student-teachers in two courses of technology in education. Many approaches such as interviews, field notes, surveys, reflective digital narratives and students-generated exhibits in exploring the pre-service teachers of how to teach science using inquiry and technology were used in the study. The finding showed that pre-service teachers did not get enough technology tool exposure. Thus, it is essential for them to get more courses so that they can get enough exposure of technology tools to implement in schools.

According to Cengiz's (2014) survey research, it explored how to enhance physical education student-teachers' TPACK, TISE and ITOE, whose versions have been completed by forty-two attendants who were juniors in a pre-/post-test design without a control group before and after twelve-week intervention. Descriptive data analysis indicated higher scores in entire of sub-components of TPACK, TISE and ITOE, while paired-sample t-test statistics ($p < 0.05$) showed a significantly different scores for CK, PK, TPK, overall TPACK as well as ITOE. On the contrary, there were not a significant different scores in TK, TPACK, and TISE. It was concluded that such intervention became effective in identifying and developing TPACK domains as well as ITOE in physical education teacher-candidates.

Banas and Yerk's (2014) survey study investigated the influence of authentic exercises of learning like a strategy instruction, on student-teacher self-efficacy in integrating technology and intentions in technology integration. This research also discovered the predictability in the relationship between changes in self-efficacy in technology integration of teacher-candidates as well as changes in technology integration intentions. The research samples were 104 teacher-candidates who enrolled in a course on a professional preparation methods. Perceived TK, PK, TPK, PCK, and TPACK self-efficacy of pre-service teachers became a measurable factor in technology integration. A paired samples t-test used to compare items indicated a significantly high scores, while PCK was greatest of all TPACK self-efficacy, and intentions to technology integration. Change in technology integration self-efficacy was determined by multiple regression analysis, predicted change in intentions in integrating, particularly change in TK.

Hsu's (2014) qualitative survey aimed at considering the influence of courses on educational technology on developing technology integration knowledge of teacher-candidates in a preparatory program for teachers in American context. A total of eight participants were pre-service teachers who enrolled in a program for primary teacher education at a large mid-western American university. Data was collected from many sources, such as interviews, documents, and observations before its analysis. It was found that TK developed and determined by pre-service teachers was essential in courses on technology integration. It was suggested that various activities could be added to courses on educational technology for better preparation for teacher-candidates in applying technology to their teaching.

Lee and Kim 's (2014) survey research aimed at developing a model for instructional design for student-teachers' TPACK learning in a course on integrating multidisciplinary technology; and applying that model in exploring its effects as it was utilized in a setting of teacher-candidate education with the participation of fifteen pre-service teachers from various areas. Data was collected from their written materials and TPACK questionnaires as well as lesson plans compiled in groups, and field notes by the researchers. Findings showed that pre-service teachers had troubles understanding PK, and their TPACK learning was combined rather than integrated with PK, TK and CK.

Koh, Chai, Hong and Tsai (2014) investigated the perceptions of TPACK, lesson design practices, and design dispositions from 201 Singaporean teachers used a survey instrument after its reliability and validity were confirmed by utilizing CFA. It was revealed that dominant influential variables of teachers' perceptions of TPACK remained undiscovered. Model of the structural equation revealed the perceptions of teachers on design dispositions and practices of lesson design were directly intertwined with the perceptions of teachers on TPACK. Findings showed that in order to improve teachers' perceptions, teachers should be offered assistance from teacher educators who could also help teachers develop practices of lesson design supporting for ideation as well as iteration. Furthermore, getting help on design dispositions, which were easy to discover and solve conflicted ideas from lesson design, from teacher trainers was also needed. What was understood about lesson design practices and design dispositions of teachers played an integral part in motivating professional development for information integration as well as communications technology when they TPACK was ignored.

Hiçde, Uçar and Demir's (2014) survey explored of teacher-candidates' and physics student-teachers' self-efficacy, as well as the relationship among Internet and habits of utilizing technology of the two groups of participants' self-efficacy towards W-PCK. Following convenience sampling techniques, 75 science teacher-candidates and 75 pre-service physics teachers who were going to Dicle University enrolled in this research. Data gathered from W-PCK Survey, including a thirty items, which was developed by Lee, Tsai and Chang (2008), after it was translated and contextualized into Turkish language by Horzum (2011). Their self-efficacy was considered based on five dimensions of the scale, namely Web-general, Web-communicative, W-CK, W-PCK and Attitude toward web-based instruction. Findings revealed that there was a difference between pre-service science and physics teachers' W-PCK with respect to their internet use habits.

Julie and Benevides's (2015) study examined whether or not pre-service teachers changed their perceptions of technology, self-efficacy for technology and understanding of multiliteracy. These teachers develop a multiliteracy lesson plan that integrates technology reports. The participants were 143 pre-service teachers who gathered in a program and were assigned to complete a course assignment. Pre-test resulted that technology is not important to either student learning (56%) or student motivation (58%). But the posttest showed the decrease to 48% for student leaning and 54% for student motivation. Slightly more than half of the respondents believed that understanding technology would improve their teaching. Small percentage of pre-service teachers (17%) feeling confident about using technology to address the need of each student. The post – test results the increase of percentage to 24%.

