UNDERSTANDING ENGLISH TEACHERS' TPACK COMPETENCE IN THE ERA OF DIGITAL LEARNING: EVIDENCE FROM PAPUA, INDONESIA

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Abstract
The swift progression of digital technology has revolutionized English language instruction and heightened the necessity for teachers capable of seamlessly incorporating technology, pedagogy, and topic expertise into their teaching methods. This research sought to evaluate the TPACK competency of junior high school English teachers in Jayapura in relation to the requirements of digital learning. A descriptive quantitative survey design was employed involving 37 English teachers determined via stratified random sampling. Data were gathered with a TPACK instrument tailored to the Papua context, comprising 28 items distributed over seven TPACK domains. Data were analyzed using descriptive statistics. The findings confirmed that the participants' overall TPACK proficiency was classified as satisfactory (M = 83.50). Within the seven domains, Content Knowledge (CK) and Technology Knowledge (TK) achieved the highest average scores, signifying that teachers demonstrated robust topic expertise and competence in technology. However, the TPACK domain attained a comparatively lower rating, indicating that enhanced assistance is necessary to bolster teachers' capacity to concurrently integrate technology, pedagogy, and content. Despite geographical and infrastructural challenges, teachers demonstrated adaptive use of accessible technologies and contextualized English instruction to local learning environments. These findings underscore the significance of ongoing professional development centered on integrated TPACK competencies and provide empirical evidence about English teachers' digital preparedness in the underrepresented educational setting of Papua.

Keywords: *digital learning; English teacher; teacher competence; TPACK; Papua.*

Introduction

Digital transformation has shifted the perspective of education worldwide, encompassing in language learning. The inclusion of digital technology is no more commonly seen as a complement to the learning process, but has become an integral part of efforts to improve learning quality, expand access to learning resources, and facilitate more interactive, collaborative, and student-centred learning (Bucăţa & Tileagă, 2024). With the development of various digital learning platforms, educational applications, and artificial intelligence-based technologies, teachers are required to possess competencies capable of effectively integrating technology into the learning

process (Marpaung, 2025; Surahman et al., 2025). Therefore, the abundance of technology is not the only factor that determines the success of educational digitalization; teachers must also be well-equipped to use it pedagogically in accordance with the demands of students and the features of the subject matter.

In the Indonesian context, the digital renaissance of education is further strengthened through various government policies, such as the implementation of the Independent Curriculum and school digitalization programs that encourage teachers to utilize technology in the learning process. This suggests that in addition to being technologically proficient, teachers must also be able to choose, modify, and incorporate technology into effective teaching methods. The success of digital learning depends heavily on teachers' readiness and mastery in effectively infusing technology with relevant pedagogy and learning substances (Naing et al., 2025).

In the context of EFL, learning digitally is becoming increasingly crucial for improving effectiveness, quality, and student engagement (Mahsunah, 2021). For English teachers, these demands are becoming increasingly important because language learning requires a variety of authentic media, communicative interactions, and diverse learning resources to support the integrated advancement of listening, speaking, reading, and writing skills (Sahnan, 2024). However, a majority of English teachers in Indonesia continue to face issues when incorporating technology into their learning materials. Specifically, in Papua, this urgency is felt even more strongly because English teachers face unique challenges in adopting technology in their learning, such as restricted digital facilities, accessibility to resources, and pedagogical capacities to incorporate technology (Naing, 2025).

One conceptual framework widely used to explain teacher competency in integrating technology is Technological Pedagogical Content Knowledge (TPACK), introduced by Koehler and Mishra (2009). TPACK explains that effective learning is not solely determined by mastery of content (Content Knowledge), pedagogical skills (Pedagogical Knowledge), or technology skills (Technological Knowledge) separately, but by the teacher's ability to simultaneously integrate these three domains of knowledge according to learning objectives and student characteristics.

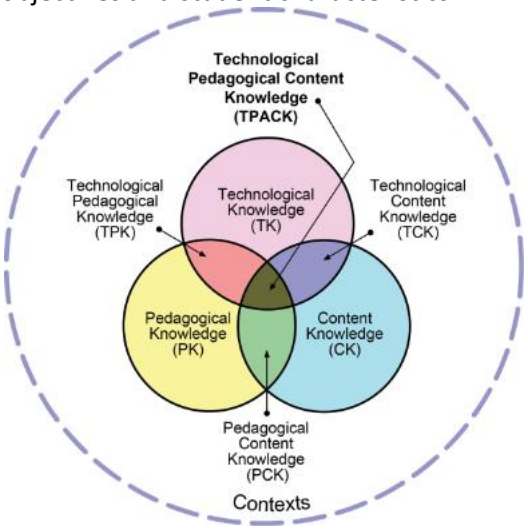


Figure 1. TPACK Framework

Mishra and Koehler reorganized these three basic forms of knowledge, namely content, pedagogy, and technology, leading to four more types of knowledge,

