

Exploring Teachers' Perceptions of TPACK Integration: A Study on Education Levels, Certification, and Kelompok Guru Penggerak

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Abstract

This study explores teachers' perceptions of the integration of TPACK (Technological Pedagogical Content Knowledge) in learning practices, particularly in Gorontalo, by considering aspects of education level, Teacher Activist group, and teacher certification. Using a quantitative approach with Kruskal-Wallis test, this study involved 303 respondents from various education levels. The analysis showed that there were no significant differences in teachers' perceptions based on education level and certification status, but there were significant differences in the Master Teacher group. The study revealed barriers to TPACK integration such as limited access to technology and training, and resistance to change, especially in areas with minimal technological infrastructure. The implications of this study emphasize the importance of teacher capacity building through continuous training and equal access to technology to improve learning outcomes in the 21st century.

Keywords: *TPACK, teacher perceptions, education, technology.*



INTRODUCTION

In the 21st century education era, advances in information and communication technology (ICT) provide great opportunities to improve the quality of learning. Teachers are expected to be able to utilize this technology effectively. This requires a deep understanding of Technological Pedagogical Content Knowledge (TPACK), which is the ability to integrate technology, pedagogy and content in teaching. According to Koehler & Mishra, (2005), the TPACK concept helps teachers manage technology appropriately in teaching subject matter. Indonesia is currently facing great challenges in improving the quality of education. Based on the 2018 Program for International Students Assessment (PISA) results, the average score of Indonesian students in literacy, mathematics, and science is still below international standards. This indicates the importance of developing TPACK skills in teachers so that learning becomes more interactive and relevant to the needs of today's students (Hewi & Shaleh, 2020).

In addition, a 2018 UNESCO report showed that the quality of educators in Indonesia ranked low among Asia-Pacific countries, highlighting the need to improve teacher competencies. This is also supported by data from the teacher competency test in Indonesia in 2019, which shows that the national average score is below the standard. Therefore, mastery of TPACK is essential to bridge the integration of technology, communication, and information in learning (Said, Mansour, & Abu-Tineh, 2023).

Professional teachers need to have adequate TPACK competencies because TPACK covers the four main competencies of a teacher: pedagogical, personality, social, and professional. Research by (Doering, Veletsianos, Scharber, & Miller, 2009) shows that TPACK integration can increase teachers' confidence as well as competence in content, pedagogy, and technology when designing lessons. Therefore, TPACK-based teacher competency development is an appropriate approach to ensure learning that is in line with current demands and changes. Before competency development is conducted, the condition of teachers' TPACK ability needs to be analyzed as a basis for policy. TPACK is considered a framework that provides direction for teachers in integrating information and communication technology (ICT) into classroom learning (Suyamto, Masykuri, & Sarwanto, 2020).

However, there are still many teachers who have not met the TPACK criteria. Based on research conducted by (Sojanah, Suwatno, Kodri, & Machmud, 2021). a survey of economics teachers in the Greater Bandung area shows that low TPACK (Technological, Pedagogical, and Content Knowledge) competence is the background of this study. The results revealed that teaching experience, training, learning facilities and infrastructure (technology), self-efficacy, and



motivation are factors that influence teachers in improving their TPACK knowledge.

In the Gorontalo region, the implementation of TPACK in schools faces a number of obstacles. Gorontalo has limited technology infrastructure and often lacks access to teacher training. Many teachers in the region may not fully understand or be adequately prepared to integrate technology, pedagogy and content in their daily teaching. Factors such as limited access to technology, lack of adequate training, and resistance to change are barriers to TPACK implementation in Gorontalo.

To obtain facts in the field, initial observations made by researchers at SMP Negeri 1 Dungaliyo showed that there were obstacles in using technology for learning. This can be seen in the practice of learning in Social Studies subjects in class, students tend to feel bored and lack understanding of the material, while teachers admit to having limitations in utilizing technology-based learning media. The researcher then conducted an in-depth interview with the teacher. The results of the interview showed that the teacher experienced obstacles in utilizing learning tools such as laptops, LCDs, and other teaching aids, as well as in accessing relevant educational content from the internet (for example, YouTube and blogs). If these constraints persist, student learning outcomes could be negatively affected. Conversely, if learning is optimized, student learning outcomes will certainly improve. This situation shows that without sufficient TPACK competencies, teachers find it difficult to create an effective and engaging learning environment. The student learning outcomes in Social Science subjects at SMP Negeri 1 Dungaliyo are as follows:.