A qualitative study conducted by Colvin and Tomayko (2015) to look for a way in presenting a specified knowledge of teachers' profile in the TPACK framework after teacher's knowledge had been qualified. A total number of 25 undergraduate students in mathematics and science joined the program. They were required to watch a video on the TPACK framework. Then, they would self-reflect their understanding about TPACK. Based on their understanding of TPACK, data analysis would be conducted. The result indicated that the qualitative proof from their self-reflections was vital for a better TPACK model. It was also evidenced that TPACK radar diagram may fit the pre-service teachers' needs.

Redmond and Peled's (2015) research explored the similarities and differences of TPACK from two international universities where provides two programs for pre-service teachers in Australia and Israel. The research included 99 pre-service teachers. It was concluded that student-teachers were much experienced in technology use from their course work. It was vital that pre-service teachers be provided opportunities so that they can apply TPACK theory in their lesson. Pre-service teachers were less confident in TK and TPK. Regardless of location, their experience and confidence in TPACK was a little different.

Oz (2015) conducted a mixed-methods study whose aim was to assess EFL teacher-candidates' TPACK with the involvement of 76 university students who participated in ELT program at a Turkish state university. They were all recruited and were asked to anonymously complete the TPACK Scale as well as addressed some open-ended questions. TPACK was found significantly high. With respect to sex, there was a difference about females' TK and PK dimensions that had higher scores in TPACK. Qualitative data analysis found that faculty members used TPACK more than cooperating teachers. It was suggested that integrated CK, PK and TK into current paradigm of teacher education and technologically-rich environment for language learners made a great contribution to quality instruction.

Liu, Zhang and Wang's (2015) research investigated in-service K12 teachers' perceptions of TPACK. Research instrument was a questionnaire adapted from Koh, Chai, and Tsai's survey, whose reliability and validity was validated. EFA showed that TPACK perceptions of 2,728 participants could divided into five scales. Standard deviation was used to analyze mean scores of seven TPACK constructs to examine participants' TPACK perceptions showed that teachers had rated themselves as slightly above five points for all the variables. Independent sample *t* tests to consider the relationships between in-service K12 teachers' sex and the TPACK domains indicated that male teachers' CK was higher than that of female teachers, lower in PK. *F* tests to consider the relationships between in-service teachers' work experience and TPACK sub-components revealed that young in-service K12 teachers had a better perception in TK, but limitation in PK and CK. Using hierarchical regression analysis in exploring which variables could predict the variable of TPACK, it was showed that in-service K12 teachers' perceptions of PK, TK and CK had the largest positive effect on the TPACK variable.

Lin, Yu, Wang and Ho's (2015) research explored the perceived integration of TPK in teaching. It was important to understand how learning theory was related to technology as learning principles and processes rationalized educational practices. The study was implemented with the participation of 313 nursing teachers who worked full-time and part-time in a nursing institute within 2012-2013 school year in Taiwan. Results revealed that department members considered learning theories as a foundation in selective technology in instruction, whereas most teachers did not feel that they match learning theories with their instructional technology selection adequately. Furthermore, when they utilized emerging technologies in their instruction, some of them recognized that that did not regard principles in pedagogy, such evaluations, activity design as well as learners' pace. It was recognized that integrated good technology should be closely intertwined with technology and technology. It was indicated that its results enabled specialists and trainers of technology with

data in enhancing materials for suitable professional training and resolve the needs of teachers within their training on technology profession in such a way that link PK and emerging technology utilization in instruction.

Corkett and Benevides's (2015) quantitative study conducted to investigate self-efficacy and technology perceptions of 144 student-teachers who came from primary and junior school before and after multi-literacy lesson plan-based app development, declared that teacher-candidates and their students had new opportunities thanks to the larger technology use in schools today. Currently, it gave student-teachers more possibilities to better multi-literacy lesson integration that technology and the learning of students were enhanced. In order to achieve this goal, teachers were supported with technology integrated in desktop computers, iPads as well as iPods. Nevertheless, it was the perceptions of pre-service in technology and their self-efficacy related to technology may affect their lessons whether or not it was integrated. It was found that young teachers did feel discomfort in technology integration into their lessons after their lesson research and completion that focused on app utilization in a classroom of inclusion.

Akman and Guven's (2015) monitoring method research considered 113 social studies teachers and 919 pre-service teachers' self-efficacy of TPACK, whose scale developed by the researcher was delivered. Using structural equity path for data analysis found consistency index values, while using SPSS program and AMOSS for data classification and analysis, respectively were examined. In the research, the relationship between other components and teachers' TK and student-teachers were low and middle, whereas the relation level between CK and PK has were higher. As a result, PK and CK integration of social studies teacher-candidates and teachers had essentially taken place.

