

Investigation of the High School Teachers TPACK Competency in South Garut, West Java, Indonesia

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Abstract: Teachers as professional educators are required to have a set of competencies to support their performance. The development of information and communication technology requires teachers to be proficient in utilizing technology in learning. The purpose of this study was to determine the competence of TPACK (Technological Pedagogical Content Knowledge) high school teachers in South Garut. The research method is survey research using the TPACK questionnaire which has been validated with good reliability. The survey was conducted on 24 high school teachers. Survey data were processed using simple statistics. The results showed that the teachers had good enough TPACK competencies in implementing technology-based learning. However, competency development is still needed in the process of designing and assessing technology-based learning.

Keywords: TPACK, competency, teacher high school

1. INTRODUCTION

Preparation of teachers in welcoming the development of Information and Communication Technology (ICT) with the application of technology integration in the classroom is an indispensable component of teacher education programs around the world [1]. This is no exception in Indonesia. Opinions from [2] revealed that in facing developments that must be done is: (1) teachers as role models in education; (2) reflecting on the use of technology in education; (3) learning to design technology; (4) collaborating with peers; (5) trustworthy experiences; and (6) continuous feedback. However, many preparatory teachers remain trapped in the experience of traditional teaching practices and knowledge that tends not to adapt to existing conditions in the classroom [3].

Active teachers will be able to make students more active so as to create a more effective learning atmosphere. Active teachers will also work harder to make class activities more meaningful. In addition, he will also be willing to work with students in extracurricular activities so that students will bond with the school and improve their achievement [4]. Furthermore, there are four types of activeness, or in this case involvement based on studies from previous studies: (1) Involvement with schools as social units, where teachers are able to create community and care for the school so that there is continuity between their personal life and their work life; (2) engagement with the academic goals of the school, where teachers are integrated with high demands that are influenced by the quality of their work life so as to increase the commitment of teachers to provide meaningful feedback; and (3)

involvement with students as individuals so that the teacher shows concern for the personal life of students, is more sensitive and aware of student development to become more mature; and 4) involvement with disciplines that influence the formation of effective learning.

Teaching needs to be understood both theoretically and practically and one way of understanding is to consider teaching as a discipline rather than as a way of conveying "knowledge of a discipline". This means, understanding teaching as a discipline offers insight into what it means to develop quality in teacher education [5]. Standards for teachers can be classified into two broad categories according to their level of specificity. The General Standards describe generally good teaching practice without specifying how, in practice, this should be demonstrated in different teaching disciplines, different grade levels of students or stages of professional development. Specific standards describe good practice for teachers of various subjects, grade levels (nursery, primary, or secondary school teachers) and even for different stages of their professional development (graduation standards, full enrollment, advanced teaching practice, leadership roles).

So, to improve teacher performance, one of them is by using the TPACK foundation as a forum for developing these competencies. TPACK is a framework that integrates Technological Knowledge, Pedagogy Knowledge, and Content Knowledge in a learning context [6]. TPACK focuses on how Technological Knowledge, Pedagogy Knowledge, and Content Knowledge can be put together in a lesson which later makes learning effective and successful in a learning context. Technological

Knowledge, on technological knowledge (Technological Knowledge) is how to use technology as a learning aid, for example the internet which is a learning resource and learning tool for learners. Internet technology is already very fast and supports learning, this technology also provides software that can be used for learning and is free, such as Moodle.

Pedagogy Knowledge, Pedagogy Knowledge is how teachers teach learning materials, the use of appropriate and creative models and methods can make the learning process more effective. Adult learning approaches such as constructivism, social collaboration, and social constructivism to form learning communities are examples of learning models that can be used. Content Knowledge, Content Knowledge is what will be studied or what material substance will be studied.

TPACK is a potential framework that can provide new directions for teachers in solving problems related to integrating ICT into teaching and learning activities in the classroom. There are seven variables that affect TPACK, namely: Technological Knowledge (TK) is knowledge of how to operate computers and relevant software: (a) Pedagogical Knowledge (PK) is the ability to manage student learning; (b) Content Knowledge (CK) is the subject matter of knowledge such as knowledge of language, mathematics, natural sciences, etc.; and (c) Technological Content Knowledge (TCK) is knowledge about how content can be researched or represented by technology such as using computer simulations to represent and study the movement of the earth's crust.