transforming the TPACK components into seven components. First, technological knowledge (TK) refers to teachers' competence to incorporate numerous technologies or digital tools to design learning. Second, pedagogical knowledge (PK) relates to the implementation of specific teaching strategies. Third, content knowledge (CK) is defined as teachers' understanding of the material and skills in their scientific fields. Fourth, pedagogical and technological knowledge (TPK) refers to teachers' ability to apply technology to support teaching. Fifth, technological content knowledge (TCK) describes teachers' comprehending of how to implement technology to improve students' understanding of the subject matter. Sixth, pedagogical and content knowledge (PCK) is described as teachers' capability to apply several teaching techniques to deliver material effectively. Seventh, technological, pedagogical, and content knowledge (TPACK) reflects the teacher's ability to assist students master the subject matter through the implementation of appropriate teaching strategies with technological support (Koehler et al., 2013).

Various national and international studies demonstrate that TPACK expertise plays a significant role in improving digital learning qualities, the effectiveness of technology utilization, and teachers' ability to design innovative learning (Choi & Chung, 2025; Kamal et al., 2025; Kuswandi, 2022; Martina et al., 2022; Naing & Wiedarti, 2023; Sultan et al., 2025; Yıldız, 2024). These findings reinforce the view that TPACK competency is a major factor in assisting the successful implementation of technology-based learning in various educational contexts.

However, a review of previous research shows that most TPACK research is still conducted in schools outside Papua, both in international contexts and various regions in Indonesia. These studies are generally conducted in areas with infrastructure characteristics, technological access, and educational environments that differ from conditions in Papua (Cahyati et al., 2024; Çalik & Mirici, 2024; Visonà & Kurt, 2024; Wahyuni et al., 2024). As a result, understanding the TPACK competencies of English teachers in Papua, particularly Jayapura, is still not comprehensively described. This limitation indicates a research gap, namely the limited empirical evidence regarding the implementation and TPACK competencies of EFL teachers in the context of education in eastern Indonesia, which has different geographic, socio-cultural characteristics, and technological access compared to other regions.

In addition to the disparity in research locations, previous studies generally used generic TPACK instruments developed based on different contexts. However, TPACK implementation is strongly influenced by the learning environment, and therefore, the instruments used should be able to represent the characteristics of the field in which the research is undertaken. Therefore, a study of the TPACK competencies of English teachers in Papua is crucial not only to expand empirical evidence on TPACK implementation in different contexts but also to provide information that can be used as a basis for designing more contextualized teacher competency improvement programs tailored to regional needs.

Based on this gap, this study yields two substantial alterations. First, this study is one of the first investigations that particularly map the junior high school English teachers' TPACK competencies in Jayapura, thus expanding the empirical evidence of TPACK implementation in educational contexts in eastern Indonesia. Second, this study uses a Papuan-based TPACK instrument. Unlike generic TPACK instruments (e.g., Schmidt et al., 2009), which operationalize the framework of Koehler and Mishra (2009) in a context-

neutral manner and implicitly assume adequate access to digital infrastructure, the Papuan-based instrument (Naing & Rambet, 2025) retains the seven TPACK constructs but measures them through context-specific indicators. These indicators include (1) the use of simple, low-cost, and low-bandwidth technologies, such as mobile phones, lightweight applications, WhatsApp groups, and offline digital resources, in settings with limited internet connectivity; (2) the integration of local Papuan culture, daily life, and the school surroundings into English content and instructional examples; (3) the adaptation of teaching strategies and assessment to constrained school facilities, including assessing learning without digital tools; and (4) the adjustment of materials, techniques, and technology to the characteristics and learning difficulties of Papuan students. The use of this instrument allows for measurement of TPACK competencies that are more appropriate to the characteristics of the learning environment in Papua than the generic instruments commonly used in previous research. Thus, this study not only provides an overview of teachers' TPACK competency levels but also reinforces the understanding that TPACK implementation needs to be understood contextually, according to the characteristics of the educational environment in which teachers practice their profession.

Based on this description, this study is meant to gauge the Technological Pedagogical Content Knowledge (TPACK) competencies of English teachers in junior high school level in Jayapura when coping the digitalization of learning. The study's findings are intended to contribute empirically to the growth of TPACK literature in Indonesia, most notably in the setting of eastern Indonesia, while also providing a basis for formulating more contextual teacher professional development programs to encourage the digital change of learning. Therefore, TPACK has become one of the most widely used frameworks to evaluate teacher readiness to face the issues of learning in the digital age.