Ersoy, Yurdakul and Ceylan (2016) sought to investigate student-teachers' TPACK competencies in terms of their ICT level, ICT phase and sex. This study included 61 pre-service teachers who enrolled school of education at a state university where a pretest and posttest quasi experimental design without control group was conducted during 2011-2012 school year. This survey research was implemented by using TPACK-deep Scale, ICT Usage Phase and ICT Usage Level. In the end, their competences of TPACK increased from medium level to higher level after taking activities based on TPACK. In addition, certain progress was found in proficiency, ethics, exertion and design which were included in TPACK scale. At the final of the intervention, teacher-candidates' ICT usage phase increased. As a result, level of ICT increase of student-teachers fluctuated their competencies of TPACK, but there was not a significant difference between sex and competence of TPACK.

Jita (2016) carried out a study to determine the pre-service teachers' perceptions on TPACK. Mixed methods were used in this study with the participation of 103 final year pre-service teachers. They were responsible for completing questionnaires on their ICT competence in teaching. 21 of them were invited for interview on their ICT use in teaching practice. The findings showed that CK and PK were more important than TK. The participants used technology to prepare and present their lesson, but they did not respond how interactively the students worked with ICT during the teaching and learning. The interview showed that the pre-service teachers did not apply ICT in the classroom because students were not allowed to use cell phone in classroom and also the cost of data bundle would be bulky. It is suggested that the pre-service teachers were not skillful at TK.

Nordin and Ariffin's (2016) research validated the TPACK instrument for ICT in effective teaching and learning in a secondary school in Malaysia. A case study was used in a specific context in Malaysia. The researchers also conducted a survey with 150 student-teachers who attended to a Malaysian university. It was first resulted that measurement model was consistent with the data collection within a Malaysian secondary school where the validity of adapted TPACK instrument in the research. Secondly, the participants felt confused about PCK, TPK TCK and TPACK. It was suggested that the pre-service teachers not distinguish the differences of between TK and PCK.

According to Luik, Taimalu and Suviste (2017), it is worth noting that quality teacher preparation in many countries for the twenty-first century students played an important role in teacher tertiary institutions. Besides teaching skills, teachers should be equipped with the ways of technology integration into their teaching so that they could teach subjects in an effective way. With respect to TPACK framework, various related studies have been done. TPACK instrument for its measurement was created in Estonia to find out pre-service teachers' perceptions of TPACK. Findings indicated that although pre-service teachers were good for technology integration into teaching, they lacked PK in their teaching practice.

2. Summary of the literature and justification of current study

As aforementioned, studies on TPACK have been increased in recent years, but very little qualitative research has been conducted to explore how teachers experienced TPACK, which remains unsolved. Almost all the research studies were conducted in various contexts in the world, not in Vietnam, where the focus of this research is on.

IV. RESEARCH METHODOLOGY

1. Participants

Ten participants were interviewed in order to investigate how they experienced their TK, PK, and TPK in their English teaching practices. In other words, the interviews were conducted to address the research question: “*How did EFL teachers experience TK, PK, and TPK in their English teaching practices?*” Interviews were conducted with the participation of at least two people in order to understand the way they live (Fontana & Frey, 2008; Glesne, 2011). On the other hand, the researcher conducted interviews for asking the participants questions to elicit their responses that could answer the research questions. The context of asking and answering exchanges that the researcher and the respondents experience was so-called creation of collaborative effort (Fontana & Frey, 2008). Flexibly, it depended on the interviewees’ answers, numerous incurred questions were asked in a spontaneous way to get more sufficient and in-depth information.

2. Data collection and analysis

In order to address research question, “*How did EFL teachers experience TK, PK, and TPK in their English teaching practices?*”, the researcher used three out of three out of seven clusters of TPACK framework adapted by Mishra & Koehler (2011), which was used to negotiate the participants’ TK, PK, and TPK. Below is follow-up interview data based on selective interviews from the teachers who have many experiences in technology and pedagogy used within their English teaching practices. The following are interview data collected from 10 teachers about their experiences of TK, PK, and TPK, which were illustrated and expressed in different views.

IV. FINDINGS AND DISCUSSIONS

1. Technological knowledge

Most of the participants agreed that technology application should be an integral part in English teaching in which Power Point is one of the most widely used tools.

“I think it is something like a device that supports for teaching in more convenient way. In order to make the lesson more vivid, we should integrate technology into it, for example, Power Point, which is used as a good tool for presentation. It can help catch students’ more attention and save teachers’ energy about writing on the blackboard, as well as reduced the use of piece of chalk which is not good for their health. Incorporating TK in teaching English is a good way to apply innovative technology to schools. In order to incorporate it, a teacher has a chance to learn more, beside their expert knowledge. Both kinds of knowledge are combined to make the lesson more attractive and effective. The computer and projector have been becoming popular in modern classrooms where a teacher uses them for their teaching, especially when he/ she wants to show videos related to the lesson. In fact, they are very useful for teaching English. It is easy. Before class, I show key words the lesson as well as some selective videos or sounds and images to the Power Point. They are all chosen carefully and must be suitable for the students’ level. It was more attractive thanks to its vivid images. There are students of different levels, so sometimes few of them can not follow the lessons although they are given time to copy down. In addition, for a 45-minute lesson, it is not enough to show all needed videos or images to cover the lessons. Moreover, the students with auditory skills can perceive pictures well, but visual ability is modest. As a result, technology use is not completely good in teaching. Before technology access, I chose to write main ideas on the board and present the specific contents to the students. They will all be given handouts to complete the assignments, but thanks to technology, I typed all in the Power Point software and the students can look at it to choose their own answers.”