Table 1. Learning Outcomes of Class IX Students of SMPN 1 Dungaliyo 2024

No	Class	Number of Students	Completing KKM (70)	Not Completing KKM
1	IX-1	28	32%	68%
2	IX-2	28	54%	46%
3	IX-3	28	57%	43%
4	IX-4	27	30%	70%
5	IX-5	28	43%	57%

(Source: Administration of SMP Negeri 1 Dungaliyo, 2024)

It is evident that many teachers experience challenges in integrating technology, pedagogy and content knowledge in learning practices. However, research on TPACK has been limited so far, especially evaluating teachers' perceptions of integrating TPACK in learning practices based



on demographic differences in education level, teacher group and teacher certification.

In this study, the context of teachers' perceptions will be differentiated in several factors such as education level, driving teacher group and teacher certification, to analyze this, Kruskal-Wallis analysis is used with the help of statistical analysis applications in the form of SPSS. This analysis can provide more accurate results regarding teachers' perceptions in integrating TPACK in learning practices (Sumintono, 2014). By understanding these conditions, this study is expected to provide new insights for the development of policies and training programs to improve teachers' TPACK skills.

Based on the above background, the researcher is interested and considers it necessary to conduct further studies with the formulation of the problem of how the differences in teacher perceptions in integrating TPACK in learning practices are viewed from the level of education, Kelompok Guru Penggerak and teacher certification.

LITERATURE OVERVIEW

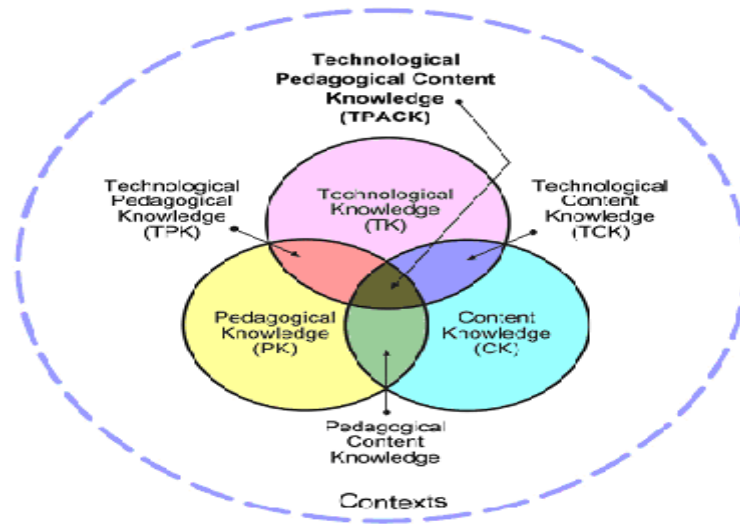
Definition Of Tpack (Technological, Pedagogical And Content Knowledge)

In the current educational context, TPACK is highly relevant, especially with the rapid development of information and communication technology (ICT). This framework emphasizes the importance of technology integration in the learning process, by combining content knowledge, effective teaching methods and appropriate use of technology. With an understanding of TPACK, teachers are expected to be able to design and implement curricula that combine technology, pedagogy and content to create more meaningful and effective learning experiences for students (Harris & Hofer, 2014).

Many researchers support the integration of technology, pedagogy and content, as Shulman did when proposing the concept of PCK. Koehler and Mishra (2005) extended Shulman's idea by adding technological aspects, creating the concept of Technological Pedagogical Content Knowledge (TPCK). Over time, the term TPCK was simplified to TPACK (read: tee-pack). TPACK is a dynamic framework that describes the knowledge required for teachers in designing and implementing lessons that utilize technology to help students think critically and learn in various contexts (Listiawan, 2017).

TPACK is a new form of knowledge that includes the three main components (content, pedagogy, and technology) as the basis for effective teaching by utilizing technology. TPACK also offers pedagogical strategies that use technology to teach content constructively (Koehler et al., 2009).(Sumintono, 2014).





Gambar 1. TPACK Components

From the explanation above, it can be concluded that TPACK is an important component needed by teachers to integrate pedagogy, content, and technology knowledge to make learning more effective, efficient, and improve teacher professionalism. Malichatin, 2019 stated that a teacher must have the knowledge and ability to design good learning, so that they are not only competent in content and pedagogy, but also in the use of technology.