Method

Research Approach

This research takes on a quantitative approach with a descriptive survey design to acquire an overview of the Technological Pedagogical Content Knowledge (TPACK) competency of junior high school English teachers in Jayapura when experiencing the digitalization of learning. This quantitative method was preferred because it allows researchers to compile numerical data that can be rigorously assessed to determine the level of English teachers' TPACK competencies based on actual conditions in the field. The survey design was used because the study focuses on collecting data from respondents through questionnaires without providing any specific treatment to the research subjects.

Research Location and Participants

The research was completed in Jayapura, Papua Province. Participants consisted of 37 junior high school English teachers from public and private schools. The sample was derived by using a stratified random sampling procedure, ensuring that each teacher had an equal opportunity to be selected based on predetermined stratified characteristics. The stratification was based on school status, namely public and private junior high schools, because this characteristic is closely associated with differences in access to digital facilities, technological support, and professional development opportunities

among English teachers in Jayapura. Teachers were then randomly selected from each stratum in proportion to the number of English teachers in that stratum.

Research Instrument

The research instrument comprised a Papuan-based Technological Pedagogical Content Knowledge (TPACK) questionnaire, created and validated in previous research (Naing & Rambet, 2025). The instrument consisted of 28 items representing seven TPACK constructs: Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), Pedagogical Content Knowledge (PCK), and Technological Pedagogical Content Knowledge (TPACK). Each construct was graded on a four-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree. The instrument used met validity and reliability requirements. The outcome of content validation by professionals showed a Content Validity Index (CVI) value of 0.92, while the reliability test using the Cronbach's Alpha coefficient yielded a value of 0.966. These findings show that the instrument has an excellent level of content validity and internal consistency, rendering it appropriate for measuring teachers' TPACK competencies.

Data Collection Procedure

Data collection started with the provision of information regarding the research objectives to the schools and potential respondents. After obtaining approval from the schools, questionnaires were distributed to the English teachers who comprised the research sample. All respondents volunteered voluntarily and were educated that personal information and data would be ensured confidential and used solely for the purpose of research. After all questionnaires were collected, the researchers conducted data cleaning before proceeding to the analysis stage.

Data Analysis Techniques

The acquired data were then examined employing descriptive statistics with the assistance of IBM SPSS Statistics version 29 software. The analysis was conducted to get the mean, median, standard deviation, minimum, and maximum scores for each Technological Pedagogical Content Knowledge (TPACK) element. In the questionnaire, the total score gained was changed into a score with a maximum score of 100, which was estimated using the following formula: P = f/N x 100, where: P = Final Score, f = Score Obtained, N = Maximum Score. Here, f is the sum of a respondent's item responses on the 1–4 Likert scale and N is the maximum attainable score (number of items × 4; e.g., N = 112 for all 28 items and N = 16 for each four-item construct). Because this conversion is linear, every converted score corresponds directly to a mean Likert score (mean Likert score = P/25; e.g., 83.50/25 = 3.34), and the standard deviation is converted in the same way (e.g., 12.83/25 = 0.51). Accordingly, the minimum attainable converted score is 25 (all responses = 1) and the maximum is 100 (all responses = 4). To ensure transparency, the results are reported both as the actual mean (M) and standard deviation (SD) on the 1–4 Likert scale and as their converted scores on the 100-point scale; in Tables 3–9, the values in parentheses indicate the corresponding mean Likert scores. The resulting scores were then matched to the interpretation criteria to identify the English teacher's TPACK competency category. Table 1 presents these interpretation requirements.

Table 1. TPACK Competency Score Interpretation Category

Score Interval (Likert Mean)	TPACK Mastery Category
86-100 (3.44–4.00)	Very Good
71-85 (2.84–3.40)	Good
56-70 (2.24–2.80)	Adequate
41-55 (1.64–2.20)	Low
≤ 40 (≤ 1.60)	Very Low

Result and Discussion

TPACK Competency Profile: Descriptive Statistical Analysis

Table 2. Descriptive Statistics of TPACK Competencies of Junior High School English Teachers in Jayapura

Statistics	Converted Score (0–100)	Likert Scale (1–4)
Mean	83.50	3.34
Median	81.25	3.25
SD	12.83	0.51
Minimum	25	1.00
Maximum	100	4.00

As demonstrated by Table 2's descriptive statistical analysis, it is known that the Technological Pedagogical Content Knowledge (TPACK) competency of junior high school English teachers in Jayapura has an average (mean) score of 83.50 (equivalent to M = 3.34, SD = 0.51 on the 1–4 Likert scale). In general, this average score indicates that junior high school English teachers in Jayapura have relatively good TPACK competency in integrating technological knowledge, pedagogy, and learning content to aid the process of learning in the digital era.