Besides, various tools are also used in teaching, such as mail accounts and videos clips because of their benefits.

“At school, I find technology necessary in teaching. Like my colleagues in the workplace, I am sure I use Power Point and computers the most in my class. In fact, it is more interesting, easy to understand and remember the lessons longer. It is good to use computer and projector to teach English because of their benefits to transfer knowledge to the students.”

In addition, projectors are another useful device that becomes popular in education. It is stated in the following excerpt.

“When I think about technology in teaching, I find it extremely important in modern time of education thanks to its effective application to teach my students. Beside textbooks used in classroom, I apply the Internet

to enlarge my lecture and widen their knowledge. Specifically, I think email is a good means of communication among me and my students because time in class is limited for further discussion. For those who are shy can contact me easily via email, instead in person. It connect students' background knowledge with the world thanks to watching videos. In addition, the lecture will be more attentive and interesting by technological application."

No one denies their popularity of Power Point, one participant adds Moodle to her teaching every day.

"Personally, I often choose to use Moodle, word processors, and Power Point in my teaching practice. Undoubtedly, these technological applications are very convenient in class where we can easily interact in long distance and in class. It is clear that technology incorporation makes the lectures more attractive and vivid. That is all I get from it."

Although some of the participants are with the technological application in their teaching practices, some have contrastive ideas on these problems because they do not think digital use is always good.

"Like other teachers, I think the development of technology is a breakthrough in science, especially its usefulness in English classroom. I believe that its application may be popular and necessary in teaching as well as learning in modern education. Moodle is my choice in teaching practice. My school equips students with this online learning system so that I can interact with them at home. Extra assignments are assigned to them for reviewing what they have learnt in class. In teaching English, the purposes of incorporating TK are to develop students' learning outcomes thanks to online tools, such as, Power Point, computers and smart board which are beneficial to present the lessons to the learners interactively. Of course, the students may keep much focused in class. That is not completely good. Students who are near-sighted become difficult in observing and copying down. Moreover, those who are so-called technology allergic ones feel useless to technology integration in the class because they are annoyed from the screen reflection. In traditional class, I wrote all new words on the board and have the students repeat after me. Until technology is integrated into the classroom, I compile those vocabulary on some slides and their transcriptions from online Oxford dictionary are inserted by side to check their pronunciation after the first reading session."

Likewise, no matter how advantageous technology is, this attendant does not think that it should be make full use.

"It can be said that new student generations are luckier than we are thanks to their access to technology in English class. Teachers in modern time also have a good opportunity to approach to it, so they can present their lesson in more effective way to catch students' focus on the taught contents. As long as the technological tools and labs are available, technology should be used. To illustrate, when I teach my students about family life, instead of using printed photos to present in class, it is more convenient to use Power Point in which I can insert many different family pictures into one slide and show their relationship. This can help the students link their ideas and imagination to create a mind-map system in remembering topic vocabulary effectively. As we have known, teaching English seems not to become efficient without the help of technology. They both cannot stand in a separable way. Frankly speaking, I do not think I should use much technology in my class. I do not deny its advantages, but my lack of knowledge leads me to more and more obstacles because in my time, I did not concentrate much on technological tools. Due to my insufficient knowledge in technology, I attend annual workshops about ICT for English teachers. That is why I become much more interested in technology use in my class and motivate my students to make use of computer-assisted language learning. In order to answer this question, let me give you an example. For a warm-up activity, I draw a circle that contains the main key word like "deforestation" or "natural disasters". Many branches are drawn from the large circle before my students suggest their answers. Those who are good at typing, will choose to type from the key board. Other use piece of chalk to respond to my earlier request. As a result, the students are more optional in their ways of presenting their answers that make the class more fun and attract more attention during the period. In the past, I used to teach English with blackboard, so what I wanted to transmit would be covered on the board. For example, like most teachers, I also used the board as a vital tool for my teaching new words as well as grammar. I would transcribe and take a careful note next to the words when I tried to explain it to my students. In addition, before a new period, I had the students to go on the board and write down what they had learnt after my request, taught words, making new sentences using those words in a grammatically correct way, for instance. Recently, I have been equipped with smart boards, so I and my student just touch the screen for the results. That's it."