Components Of Tpack

The TPACK component is based on the concept of Pedagogical Content Knowledge (PCK) proposed by Shulman (1986) to describe how teachers understand the interaction between educational technology and PCK, which together result in effective teaching by utilizing technology. Although different labeling schemes are often used by other authors, this basic idea remains consistent. The TPACK concept itself has evolved over time through various publications, with the most comprehensive description of the framework found by Koehler and Mishra (2005).

TPACK consists of three main components, namely Pedagogy, Content, and Technology. When the three components are combined, a wedge is formed that results in seven TPACK components according to Koehler and Mishra, which are as follows:

a. Technological Knowledge (TK)

Technological Knowledge (TK) is explained by Sintawati and Indriani (2019) as teachers' knowledge of technology, software, or applications that can be used in learning. TK also includes

the ability to adapt and learn new technologies. The ability to keep learning and exploring the latest technology that can be applied in learning is very important, given the rapid development of technology. For example, the development of software for learning, ranging from PowerPoint, Google Classroom, Canvas, Zoom Meeting, to Augmented Reality technology that is currently being introduced, can all be utilized in the learning process.

b. Pedagogical Knowledge (PK)

Pedagogical Knowledge (PK) is a teacher's knowledge of the processes, practices and methods of teaching and learning. This knowledge includes an understanding of learning objectives, educational values, and overall educational goals. In general, it includes an understanding of student characteristics, classroom management, lesson planning, techniques or methods applied in the classroom, and strategies for evaluating student understanding. Therefore, it requires an understanding of cognitive and social theories, as well as the ability to adapt and learn the latest learning methods, and even create learning strategies that suit the needs of the classroom.

c. Content Knowledge (CK)

Content Knowledge (CK) is the teacher's knowledge of the subject matter to be taught or learned. This knowledge includes an understanding of concepts, theories, ideas, as well as practices and approaches that are appropriate for developing the material.

d. Technological Content Knowledge (TCK)

Technological Content Knowledge (TCK) is an understanding of how technology and content influence and limit each other. Teachers not only need to master the subject matter to be taught, but must also have a deep understanding of the specific technology that is most suitable for use in certain content. Furthermore, Sintawati and Indriani (2019) explained that TCK is the teacher's ability to deliver material by utilizing technology. TCK relates to the way teachers portray content (material) with a different approach, using technology that was previously impossible to implement. TCK includes the teacher's ability to choose and use the right technology to create new representations in the process of transferring learning materials, which have special characteristics and can change the mindset of students.

e. Pedagogical content knowledge (PCK)

Pedagogical Content Knowledge (PCK) is a concept proposed by Shulman regarding pedagogical knowledge that can be applied to teaching specific content. Sintawati and Indriani (2019) also stated that PCK is the teacher's ability to deliver material to students. In delivering material, teachers not only provide information, but also use certain effective strategies. Therefore, PCK includes the teacher's ability to choose the right approach or strategy according



to the material being taught and the characteristics of the students, because not all strategies are suitable for every material.

f. Technological Pedagogical Knowledge (TPK).

TPK identifies the reciprocal relationship between technology and pedagogy. TPK also includes teachers' ability to select and utilize appropriate technology to support the implementation of various learning tools used.

g. Technological Pedagogical Content Knowledge (TPACK)

Technological Pedagogical Content Knowledge (TPACK) is the ability of teachers to organize learning by integrating learning strategies and technology. This is what distinguishes the depth of mastery of the competencies of each subject teacher. TPACK is the optimization of Technological Knowledge (TK) used in learning to integrate Content Knowledge (CK), Pedagogical Knowledge (PK), and Pedagogical Content Knowledge (PCK) into a unified whole, which can produce an effective, efficient, and more interesting learning process (Rahman in Sintawati & Indriani, 2019).

The TPACK framework is a complex interaction of seven knowledge components (TK, PK, CK, TCK, PCK, TPK, and TPACK). Therefore, the improvement of patterns and ways of reasoning in this study is the combined result of the strengths and weaknesses of each component. The success of learning using the TPACK framework depends largely on the accuracy of determining the types of elements of each component that are integrated.

Teacher Perception

Perception is the process by which a person selects, organizes and interprets information to give meaning to the surrounding world (Robbins & Judge, 2013). In the context of education, teachers' perceptions are instrumental in influencing how they receive, understand and implement pedagogical innovations, including the integration of technology in learning.

Teacher perception refers to how teachers perceive, assess and respond to various aspects of learning practices, including TPACK integration. According to Mergel (2019), teachers' perceptions of technology use in teaching are influenced by various factors, such as previous technology experience, training attended and the level of institutional support.