The median score of 81.25 (Likert M = 3.25) indicates that fifty percent of respondents scored below 81.25 on TPACK competency, while the other fifty percent scored above. The closeness between the mean (83.50) and median (81.25) indicates a relatively balanced data distribution, although there was a tendency for some respondents to score higher, causing the mean score to be slightly higher than the median. This indicates that there is no extreme deviation in the data distribution, and that most respondents have competency levels around the average.

The standard deviation of 12.83 (0.51 on the Likert scale) indicates that there is variation in TPACK competency among junior high school English teachers in Jayapura. The large standard deviation indicates that although teachers generally possess good TPACK competency, their mastery of these competencies is not entirely uniform. In other words, some teachers possess very high TPACK skills, while others possess relatively lower competency levels. This variation is normal, given differences in educational background, teaching experience, intensity of technology use in learning, and opportunities to participate in digital competency development training.

The analysis also shows that the lowest (minimum) TPACK competency score was 25 (Likert score = 1.00), while the highest (maximum) score reached 100 (Likert score = 4.00). This wide range of scores indicates significant differences in competency levels among respondents. Teachers who obtained the maximum score can be interpreted as possessing excellent skills in integrating technology, pedagogy, and learning content. Conversely, some teachers still scored relatively low, indicating that their ability to

integrate these three aspects still requires strengthening through various competency improvement programs.

Overall, although not yet fully dispersed among all teachers, the descriptive statistical analysis's findings confirm that junior high school English teachers in Jayapura have demonstrated positive TPACK competency. Although the average score indicates a high level of competency, the presence of significant variation in scores indicates that competency gaps remain among teachers. Therefore, efforts to improve TPACK competency need to be carried out continuously through programs for professional development, mentoring, and training that are specific to the requirements of teachers so that all teachers have optimal abilities in technology incorporation, pedagogy, and subject matter in accordance with the demands of digitalization in education.

Analysis of Teacher Competencies Based on TPACK Components

After obtaining a general overview of the teacher's TPACK competency profile through descriptive statistical analysis, the next stage is to analyze the competency level in each component of TPACK. This analysis aims to show a more in-depth picture of teacher abilities in each aspect of knowledge that forms the TPACK framework, namely Technological Knowledge (TK), Pedagogical Knowledge (PK), Content Knowledge (CK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK).

Pedagogical Knowledge (PK)

Pedagogical Knowledge (PK) encompasses educators' expertise in learning theories and methodologies, which includes diverse instructional approaches, efficient teaching techniques, classroom management competencies, and the creation of stimulating, student-focused learning atmospheres. The results of the analysis of English teachers' pedagogical knowledge are reported in the next section.

Table 3. Analysis of Pedagogical Knowledge (PK) Mastery

No	Aspect	PK	
		Score	Category
1	I can effectively direct the class by employing learning techniques that are customized to the local context of my students.	81 (3.24)	Good
2	I am capable of crafting lessons that include local Papuan culture to enhance student involvement.	81 (3.24)	Good
3	I can select straightforward yet impactful educational techniques within	84 (3.36)	Good

	constrained resources.		
4	I am capable of assessing student learning outcomes without the use of digital tools.	80 (3.20)	Good
	Average	**82** (3.28)	**Good**

According to Table 3, the mean score for Pedagogical Knowledge (PK) competency was 82, categorising it as Good. The findings suggest that, overall, junior high school English educators in Jayapura exhibit sufficient pedagogical competencies in planning, executing, overseeing, and assessing the educational process in alignment with student attributes and the learning context.

The indicator with the highest score was the statement "I can select straightforward yet impactful educational techniques within constrained resources," with a score of 84. These results indicate that most teachers are able to modify the learning strategies to the facilities and infrastructure available at their school. Meanwhile, the indicator with the lowest score was the statement "I am capable of assessing student learning outcomes without the use of digital tools" which received a score of 80. While still in the good category, this result indicates that teachers' ability to implement flexible learning evaluations still needs to be improved.

Content Knowledge (CK)

Content Knowledge (CK) denotes a teacher's comprehensive grasp of the subject matter being instructed, encompassing fundamental concepts, organisational frameworks, theories, and essential principles vital for efficient education. The findings from the data analysis about the subject knowledge of English teachers are illustrated in the subsequent table.