Sharing the same ideas, another participant shares his opinion in different perspective as follows:

"From my point of view, technology is an inseparable part in teaching in general and in English classroom in particular. It sometimes takes much time to plan a lesson on Power Point before class. I do not

think it is the best to integrate technology into the lessons all the time. In other words, it depends on the teaching contexts, students' level and conditions which play a decisive role in their learning outcomes. I have a feeling that most students may remember the lessons better when they sit in a traditional class with blackboard and piece of chalk while others feel good when they are sensitive to technology-designed lessons because they familiarized themselves at their earlier age. Technology incorporation in English class is to make the periods more attractive and catch learners' more attention to the presented lessons, especially for younger learners who are sensitive to colorful pictures that illustrates respectively written new words. I have two different ideas about the use of computer and projector in teaching English. Firstly, it supports teachers to write less in the board and limits their contacts with piece of chalk that can cause them to have tuberculosis and other professional diseases. This can help teachers save more time in their lesson plans and they can take such time to explain to their students in more detail. Secondly, it is technological tool that enhances their work effect and quality. Thanks to the projector, the teachers may integrate more useful materials related to the current lessons that may be good reference to learners who can read deeper at home. Interestingly, when I teach vocabulary before technology, I write them on the board together with their drawn pictures. However, with the support of technology, I insert those images downloaded from the Internet, which are easily conducted and save time."

In the same vein, another interviewee agrees with the usefulness of technology use in her work, but it also depends on the learners' ability.

"Undoubtedly, technology has been long become an integral part in teaching because it brings about convenience and usefulness that benefits much to teachers who are good at its application to their teaching practices. Thanks to its goodness, a teacher does not need to bring something in heavy weight to their workplace where they, instead, can feel good and comfortable. Anyway, sometimes, it is not good if much technology use is made during the period, while audio learners do not consider it as their useful tools. As popular tools like computer and smart boards, a teacher should use Power Point for their oral class presentation as well as interaction with the learners who are actively participatory in class. In addition, teachers can save their energy and keep a better voice if they have to talk so much during the day. Regarding smart boards, it is good to activate students' mind to remember new words more effectively. This is appropriate to teach those who are visual learners because it is easier to catch their attention to the lessons that are vivid and attractive. It is clearly stated that technology integration in school is a marvelous profit that leads teachers to approach various online materials as well references for lesson plans uploaded and updated every day. Thanks to it, a teacher will be reachable to new methods that might be used as a trial for students in order to test its suitability and effect. The two tools are useful because they are used as a means of presenting the lesson before class. A teacher can display most main content on the screen and student can witness it directly and vividly, indicating that they will swallow more effectively as well as remember the lesson longer."

There is one more respondent who confirms that technology sometimes is not the best to attract students' attention and proposes a different idea about its application.

"Technology becomes much applicable to teaching, especially in English classroom. In today class, Power Point, computers and projectors, spreadsheets become commonly used to exploit its high effect in teaching practice. Although its convenience, a teacher should not make full use of it because traditional class sometimes makes a big difference in attracting students' interests. There is no denial that technological device plays an integral part in modern classrooms where the learners can approach to educational advancement and improve their perceptions as well as intelligence thanks to good equipment."

The final participant shares the same idea as his colleagues that everything should be moderate, instead of overusing it in class.

"Maybe the application of Power Point is the most popular in each classroom. To me, I also take time to apply interactive whiteboard as technological tools in my class to help the learners familiarize with the variety of technological tools in their learning. In conclusion, I do not think that the teacher should make full use of technology in the classroom because everything should be so moderate that it can gain the best effect. We should also use blackboard to teach the students sometimes. In general, technology plays an integral role in teaching English. With the use of it, the teacher can find it much more available to transmit his/ her lecture to the students."

In general, although most teachers agree that technology use in their classroom is quite necessary, it should not be made full use, depending on the teaching conditions, learners' context and teachers' own ability in applying it to their teaching practices.

2. Pedagogical knowledge

Regarding pedagogical knowledge, many teachers seemed to feel vaguely about it. One of them demonstrated in the following excerpt:

"Up to now, I have taught English for eleven years, recalling my application of pedagogical knowledge is sometimes vague because such knowledge is usually necessary during my internships. In my current teaching context, I often transfer my knowledge to the students as an observer in class instead of performing my pedagogical ability as in an internship session. It aims to transfer knowledge to learners more effectively. If a teacher with proficient and competent English has no good pedagogical skills, she/ he will not teach well, especially when she/ he want how the learners can understand the lessons. With what I learnt at my university training courses, I will apply it in a selective way as long as it adapts to my teaching context. To illustrate, before have students describe a picture, I will give them clear instructions before delivering my handouts to them in order to attract them from my words. After they receive the pictures, I will make an example and some descriptive vocabulary as well as adjectives. Their duties are to look at the pictures and imitate the given example in a creative way."

Another interviewee illustrated his answer to his experience in pedagogical capacity in a different perspective to show his uncertainty about it in the following excerpt:

"Although I graduated from a school of education, I do not think I always apply pedagogical techniques to my teaching because it is monotonous and provincial. However, I can't help applying it in an observed class by my colleagues and/or school board. Like my colleagues, I believe that PK is inseparably related to teaching English because it is useful to transmit and present the lessons to the learners who can perceive the taught contents well or not, depending mainly on a teacher's pedagogical skills."