TPACK has been used in various countries. As in Japan, the focus of using TPACK lies in material development, information ethics, and school work [7]. In America, the use of TPACK focuses on developing competencies in accordance with technological developments. In Australia, the use of TPACK is focused on a variety of learning services [8]. In Turkey, TPACK is used as a forum for teachers to design and evaluate learning by combining technology, teaching and content provided, especially for elementary school (SD) teachers [9]. This is in line with the statement 14 that TPACK is a model that integrates technology (computers, internet, digital video, etc.), pedagogy (teaching-learning methods and strategies) and content (subject matter). In Southeast Asia, to be precise in Malaysia, the use of TPACK tends to use ICT more as a challenge in facing the future [10]. Finally, in Finland, the use of TPACK focuses on developing learners to adapt to 21st century developments [11].

Research on teacher competency analysis of TPACK was conducted in Garut, West Java. Based on the data from the survey conducted before the activity was carried out, it can be explained that the total number of teachers from the three schools was 42 people with a total number of students as many as 661. The highest total of teachers and students was at SMAN 21 Garut. The only public high school in Talegong District. The school was established in 2002. Meanwhile, the next two schools were still new, so the quantitative data was also relatively

lacking. This is inseparable from its status as a private school owned by the foundation and the location of the school which is far from the sub-district capital [12].

Based on observation data from [12], in particular, the outline of the problems faced by partners can be described as follows: (1) schools have limited facilities and services as well as completeness of library collections as student learning resources; (2) schools have limited online information facilities via the internet that can be used by students to search and find additional learning resources online (online); (3) 94.9% of students admitted that they needed additional teaching materials other than textbooks to support the need for subject matter, both that can be studied at school and at home; and (4) 74.6% of students admitted to having difficulty understanding the contents of textbooks independently so that additional teaching materials were needed using the teacher's language to make it easier to understand;

The purpose of this study was to determine the level of competence of TPACK teachers of high school and equivalent in Garut Selatan, West Java. The results of this study are expected to be valuable input for the local education office in developing a program to increase teacher competence in their region. So that in the future, the quality of education in South Garut can develop and be able to produce graduates who are highly competitive both when working and continuing their studies at college.

2. METHOD

This study uses a survey method. The survey method is a research method by collecting data from respondents using survey measuring instruments that have been developed and validated. The questionnaire used is a translation of the TPACK measuring instrument which has a high level of validity and reliability. The survey activities were carried out in conjunction with the implementation of community service programs in South Garut in June 2019.

The number of respondents surveyed was 24 senior high school teachers who were randomly selected from all teachers in each school. The teachers surveyed came from a diverse group of disciplines such as Chemistry, Biology, Mathematics, Physics, ICT, History, Languages, Geography, and Religion. The period of work as a teacher also varies, ranging from 2-15 years. The mean age of the respondents when filling out the questionnaire was 31 years. The teachers come from several public and private universities in West Java.

In general, the research stages that have been carried out include the stages of developing a research questionnaire adopted from the TPACK standard questionnaire. Furthermore, the activity of distributing questionnaires to respondents. The next stage is simple data processing using a number processing program. Then proceed with the data analysis stage and end with drawing conclusions and submitting recommendations to related parties.

The data analysis technique used is descriptive quantitative data analysis, which describes the data based on the processed survey results. Each data entry from the respondents is processed in the form of a percentage. Then the average is calculated to see the level/level of TPACK competency that has been mastered. After that, the researchers conducted competency mapping analysis on each TPACK component, namely technological knowledge, pedagogical knowledge, and content knowledge.

3. RESULTS AND DISCUSSION

3.1 Implementation of the TPACK Training Program

In this case, it is in the form of an explanation of the research results in the form of a graphic about their TPACK condition (data obtained from the results of an online questionnaire). also accompanied by some documentation of research activities using online assessment. Teacher competence tested through this quantitative online questionnaire as described in Table 1.

Table 1 show data about TPACK condition that was tested had the lowest score of 100, the highest score of 143, with an average score of 118. Based on the data in table 1, we can conclude that 10 participants have a moderate category, while 14 others have a high TPACK competency category. This means that the TPACK competency level of the participants generally spreads to the *sedang* and high categories.

Table 2 shows the data that in general the average TPACK competency score of the respondents is in the high category, except for the Technological Knowledge (TK) component. Meanwhile, the components of CK, PK, PCK, TPK and TPACK are in the high category (Figure 1).

From a geographical perspective, Talegong is a sub-district far from the center of the capital. This also makes an impact in terms of TPACK-based competencies. However, many things also affect the TPACK-based Competency. Among them are (a) Having talents, interests, calling and idealism; (b). Having a commitment to improve the quality of education, faith, piety, and noble character; (c). Academic qualifications and educational background in accordance with the field of work; (d). Have the necessary competencies. according to the task field; (e). Has responsibility for the implementation of professional duties; (f) Obtain an income determined in accordance with work performance; (g). Have the opportunity to develop professionalism in a sustainable manner by learning throughout life; (h) Has guaranteed legal protection in carrying out professional duties; and (i) Having a professional organization that has the authority to regulate matters relating to teacher professionalism [13].