Table 4. Analysis of Content Knowledge (CK) Mastery

No	**Aspect**	**CK**	
		Score	**Category**
1	I comprehend the English content aligned with the junior high school syllabus and can tailor it to the contexts of Papuan students.	80 (3.20)	Good
2	I can elucidate English lexicon with pertinent instances from living in Papua.	88 (3.52)	Very Good
3	I understand the structure of English texts and can relate them to local contexts.	85 (3.40)	Good

4	I can provide examples of English use in everyday situations around the school.	89 (3.56)	Very Good
	Average	**85** (3.40)	**Good**

According to Table 4, the mean score for Content Knowledge (CK) competency was 85, categorising it as Good. The findings suggest that, overall, junior high school English educators in Jayapura possess a solid understanding of the instructional content and can relate English curriculum to student traits and the everyday setting of Papua.

The indicator with the highest score was the statement "I can provide examples of the use of English in everyday situations around the school," with a score of 89, falling into the Very Good category. These findings reveal that most teachers are able to connect learning material to real-life experiences relevant to students' lives. Meanwhile, the indicator with the lowest score was the statement "I comprehend the English content aligned with the junior high school syllabus and can tailor it to the contexts of Papuan students," which received a score of 80, categorized as Good. Although still in the Good category, this result indicates that teachers' ability to adapt curriculum materials to students' backgrounds still requires strengthening.

Technological Knowledge (TK)

Technological Knowledge pertains to proficiency in employing diverse digital tools and media for educational purposes, encompassing both hardware and software, along with capabilities in utilizing educational technology applications such as proficiency in learning management systems, video technology, augmented reality, virtual reality, and artificial intelligence.

Table 5. Analysis of Technological Knowledge (TK) Mastery

No	**Aspect**	**TK**	
		Score	**Category**
1	I am capable of utilizing basic digital gadgets such as a mobile phone or smart speaker to facilitate education.	89 (3.56)	Very Good
2	I can employ lightweight software that function effectively even with a restricted internet connection.	84 (3.36)	Good
3	I am familiar with utilizing fundamental equipment such as a projector or laptop when accessible at school.	82 (3.28)	Good

4	I employ social media or WhatsApp groups to disseminate educational resources or information.	84 (3.36)	Good
	Average	**85** (3.40)	**Good**

According to Table 5, the mean score for Technological Knowledge (TK) proficiency was 85, categorizing it as Good. This outcome suggests that, overall, junior high school English educators in Jayapura possess proficient abilities in employing technology to enhance the educational experience. Technology competency is an essential advantage for educators confronting the escalating requirements of digitalization in education.

The indicator with the highest score was the statement "I am capable of utilizing basic digital gadgets such as a mobile phone or smart speaker to facilitate education," which scored 89 and falls into the Very Good category. This finding shows that most teachers are accustomed to utilizing easily accessible digital devices to support the learning process. Moreover, the indicator with the lowest score was the statement "I am familiar with utilizing fundamental equipment such as a projector or laptop when accessible at school," with a score of 82, still in the Good category. Nevertheless, these results indicate that the use of learning devices available at schools can still be improved. The relatively low scores on this indicator are likely influenced by variations in the availability of technology facilities in each school, resulting in uneven use of devices such as projectors or laptops among teachers.

Technological Pedagogical Knowledge (TPK)

Technological Pedagogical Knowledge (TPK) pertains to educators' comprehension of the effective application of technology to improve instructional strategies. This encompasses the capacity to identify digital instruments that can proficiently enhance teaching methodologies, such as employing artificial intelligence-driven simulations to stimulate student interest, or utilising interactive platforms to facilitate formative assessment. The findings of the examination of English teachers' TPK are displayed in the subsequent table.

Table 6. Analysis of Technological Pedagogical Knowledge (TPK) Mastery

No	**Aspect**	**TPK**	
		Score	**Category**
1	I am capable of selecting straightforward and efficient technological resources for education in my classroom.	86 (3.44)	Very Good
2	I am capable of integrating	79 (3.16)	Good

	conventional pedagogical techniques with basic technological tools.		
3	I recognize the appropriate moments to employ technological tools to improve student comprehension.	84 (3.36)	Good
4	I modify the application of technology to fit the framework of my educational institution.	86 (3.44)	Very Good
	Average	**84** (3.36)	**Good**

According to Table 6, the mean score for Technological Pedagogical Knowledge (TPK) proficiency was 84, categorising it as Good. This finding suggests that, overall, junior high school English educators in Jayapura possess proficient abilities in merging technology with instructional methodologies.