Sharing the same idea, his colleague explained it in a different way quoted in the following excerpt:

"My major is English language education, but I am not sure my knowledge in pedagogical course can be completely applied. Thus, my experience is usually useful to my teaching because it suits my teaching context. In order to attract students' attention, good application of pedagogical skills is crucial to a teacher in class where many students will have a good opportunity to acquire their lesson effectively."

Similarly, another participant interpreted her experience in pedagogy based on its unnaturalness when it was applied in class.

"It is good to apply PK in the lessons because it may be a good way to help students build new knowledge. Usually, I apply my PK when I am observed by school official and those from the Department of Education and Training. Franking speaking, if PK is made much use, the lessons will be boring and some learners cannot follow because it is not taught in a natural way. It is clear that PK is necessary for effective transmission of lecture in class because it makes students perceive the lesson or the lecture easier. However, the more I teach, the more I will use my experience to adapt the context instead of apply pedagogical skills all the time."

Once again, lack of naturalness in applying pedagogical skills is stated by one more respondent because he concentrated on the learners' acquisition level.

"I got an educational certificate of professional development and I have over ten years of teaching experience. At the beginning, I applied all from pedagogical course to my class and I got failure as a result of its unnaturalness in teaching. My students are merely learners, not teacher educators or experts in pedagogy who are skillful at pedagogical application, so the students need to be taught in such a way that they can perceive the lessons well and apply that knowledge to their exams effectively. Learning pedagogical skills form university training course, I find it useful in teaching, especially, helping my students acquire new knowledge more effectively. Nevertheless, I do not know for sure that I will use it in all situation because sometimes using my own experience to help learners have easier understanding is my choice."

Clearly, although no participants underestimated the importance of pedagogical skills in teaching practices, she revealed her opinion by her teaching experience as follows:

"Sometimes, I do not think pedagogy is always suitable for teaching. It depends on the teaching context, especially when I am observed by some officials or inspectors. At that time, I must apply all about pedagogy I had learnt to my class. To me, it is something artificial and unnatural in real teaching context. Same as usual, my teaching experience is applicable to my teaching so long as it provides students with good understanding after class. Theoretically, as I have said, pedagogical skills are not always suitable to class although it is crucial to transmit knowledge to the learners in a smooth and creative way. Undoubtedly, pedagogical skills

help attract students' attention to the lessons more efficiently. However, it is sometimes boring. Recalling my high school time, I could not tolerate a teacher who applied her skills in pedagogy to her lectures. It made her feeble and not very natural in every period she taught. On the contrary, another teacher who was her colleague did something different for her caught my attention to her presentation before class so much."

One of the interviewees illustrated her answer to teaching skills depending on the creation as well flexibility, instead of the rigidity that hindered the effectiveness of a period. She explained as follows: "I do not deny the benefits of pedagogical skills applied in class, but it should be flexible in using because a teacher who stands in class unlike an actor or an artist who performs onstage, so it is better to apply pedagogical skills in more flexible way. In other words, she/ he should make full use of it in class. In my opinion, pedagogical skill application becomes a good way to transmit the lesson content as well as knowledge to the students. It can help them understand the lesson easily."

No matter how different they were, some of them showed more positive views on pedagogical ability although it was also based on their teaching experience.

"In addition to teaching experience, a teacher's pedagogical skills that I was taught at the university plays an integral part in my class. For instance, effective classroom management is an essential factor for a teacher who wishes to do well in class. To manage the learners more professionally in class. This helps me act smoothly in presenting the lecture to my students."

Another interviewee showed her pedagogical experience in classroom management. She also agreed that it was very important in teaching.

"It is true that pedagogical knowledge is essential in teaching. All I want to share is classroom management skills and lesson plan development. Those are extremely important to teachers who want to gain success in their teaching practices. I must confirm that a teacher's skill of teaching are regarded as a good way to check how professional a teacher is in teaching. It also shows how good their classroom management as well as their way of materials development for their teaching."

Similarly, another participant also appreciated its importance in her class although it was hard for young teacher to apply it to teaching practices. It is illustrated as follows:

"Beside teaching techniques, methods and approach in general, classroom management and student evaluation in particular is often used in integrating in the class. Anyway, such integration is entirely needed as long as it is effective. Although PK seems difficult to some teachers who are too young, it is an alarming need to be applied pedagogical ability to teaching to make sure that the lecture and presentation are taken place smoothly. It makes the learners feel good and understandable the lesson easily."

In conclusion, although most of the teachers do not completely agree that pedagogical skills are an integral part in teaching, they reveal that it should be applied in a more flexible way so that the period quality and effect can possibly become much better. Some limits of the firmly used pedagogical skills are shown by nearly all respondents, namely unnaturalness, monotony and their incompetence in pedagogical application that should be enhanced in the future class.