Concept of Teacher Perception of TPACK Use

Technological Pedagogical Content Knowledge (TPACK) is a framework that integrates three main knowledge components, namely content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK), to support teachers in designing and implementing



effective and efficient learning (Koehler & Mishra, 2009). Teachers' perceptions of integrating TPACK in learning reflect the extent to which teachers understand and apply the three components in the context of classroom learning. This perception is very important because it influences teachers' attitudes, beliefs, and abilities in integrating technology in the teaching process.

Teachers who have a positive perception of TPACK tend to be more confident in integrating technology with their content and pedagogy. According to Mergel (2019), teachers' perceptions of TPACK are influenced by their experience in using technology, pedagogical knowledge, and their understanding of the content they teach. On the other hand, negative perceptions may emerge if teachers feel that they are insufficiently trained or have insufficient depth in understanding the integration of these three components. This shows that teachers' perception of TPACK is not only limited to theoretical understanding, but also influenced by their practical experience in implementing technology in learning.

Teachers' perceptions also play a role in determining the success of TPACK integration in the classroom. According to Rahman et al. (2020).

Factors that may influence teachers' perception of TPACK

a. Professional Experience and Technology Training

The professional experience and training teachers receive play an important role in shaping their perceptions of TPACK use. Research by Harris et al. (2018) shows that teachers who have attended comprehensive technology training are better able to understand and apply TPACK in their learning. This training helps teachers develop the necessary technical skills and improves their understanding of how technology can support better learning.

b. Institutional Support

Support from schools and educational institutions also greatly influences teachers' perceptions of TPACK. Adequate technology facilities, sufficient time for experimentation with technology, and policies that support the use of TPACK in learning can improve teachers' perceptions of the importance of technology integration in their teaching (Janssen & Lazonder, 2021). Conversely, a lack of institutional support may cause teachers to feel unprepared or inhibited in integrating TPACK.

c. Teachers' Personal Factors

Personal factors, such as self-confidence, interest, and attitude towards technology, also influence teachers' perceptions of TPACK. According to Puentedura (2019), teachers who have an



open attitude towards technology and innovative learning tend to have a more positive perception of TPACK. On the contrary, teachers who are less interested in technology or have a negative attitude towards innovative learning tend to have more positive perceptions of TPACK.

d. Availability of Resources and Access to Technology

The availability of resources, such as adequate hardware, software, and internet connection, is also an important factor influencing teachers' perceptions of integrating TPACK. Without adequate access, teachers will find it difficult to make the most of technology in their teaching (Zhao et al., 2020). This confirms that the provision of sufficient resources and equitable access are crucial in improving teachers' perceptions of TPACK use.

RESEARCH METHODE

This research was conducted in Gorontalo. The research time was conducted in September-November 2024. This study uses a type of quantitative research. According to Sugiyono (2013) quantitative research is a research method based on positivistic (concrete data), research data in the form of numbers to be measured using statistics as a calculation test tool, related to the problem under study to produce a conclusion. The quantitative approach is also a research approach using numbers, starting from collecting data, interpreting data, to presenting research results (Arikunto 2016: 12).

The research design used in this study is survey research design. Survey research is defined as research where the sample is taken from one population using a questionnaire instrument as the main data collection tool (Adiyanta, 2019). Respondents in this study were teachers at the elementary/middle school, junior high school, middle school, and senior high school/vocational high school levels in Gorontalo, totaling 303 respondents. Respondents were identified using non-probability sampling technique and the sampling technique used in the study was convenience sampling.

To determine differences in teachers' perceptions of integrating TPACK in learning practices, a non-parametric test, namely the Kruskal-Wallis test, was conducted using SPSS software to determine whether there were statistically significant differences in teachers' perceptions of integrating TPACK in learning practices in terms of education level, teacher mobilization group and teacher certification.

RESULT AND DISCUSSION

Based on the results of the normality test and the homogeneity of variance test that have



been carried out, it is found that the data in this study are non-parametric data both at the education level, Kelompok Guru Penggerak and teacher certification. Furthermore, the hypothesis analysis was carried out with the Kruskal-Wallis Test.