The indicators with the highest scores were two statements: “I am capable of selecting straightforward and efficient technological resources for education in my classroom” and “I modify the application of technology to fit the framework of my educational institution,” both of which scored 86, which fall into the Very Good category. These findings confirm that most of the teachers are capable of selecting technology appropriate to learning needs and consider the actual conditions in their schools before using it. Meanwhile, the indicator with the lowest score was the statement “I am capable of integrating conventional pedagogical techniques with basic technological tools,” which received a score of 79, categorized as Good. Although still in the Good category, this finding reveals that teachers' ability to mix conventional learning approaches with technology still needs further improvement.

Technological Content Knowledge (TCK)

Technological Content Knowledge (TCK) is defined as an educators' insight into how technological tools can enhance and enrich the learning of the course, for example, the use of simulations in physics teaching or the integration of multimedia in history lessons. The findings from the data analysis concerning the TCK of English teachers are displayed in the subsequent table.

Table 7. Analysis of Technological Content Knowledge (TCK) Mastery

No	**Aspect**	**TCK**	
		Score	**Category**

1	I utilize basic visuals, sound recordings, or films to elucidate English content.	87 (3.48)	Very Good
2	I select digital educational resources that learners may utilize without an internet connection.	79 (3.16)	Good
3	I am capable of producing basic visual instructional resources to aid student comprehension.	85 (3.40)	Good
4	I elucidate English content utilizing approachable mediums, such as posters or audio recordings.	83 (3.32)	Good
	Average	**84** (3.36)	**Good**

According to Table 7, the mean score for Technological Content Knowledge (TCK) proficiency was 84, which classifies it as Good. These findings indicate that, in general, junior high school English teachers in Jayapura have demonstrated strong ability to integrate technology with learning materials, making the delivery more engaging, easier to understand, and tailored to student characteristics.

The indicator with the highest score was the statement “I utilize basic visuals, sound recordings, or films to elucidate English content,” which scored 87 and falls into the Very Good category. These findings elucidate that most teachers have utilized simple multimedia as a means to clarify material delivery. Meanwhile, the indicator with the lowest score was the statement “I select digital educational resources that learners may utilize without an internet connection,” which received a score of 79, categorized as Good. While still considered good, this result indicates that teachers' ability to select or provide digital teaching materials that can be used without an internet connection still needs strengthening.

Pedagogical Content Knowledge (PCK)

Pedagogical Content Knowledge (PCK) embodies a teacher's cohesive comprehension of the subject matter (content) and the instructional methods (pedagogy) employed. PCK includes methodologies for conveying intricate subjects, tailoring education to varied learners, and creating efficient evaluations. The findings from the data analysis about the pedagogical content knowledge of English teachers are encapsulated in the subsequent table.

Table 8. Analysis of Pedagogical Content Knowledge (PCK) Mastery

No	**Aspect**	**PCK**	
		Score	**Category**

1	I select an English instructional method that aligns with the traits of Papuan learners.	80 (3.20)	Good
2	I recognize the challenges that students in my region encounter when learning English and modify my instructional techniques accordingly.	84 (3.36)	Good
3	I am capable of creating engaging and contextually relevant educational experiences.	84 (3.36)	Good
4	I elucidate English concepts using illustrations from regional culture or the surroundings.	83 (3.32)	Good
	Average	**83** (3.32)	**Good**

Based on Table 8, the average Pedagogical Content Knowledge (PCK) competency score was 83, which falls into the Good category. This result indicates that, in general, junior high school English teachers in Jayapura have good skills in integrating material mastery with learning strategies appropriate to student characteristics.

The indicators with the highest scores were two statements: “I recognize the challenges that students in my region encounter when learning English and modify my instructional techniques accordingly” and “I am capable of creating engaging and contextually relevant educational experiences,” each of which scored 84, in the Good category. These results elucidate that most teachers are able to identify learning barriers experienced by students and adapt their learning strategies to better suit their needs. Meanwhile, the indicator with the lowest score was the statement “I select an English instructional method that aligns with the traits of Papuan learners,” which received a score of 80, categorized as Good. Although still in the Good category, this result demonstrates that teachers' ability to choose learning approaches that truly align with students' characteristics can still be improved.

Technological Pedagogical Content Knowledge (TPACK)

The merging of technology, pedagogy, and subject expertise results in the concept referred to as Technological Pedagogical and Content Knowledge (TPACK). This paradigm elucidates how instructors can proficiently synchronize learning methodologies, instructional resources, and digital instruments to create holistic, engaging, and significant educational experiences for students. The results from the data examination about the TPACK of English teachers are illustrated in the subsequent table.