3. Technological pedagogical knowledge

Most participants had good experience in applying technological pedagogical knowledge to their teaching practicum. Two of them stated in turn as follows:

"I have to confess that I am quite good at technology. It could be said that she was an enthusiastic user of technology for teaching. Like my colleagues, I usually use Power Point, computer, blackboard and projector very fluently and cleverly. Furthermore, I also exploit my school internet connection system in my teaching. For example, I get access to online Oxford dictionary in which I can look new word up, especially, with American-English and British-English accent, my students could familiarize themselves with various accents and understand what native English speakers said in real context."

"The way I see it is bad when we make the best use of technology in teaching. In some situation, the application of pedagogical knowledge and technology is crucial. To illustrate, in a speaking period, I teach the students about pronunciation, it is better to use cassettes to play a Native American accent so that they can listen to and familiarize themselves with authentic English. Absolutely, a teacher must adjust the cassettes in such a way as to have them imitate the pronunciation in right intonation. I must confess that a teacher should be

good at teaching skills and apply technological tools well in order that they can be successful in his teaching career as well as ensure the learners' learning outcomes."

Like his colleague, another interviewee share his flexible competence in integrating those two kinds of knowledge. The following excerpt illustrated his view.

"I confess that integrating digital device into teaching was an interesting activity. For example, when there was a class observation, I registered for a lab where he could use Power Point connected to the projector to present his lessons to the students. It was so convenient that he rarely write on the blackboard. My students sometimes felt bad because very few could not complete writing down all the presented contents. For another instance, instead of using audio cassette in listening activities, videos were played and attracted the students' attention thanks to its vivid images and sounds. In addition, the students could watch the speaker's mouth, so they could easily imitate his/her accent. Anyway, I prefer technology in teaching that would be in inseparable relationships."

Undoubtedly, knowledge of Power Point use connected with teaching methods and techniques is the most popular in modern English classrooms. Such integration made a greater contribution to creating an active learning and teaching environment in modern teaching context.

"In my opinion, it is of great importance to integrate TPK into the lessons. This becomes essential in high school where Power Point and computer, which are ready in a laboratory, are always available to use in teaching. By employing diverse methods and approaches; and adjust the technological tools at the same time, a teacher must have prepared the lesson plans for a long time before the lecture. The application of TPK to English class helps promote the students' excitement and inspiration to study much better because they are provided with various ways to acquire new knowledge. In addition, they will feel comfortable and attractive in learning English thanks to the flexibility of a teacher in his/ her adjustment of the tools in accordance with pedagogical capacity."

Similarly, the effective application of TPK attracted the students by using many tools of technology and teachers' skills of pedagogy that they had been trained at the university.

"This action is important in English language teaching because one stone kills two birds. When technology was underdeveloped, a teacher's pedagogical skills played a central role in teaching. It remains crucial until the development of technology appears today. When both are harmoniously applied in teaching, I am sure the lessons will be more interesting, so it is necessary to integrate technology and pedagogy in a period to exploit its convenience and advancement in modern education. It is generally spoken in teaching and particularly in English language teaching, the incorporation of TPK is of great importance because it helps enhance teaching and learning quality in class where the learners, especially in educational globalization, should be equipped with as good knowledge as possible in adapt to the world innovation, specifically English communicative competence in multicultural environments."

Once again, the full use of familiar tools as Power Point as well as English websites is presented via their valuable teaching experience, whose application played an integral part in linking with their pedagogical skills. They were generally beneficiary for teachers' teaching practices. One participant explained it in more detail.

"Although it is not very easy to control the use of pedagogical possibility to give a lecture with the support of technology, it is essential to do that. In class, I use Power Point together with projector most often thanks to their convenience and simple usage. I do not think it is enough to use only those aforementioned tools, so I exploit the Internet sources from British Council websites to teach reading and writing. Thanks to the available lesson plans on it, I adapt them to suit my teaching context and use to teach my students who are also encouraged to promote online learning via Zoom for two hours in the evening. Clearly, although not all teachers of English are good at both using technology and pedagogical skill application in their teaching, they find it necessary to integrate into their lectures. Frankly speaking, it is supportive of students' interests in acquiring and understanding the lessons. Various ways of transmitting knowledge from the teachers to the learners provides them with easier forms to keep pace with the lesson content."

Like other teachers' experiences in their TPK, one of the interviewees not only integrated social networks, she also applied her teaching skills to her presentation in the classroom. In addition, she also indicated he difficulties that she encountered at work as follows:

"The integration of pedagogical skills with the support of technology is needed in teaching, especially in teaching foreign languages. However, I am keen on apply technology in my teaching practice, and I also

engage my students to use online programs in their learning. In order to contact them, I, myself, usually use many means, such as Zoom, Zalo and Facebook to interact with my students. I appeal my students to reviewing their lessons before each test twice a week and they appear to like it so much. I find it convenient and highly applicable to teaching and learning process. I realize that the use of technology is necessary both in life and teaching practice. Among many tools, I prefer Zoom because it we can talk and interact with one another face-to-face from distance. Time in class is limited, thus we do not have much time to discuss further. Applying Zoom in general is important for us to connect more with them in a friendly learning environment which we can attend in a flexible way.”