One of the lowest scores was participant 5, who was 20-30 years old in the field of Chemistry teaching. While the highest scores were 2 people who were vulnerable to the age of 20-30, namely participant 3 in the field of

teaching ICT and participant 10 in the field of teaching Indonesian. If you look at it from an age point of view, there are the 2 oldest vulnerable people aged 41-50 years, namely participant 11 in the field of Sociology teaching and participant 17 in the field of teaching Islamic Religious Education.

Table 1 TPACK Score of Each Participant

Participants	TPACK Score	Category
Participant 1	111	Medium
Participant 2	121	High
Participant 3	143	High
Participant 4	115	High
Participant 5	100	Medium
Participant 6	118	High
Participant 7	107	Medium
Participant 8	113	Medium
Participant 9	113	Medium
Participant 10	143	High
Participant 11	107	Medium
Participant 12	112	Medium
Participant 13	109	Medium
Participant 14	129	High
Participant 15	120	High
Participant 16	123	High
Participant 17	113	Medium
Participant 18	130	High
Participant 19	123	High
Participant 20	118	High
Participant 21	124	High
Participant 22	116	High
Participant 23	112	Medium
Participant 24	120	High

Table 2 TPACK Score Based on Each Aspect

Aspect	TPACK % Score	Category
TK	66.25	Medium
CK	82.71	High
PK	80.21	High
PCK	76.56	High
TCK	72.08	High
TPK	75.63	High
TPACK	71.35	High

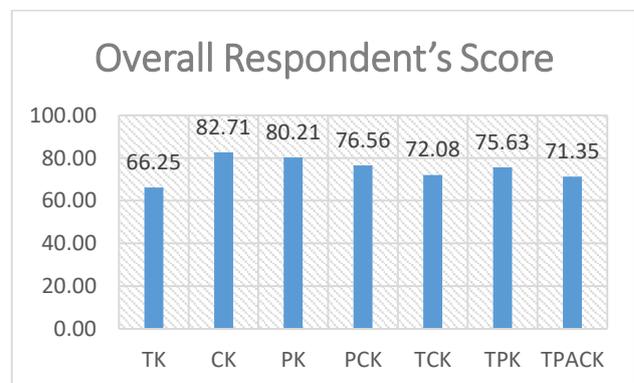


Figure 1 Overall Score Based on TPACK Aspect

3.2 The Challenge of Teacher Competence responds to the Current Changes of the Age

In times like today, the learning process tends to change. No longer from A, B, C or any sequence up to Z, but tends to lead to specific and irregular things. Teachers face students who are in the Z generation layer. This generation tends to have a different learning pattern from the previous generation. This generation can be called the early transition generation of technology. Thus, there are nine internal soft skills that individuals in this century must possess, including (1) emotional awareness, (2) digital literacy, (3) problem solving, (4) core knowledge, (5) cultural competence, (6) innovation (creativity), (7) interdisciplinary knowledge, (8) leadership, and (9) collaborative communication [14].

This is shown in research from [15] who conducted a survey to students showed that 32.3 percent of students use smartphone technology devices for 3-5 hours, 25.8 percent for more than 7 hours, 22.6 percent for under 3 hours and 19.4 percent for 5 -7 hours. So according to 21 There are four elements that are the focus of the teacher, namely: (1) changing the focus of learning; (2) increasing learning motivation; (3) clarity of material; and (4) providing stimulation of learning.

In order to face these challenges, teachers, like the principles of *Ing Ngarso Sung Tuladha*, put forward by Ki Hadjar Dewantara, must provide an example of how to wisely teach material to students through existing digital learning resources. Teaching by maximizing existing digital learning resources aims to encourage students to carry out the learning process to achieve the expected competencies [16].

In this rapid development of information technology, teachers are obliged to design and deliver learning approaches that are able to improve students' critical and creative thinking. The optimal development of this type of mental skill will lead students to build the competences of their time [17]. Generally, teachers have mastered skills in partial aspects, but not in integrated application and utilization. Due to the demands of the education law, school administration, classroom culture, and student characteristics in the multilevel education system have become increasingly complex [18].

Teacher professional development programs that have been carried out by local governments and any training organizations have not produced positive results for teacher performance in teaching, and furthermore, for improving student learning outcomes. Many elements contribute to these conditions, such as economic, social, infrastructure, policies, and even administrative systems (e.g. curriculum) [19]. Teacher professional development programs aim to help teachers develop beliefs that are consistent with the needs of the current or new education system regarding educational technology [20].