Table 9. Analysis of Technological Pedagogical Content Knowledge (TPACK) Mastery

No	Aspect	TPACK	
		Score	**Category**
1	I am capable of creating English lessons that include basic technologies and regional methodologies.	82 (3.28)	Good
2	I am capable of developing authentic lesson plans customized for the educational environment in Papua.	84 (3.36)	Good
3	I am capable of critically assessing the effectiveness of incorporating technology into my lectures.	82 (3.28)	Good
4	I am capable of modifying resources, techniques, and technology to accommodate my students in Papua.	81 (3.24)	Good
	Average	**82** (3.28)	**Good**

According to Table 9, the mean score for Technological Pedagogical Content Knowledge (TPACK) proficiency was 82, defining it as Good. This outcome suggests that English educators at the junior high level in Jayapura typically exhibit robust competencies in the amalgamation of technology, pedagogy, and educational resources.

The indicator with the highest score was the statement “I am capable of developing authentic lesson plans customized for the educational environment in Papua,” which scored 84, in the Good category. This result confirms that most teachers are able to design lessons that take into account the actual conditions of their schools, including the availability of facilities, student characteristics, and the learning environment. Meanwhile, the indicator with the lowest score was the statement “I am capable of modifying resources, techniques, and technology to accommodate my students in Papua,” which received a score of 81, categorized as Good. Although still in the Good category, these results indicate that the ability to simultaneously integrate the three main components of TPACK still needs further improvement.

Overall, the research results indicate that junior high school English teachers in Jayapura have good TPACK competency. Teachers not only have mastered each component of TPACK but are also able to integrate all three into the learning process, although there is still room for improvement in several aspects.

After analyzing each TPACK component, the next step was to compare competency achievement in each component to identify aspects with the highest level of mastery and those requiring improvement. This analysis was conducted based on the average score for each component, providing a more comprehensive picture of the strengths and weaknesses of the TPACK competencies of English teachers in junior high school level in Jayapura.

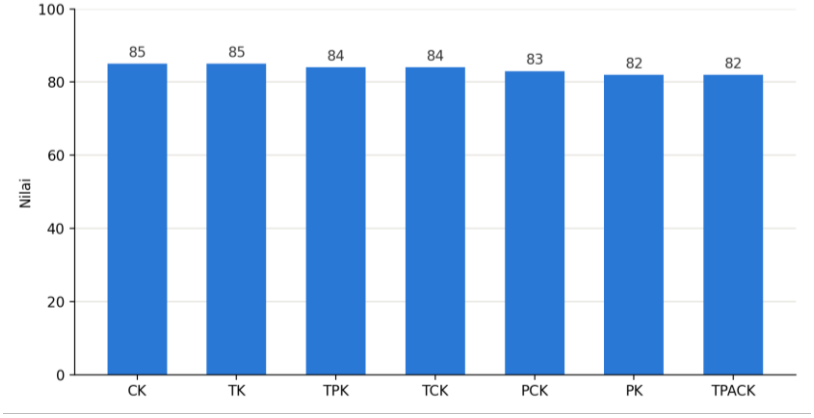


Figure 2. Bar Chart of TPACK Component Score

Based on Figure 2, all TPACK components received a Good score, with scores ranging from 82 to 85. These results indicate that junior high school English teachers in Jayapura have relatively even competency across all TPACK components. The relatively small differences in scores between components indicate that there are no significant competency gaps.

The components with the highest average scores were Content Knowledge (CK) and Technological Knowledge (TK), each of which received a score of 85. These results indicate that teachers have a good grasp of English learning materials and a strong ability to utilize digital tools to support the process of learning.

Conversely, the Technological Pedagogical Content Knowledge (TPACK) component received the lowest score compared to the other components, although it still falls within the Good score. These results indicate that the main challenge no longer lies in mastering technology or materials separately, but rather in the ability to integrate these three components into a unified whole in learning practices.

Discussion

TPACK Competencies of Junior High School English Teachers in Jayapura in Facing the Digitalization of Learning

The findings of this research reveal that the Technological Pedagogical Content Knowledge (TPACK) competency of junior high school English teachers based in Jayapura is within the commendable range, achieving an average score of 83.50. This discovery suggests that educators possess sufficient competencies in merging technology, pedagogy, and expertise in learning resources to facilitate the digital transformation of education. All findings correspond with the TPACK concept introduced by Mishra and Koehler, highlighting that successful learning in the digital era relies on educators' capacity to concurrently integrate all three knowledge domains. Consequently, this accomplishment signifies that English teachers in Jayapura are not just capable of

employing technology as a learning instrument but are also commencing to apply it pedagogically to facilitate the attainment of educational goals.