The Education Level

Table 2. Kruskal-Wallis test of education level

Test Statistics ^{a,b}	
	Skor
Kruskal-Wallis H	.188
Df	2
Asymp. Sig.	.910

(Source : SPSS Statistics 29.0.2.0)

The results of the Kruskal-Wallis test conducted to test differences based on education level showed an Asymp. Sig. (P.value) of 0.910. In statistical interpretation, this P.value is compared with the significance limit of 0.05. If the P.value is smaller than 0.05, then the difference between groups can be considered significant. Conversely, if the P.value is greater than 0.05, the difference between groups is considered insignificant.

Since the Asymp. Sig. value in this test is 0.910, which is greater than 0.05, we cannot reject the null hypothesis. This means that there is insufficient evidence to suggest that there is a significant difference between the tested education level groups. In other words, the distribution of data across the education level groups does not show statistically significant differences.

Based on this Kruskal-Wallis test, it can be concluded that the level of education does not affect significant differences in the undergraduate, postgraduate and doctoral education level variables. This suggests that there is no strong influence or notable difference between the groups classified by education level in the context of the data analyzed.

Based on the results of the hypothesis test analysis using the Kruskal-Wallis Test with the help of SPSS application, it can be concluded that H₀ is rejected or H₁ is accepted. This means that there is no significant difference in teacher perceptions of integrating TPACK in learning practices in terms of education level. This is because the Asymp.Sig. value generated in the Kruskal-Wallis test is greater than 0.05.



Kelompok Guru Penggerak**Table 3. Kruskal-Wallis Test of Kelompok Guru Penggerak**

Test Statistics ^{a,b}	
	Skor
Kruskal-Wallis H	8.066
Df	1
Asymp. Sig.	.005

(Source : SPSS Statistics 29.0.2.0)

The results of the Kruskal-Wallis test conducted to test the difference in scores based on Kelompok Guru Penggerak show the Asymp. Sig. (P.value) of 0.005. Based on the criteria given, if the P.value is smaller than 0.05, it can be concluded that there is a significant difference between the tested groups.

Since the Asymp. Sig. value is 0.005, which is smaller than 0.05, we can reject the null hypothesis. This means that there is a significant difference between the tested groups of teachers in terms of the scores obtained. This difference may indicate the presence of certain factors that influence the different results or scores between the groups.

Based on the results of the hypothesis test analysis using the Kruskal-Wallis Test with the help of SPSS application, it can be concluded that H₀ is rejected or H₁ is accepted. This means that there is a significant difference in the perception of teachers in integrating TPACK in learning practices in terms of Kelompok Guru Penggerak. This is because the Asymp.Sig. value produced in the Kruskal-Wallis test is smaller than 0.50.

Teacher Certification**Table 3. Kruskal-Wallis Test of Teacher Certification**

Test Statistics ^{a,b}	
	Skor
Kruskal-Wallis H	.001
Df	1
Asymp. Sig.	.975

(Source : SPSS Statistics 29.0.2.0)



The results of the Kruskal-Wallis test conducted to test the difference in scores based on teacher certification status showed an Asymp. Sig. (P.value) of 0.975. Based on the criteria given, if the P.value is greater than 0.05, it can be concluded that there is no significant difference between the tested groups.

Since the Asymp. Sig. value is 0.975, which is greater than 0.05, we cannot reject the null hypothesis. This means there is insufficient evidence to state that there is a significant difference between the certified and non-certified teacher groups in terms of the scores obtained. Based on this Kruskal-Wallis test, it can be concluded that there is no significant difference between certified and non-certified teachers in terms of scores. This means that teacher certification does not significantly affect the scores obtained in the context of the data analyzed.

Based on the results of the hypothesis test analysis using the Kruskal-Wallis Test with the help of the SPSS application, it can be concluded that H_0 is rejected or H_1 It can be interpreted that there is no significant difference in teacher perceptions in integrating TPACK in learning practices in terms of teacher certification. This is because the Asymp.Sig. value generated in the Kruskal-Walis test is greater than 0.50.

CONCLUSION AND RECOMMENDATION

Based on the results of the study, it can be concluded that there were no significant differences in perceptions across education levels and certification groups, however, significant differences were found in perceptions between groups of teacher movers, these findings underscore the need for professional development programs tailored to address specific challenges in technology integration. Limited access to training and resistance to change remain barriers to effective TPACK adoption, especially in less technologically prepared regions. To improve learning outcomes, educators and policymakers must prioritize equitable access to technology and sustainable capacity building initiatives. Ultimately, this study provides valuable insights for designing targeted interventions to improve teacher competencies and align them with the demands of 21st century education.

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