3.3 TPACK's Competence as a Contemporary Teaching Approach

TPACK has been explained earlier, is an approach that integrates technology, pedagogy and material into one interesting combination. The term TPACK began to gain wide popularity in 2006 after work outlined the model and described the respective central constructions [21]. TPACK was called "TPCK" in the literature until 2008, when some in the research community suggested using the easier pronounced TPACK term. There are several challenges in the development of TPACK. The first challenge arises from the fact that the TPACK framework is built on an existing theoretical framework that lacks theoretical clarity. The second challenge involves finding a balance between parsimony and the complexity of the framework. The third challenge is to develop a precise definition for each construction within the TPACK framework (Figure 2) [22].

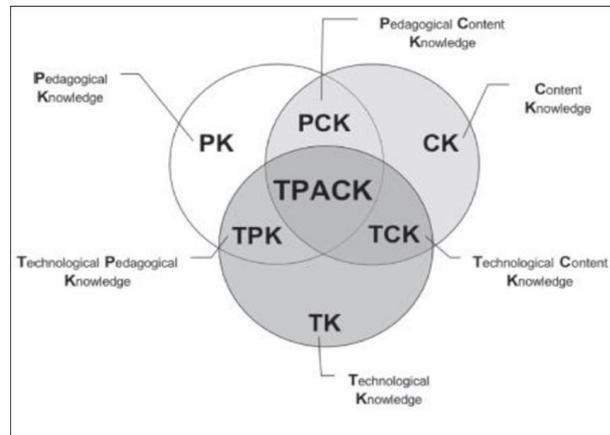


Figure 2 TPACK Framework [22]

In technological competence, teachers need to develop integrated knowledge about various fields of knowledge by using learning resources as technology in solving learning problems [23]. If the teacher is the person who designs the teaching and learning process and manages its development, he or she has the primary responsibility for integrating technology into it, not only by using them in the activities in which he participates, but also by encouraging students to do so in other activities that require involvement. them to a greater extent [24]. In this respect, it has been shown that the range of technologies used in the teaching and learning process in the university context is limited and that these technologies contribute to the development of a low number of academic tasks [25]. These results imply that teachers' ICT knowledge and skills are related to the successful implementation of ICT as a pedagogical tool is a complex and not a clear predictor of the integration of ICT in teaching and learning [26].

In pedagogical competence, pedagogical knowledge includes general principles of teaching, learning, assessment, and classroom management [27]. So,

in this case it is a unique teacher professional expertise where the teacher has the relevant knowledge to make specific content accessible to students. Recently, attempts have been made to design models that map cognitive representations of intermediate between general declarative professional knowledge and actual classroom practice. However, when taking a developmental perspective, theoretical thinking and empirical research have concentrated on pedagogical knowledge which is the main outcome of teacher education [28].

Effective pedagogy is essential for teacher decision making. Lack of strong pedagogical practices in technology can undermine student learning [29]. The technology that is quite attractive is no longer acceptable. Educators must consider how best to use technology to enhance student learning [30]. The absence of corroborating content and technological knowledge can interfere with teachers' ability to discern appropriate pedagogical strategies, leading to more examples of informing students [31]. In the learning process in the classroom, teachers need to explore learning methods that are suitable for students, such as collaborative learning, inquiry learning or problem-based learning [32]. Thus, teacher training in the pedagogical aspect is very important to improve teacher teaching abilities and student academic performance [33].

In the aspect of material management (*content knowledge*), focuses on the material to be delivered. For the most frequently taught topics in one's subject area, the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstrations - in other words, the ways of representing and formulating the subject which make it possibly understood by others. Since no single form of representation is the strongest, the teacher must have an armamentarium of correct alternative forms of representation, some of which come from research while others come from practical wisdom [34]. This can provide an explanation of the success of these students on assessment items related to the withdrawal and identification of content material. Meanwhile students have a deeper understanding of the material. Understanding is not represented on the level of success or attainment of the knowledge obtained, but based on the learning process that is experienced.

4. CONCLUSION

Based on the analysis in the discussion section, it can be concluded that in general the competence of TPACK teachers in South Garut falls into the good category. This is based on the average survey results on the Technological knowledge aspect of 66.25% (moderate), content knowledge of 82.71% (high), pedagogical knowledge of 80.21% (high), pedagogical content knowledge of 76, 56% (high), Technological Content Knowledge 72.08% (high), Technological pedagogical knowledge of 75.63% (high), and overall TPACK 71.35%

(high). However, it is still necessary to increase competence in the technological aspects of technological knowledge, especially relating to mastery of supporting software for the development of learning media. Competency improvement in this aspect can be done through intensive training and workshops. The results of this study have implications for the importance of developing the sustainable competence of teachers to improve their competence in order to be able to present quality learning. In addition, the education office needs to prioritize training programs that are oriented towards increasing the competence of TPACK for teachers.

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