This research's findings are corroborated with various national and international studies that report teachers' TPACK competencies in the good category. Studies by Tschönhens et al. (2024) and Mohamad (2021) showed that teaching experience, professional training, and the intensity of technology use contribute to improving teachers' TPACK competencies. Chan and Tang (2025) also found that reflection on learning practices and experience integrating technology are important factors in strengthening TPACK competencies. However, compared to several previous studies that showed technology was still largely used as a medium for delivering material, the results of this study confirm that English teachers in Jayapura show a more adaptive tendency in selecting and utilizing technology according to the learning needs of their respective schools.

An interesting finding in this study is the strong achievement of TPACK competencies despite the research being conducted in the Papuan context, which still faces geographical challenges and limited digital infrastructure. Unlike most previous studies conducted in areas with relatively better access to technology (Amelia et al., 2021; Kristiawan et al., 2022), the study's results elucidate that limited infrastructure is not always the main obstacle to developing TPACK competencies. Teachers are able to adapt by utilizing available technology, such as simple applications and easily accessible digital media, and integrating them into learning according to school conditions. These findings reinforce the view that successful technology integration is determined more by teachers' ability to select technology relevant to learning objectives than by the level of sophistication of the technology used.

However, the relatively high standard deviation (SD = 12.83; Likert SD = 0.51) and wide range of scores indicate that teachers' TPACK competencies are not evenly distributed. This indicates that some teachers already possess excellent competencies, while others still require strengthening, particularly through ongoing training, professional mentoring, and institutional support. These results correspond with studies conducted by Elmaadaway and Abouelenein (2023) and Lai (2022), which confirm that the cultivation of TPACK competencies is affected by experience using technology, opportunities for professional development, and a supportive school environment. Consequently, enhancing TPACK competences must prioritize not just the provision of digital devices but also the augmentation of educators' abilities to contextually amalgamate technology, pedagogy, and material in relation to the nuances of English language learning.

Dominance of Content Knowledge and Technological Knowledge as the Foundation for Technology Integration in English Language Learning

The findings of the research reveal that Content Knowledge (CK) and Technological Knowledge (TK) were the two TPACK elements with the highest ratings, both achieving a score of 85, whilst the Technological Pedagogical Content Knowledge (TPACK) component received a score of 82. Although all components were in the good category, this pattern indicates that junior high school English teachers in Jayapura have a stronger mastery of learning materials and technology use than their ability to integrate both into a comprehensive learning strategy. This finding aligns with the TPACK theory developed by Koehler and Mishra (2009), which emphasizes that TPACK is not simply the

accumulation of Pedagogical Knowledge, Content Knowledge, and Technological Knowledge, but rather integrative knowledge formed through the dynamic interaction of these three domains. Therefore, mastery of materials and technology does not automatically result in the ability to integrate technology pedagogically in learning.

This discovery aligns with earlier research indicating that teachers typically achieve better scores on the CK (Naing, 2025; Shi & Jiang, 2022) and TK (Darsih et al., 2023) aspects than on the integrative component of TPACK. However, this study demonstrates a different characteristic, as high CK mastery is reflected in teachers' ability to relate English language material to the context of students' lives in Papua, such as using examples relevant to their culture and environment. Meanwhile, high TK is not demonstrated through the use of advanced technology, but rather through teachers' ability to utilize simple devices and applications available at school. This indicates that teachers' technological competence develops through a process of adaptation to available resources, rather than solely relying on the sophistication of digital facilities.

These findings provide the perspective that the success of technology incorporation in learning is not solely reliant on the extent of infrastructure advancement, but by teachers' ability to select technology that is appropriate to learning objectives and student characteristics. Therefore, the results of this research strengthen the view that the advancement of TPACK competencies needs to be directed not only at improving technological literacy, but also pertains to educators' capacity to amalgamate technology, pedagogy, and subject matter in alignment with learning requirements and regional circumstances.

Conclusion

This research highlights that the Technological Pedagogical Content Knowledge (TPACK) competency of junior high school English teachers in Jayapura falls within the commendable range, with an average score of 83.50, reflecting their preparedness to amalgamate technology, pedagogy, and educational resources in the digital age. The Content Knowledge (CK) and Technological Knowledge (TK) elements achieved the highest ratings, however the TPACK component, as a composite skill, obtained comparatively lower marks. These results suggest that enhancing teacher skills should prioritize the optimal integration of technology, pedagogy, and content in English education.

This study enriches the study of TPACK in the educational context of Papua by demonstrating that strong TPACK competencies can still develop despite limited digital infrastructure. These findings confirm that successful technology integration is determined more by teachers' ability to adapt technology to learning objectives and local contexts than by the sophistication of the technology used. Future research is recommended to explore the factors influencing TPACK competency through a mixed-methods approach or comparative studies across various regions, as well as to assess the effectiveness of TPACK-based professional development programs in increasing the quality of English learning.

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