“It is so interesting and pivotal in collaboration between pedagogy and technology skills into the lessons. The most popular tools I use are Power Point and projector which are useful in class. In addition, like my colleagues, I apply Zoom to contact my students and gather them in reviewing former lesson in the evening. This is good to promote their online learning to approach to innovative devices of technology, and natural interaction among them. With the cooperation of technology and pedagogical skills to teach English in my class where the students find it interesting and exciting to acquire new lessons. In addition, it is also a good chance for my students to approach new technology-based learning environment via the flexible application of pedagogical capacity. Thus, the most valuable thing they get is update knowledge in the world where they can hardly reach out.”

Sharing the same ideas, one more interviewee demonstrated his amazing experiences in her integrative capacity of knowledge on technology and pedagogy. She showed her obstacles expressed in a different way compared with her colleague as mentioned earlier.

“I would say that if we can apply technological tools together with teaching approaches and techniques effectively at the same time, the lecture will possibly be more attractive than any more. At my work, doing it seems to be compulsory at school. To put it simply, in a listening period which I have my students fill in the gaps. They are given two minutes to skim the test before starting listening to the tape which had been prepared and checked carefully before. In order to ensure the sound quality, I turn it on and ask the students to comment whether it is sound and clear enough before an official listening session. I adjust the short audiotape in a specific situation three times before they complete the assignment. From my point of view, it takes a teacher much time to prepare for a smooth lecture in class. However, the flexible linkage of technological devices and a teacher’s pedagogical ability provides the learners with careful attention to the presentation or lecture, which will result in students’ good understanding and possibly good learning outcomes.”

Another respondent seemed to find it difficult to apply those two kinds of knowledge at the same time although she supported how efficient it is in catching the students’ attention in class.

“I strongly believe that the integration of TPK in class is normally mandatory in modern education. In fact, it is very hard to link both effectively at the same time. However, when a teacher does it well, her lecture or presentation will become attractive to the learners who can possibly perceive very well. As I have mentioned, the integration of technology and pedagogy can improve instructing quality in class. The learners may feel good in remembering the lessons after their teachers’ lectures. Thanks to the variety of technology and pedagogical application, the students are also interested in what is presented by the teachers.”

In a nutshell, the integration of technology and pedagogical skills into teaching is shared in a very interesting way by experienced teachers of English who used various tools together with teaching methods as well as approaches they have accumulated for ages. Besides the convenience and usefulness within English teaching, many obstacles are still existing, namely limited time, teachers’ incompetence in integrating those two kinds of knowledge.

V. CONCLUSIONS AND SUGGESTIONS

1. Teachers’ experience of three TPACK clusters

The data analysis of the results gained by interviews showed many views of respondents who had many years of teaching experience revealed that TPACK integration into English teaching practice was time-consuming. The present study confirmed the findings about how to manage time in integrating TPACK clusters, which was consistent with Top’s (2007) research results. Another promising finding was that the application of technological tools depended on the teaching conditions, learners’ context and teachers’ own ability in applying it to their teaching practices. This is an important finding in the understanding of the TK in English instruction.

2. Pedagogical implications of the study

Based on the research findings, some pedagogical implications can be considered to enhance the quality of English language teaching and learning in the research context. First and foremost, in order to integrate technology into English language teaching more effectively, teaching conditions should be better. Secondly, it is time-consuming in TK and TPK integration, so it is suggested that teachers should equip themselves with better time-management skills at work. It is important to facilitate EFL teachers' technology use in their teaching environment and provide them with more chance in approaching to new technology. Thirdly, it is confessed that unnaturalness and monotony still exist in integrating TK into English teaching. Balancing pedagogy and technology in acquisition at higher education institutions is necessary for teacher-candidates who can get help from teacher educators because investing much time in digital device alone does not sufficiently equip student-teachers with integrating technological skills into their university courses. Finally, teachers' incompetence in technological and pedagogical application is a controversial issue. It is suggested that they should be given more opportunities to attend annual training workshops so that they can enhance their professional development in education and ICT skills.

3. Limitations and suggestions for further study

The present research has some limitations which should be considered for future research. First, the research context was narrow and the samples were small, so it seemed not to be generalizable. Second, English questionnaire version should have been used although it was psychologically friendly enough with the respondents who came from different educational background and working environments. The research implications of this study are provided along with suggestions. It is recommended that future research should be conducted in larger context where STEAM environment is included. Moreover, further study should consider teachers' experiences in many aspects, such as majors, workplace, educational level, interests. Furthermore, those who care for the remaining clusters of TPACK should develop a new scale in larger Vietnamese research context with more items by using CFA and EFA. In addition, future study should compare the perceptions of TPACK among teachers from elementary, secondary and high schools where they face various working environments. Another recommendation is that comparative data analysis on TPACK should be conducted between the teachers who work at high schools and English language centres where their milieu seems more flexible. If possible, it is also recommended that further research should be implemented by using convenience sampling techniques.

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