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The Adoption of TPACK in Teaching English By EFL Pre-Service Teachers during the Apprenticeship Program in The *Merdeka* Curriculum Framework

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Abstract

This study investigates how pre-service teachers use Technological Pedagogical Content Knowledge (TPACK) to teach English during their apprenticeship within the framework of the Merdeka Curriculum. Promoting successful teaching practices in contemporary classrooms requires TPACK, or the integration of technology, pedagogy, and content knowledge. The Merdeka Curriculum provides a framework for applying TPACK principles in practical contexts, with a strong emphasis on adaptability and digital competency. A qualitative descriptive methodology was used to investigate the perspectives and experiences of twenty Pre-Service Teachers from Wiralodra University. The data was collected using a TPACK questionnaire, and the seven TPACK components were measured using a Likert scale. The results indicate that Pre-Service Teachers are highly skilled in integrating technology with content and pedagogy, particularly in planning and aligning digital tools with lesson objectives. However, they encounter challenges in areas such as technical troubleshooting, managing learning complexity, and fostering student-centred exploration using technology. While their ability to design lessons with technological resources is commendable, their readiness to address real-time issues in digital classrooms remains limited. The flexibility of the Merdeka Curriculum enhances their readiness, but deficiencies in technical knowledge and problem-solving skills highlight the need for more targeted instruction and mentoring in these areas. The study underscores the importance of comprehensive preparatory programs to improve TPACK adoption and advocates for ongoing professional development that meets the demands of 21st-century learning. This study successfully advances the implementation of TPACK and emphasizes key areas for enhancement in pre-service teacher education programs aimed at supporting technologically advanced instruction.

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Kata Kunci:
TPACK, Calon Guru, Kurikulum Merdeka, Integrasi Teknologi, Pengajaran Bahasa Inggris

Abstrak
Penelitian ini mengkaji adopsi Technological Pedagogical Content Knowledge (TPACK) oleh Mahasiswa Calon Guru dalam pembelajaran Bahasa Inggris selama masa magang dalam kerangka Kurikulum Merdeka. Integrasi antara teknologi, pedagogi, dan pengetahuan konten—yang dikenal sebagai TPACK—merupakan elemen penting dalam mendorong strategi pengajaran yang efektif di ruang kelas modern. Kurikulum Merdeka menyediakan kerangka penerapan prinsip-prinsip TPACK dalam konteks praktik nyata, dengan penekanan kuat pada fleksibilitas dan kompetensi digital. Penelitian ini menggunakan metode deskriptif kualitatif untuk mengkaji perspektif dan pengalaman dua puluh Mahasiswa Calon Guru dari Universitas Wiralodra. Pengumpulan data dilakukan menggunakan kuesioner TPACK, dan pengukuran tujuh komponen TPACK dilakukan melalui skala Likert. Hasil penelitian menunjukkan bahwa Mahasiswa Calon Guru memiliki keterampilan tinggi dalam mengintegrasikan teknologi dengan konten dan pedagogi, terutama dalam merancang dan menyelaraskan alat digital dengan tujuan pembelajaran. Namun demikian, mereka menghadapi tantangan dalam hal pemecahan masalah teknis, pengelolaan pembelajaran yang kompleks, serta pengembangan pembelajaran yang berpusat pada siswa melalui teknologi. Kemampuan mereka dalam merancang pembelajaran berbasis teknologi cukup baik, tetapi kesiapan mereka dalam menghadapi permasalahan secara langsung di ruang kelas digital masih terbatas. Fleksibilitas yang ditawarkan oleh Kurikulum Merdeka turut meningkatkan kesiapan mereka, namun kekurangan dalam aspek pengetahuan teknis dan keterampilan pemecahan masalah menegaskan perlunya pelatihan dan pendampingan yang lebih terarah. Penelitian ini menegaskan pentingnya program persiapan yang komprehensif untuk meningkatkan adopsi TPACK serta merekomendasikan pengembangan profesional berkelanjutan yang sesuai dengan tuntutan pembelajaran abad ke-21. Studi ini berkontribusi dalam penguatan implementasi TPACK dan menyoroti area utama yang perlu ditingkatkan dalam program pendidikan calon guru yang mendukung pembelajaran berbasis teknologi secara optimal.

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INTRODUCTION

Technology integration in the classroom has grown to be a crucial component of the teaching and learning process in recent years. It alters the way educators perceive the teaching and learning process. Technologies have the potential to primarily change the way the teacher thinks about teaching and learning (Hulya & Ay en, 2015). Teachers consider technology a medium for teaching the material. They adopt it as a teaching and learning tool for both instruction and interaction. In terms of instruction, the integration of technology is expected to create effective instructional practice (Voogt & McKenney, 2017). While in the interaction, technology allow the teacher to engage the interaction with the students, especially in language learning (Tseng et al., 2022).

In the framework of TPACK, there are three basic components of knowledge such as technology, pedagogy, and content. (Schmidt et al., 2009) elaborates the intersection of those three knowledge types for teachers to understand; technology knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Content Knowledge (TCK) and Technological Pedagogical Content Knowledge (TPACK). This knowledge is needed to construct effective learning process with the integration of technology.

The variety of media and tools that support to the learning process is also emphasized in the current curriculum framework. *Merdeka* Curriculum is a curriculum that allow diverse intra-curricular learning. It allows the students to explore more about the concept of the subject they learn and strengthen their competency (Rizaldi & Fatimah, 2022). The teaching and learning activity in this curriculum framework expect the teachers and students to adapt with the advance of the current era development (Pratini, et al., 2022). In the practice of teaching; preparation, implementation, and evaluation and assessment are carefully designed to achieve the learning goals that are not only to cover the cognitive aspect, but also, affective, psychomotor, and behaviour. The curriculum also places a strong emphasis on character development, ensuring that the values embodied in the Pancasila Student Profile are integrated into the teaching and learning process.

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Recent scholarly inquiry has shown a growing emphasis on the integration of technological tools within educational practices, with particular attention to their application in language learning contexts. investigated the integration of technologies in teaching and learning process especially in language learning. Voogt & McKenney (2017) reported that teachers often pay little attention to the foundational knowledge that supports early literacy in technology use, which results in difficulties when implementing technology in the classroom and negatively affects students' comprehensive learning. Cheung & Jang (2020) emphasized that integrating technology into specific language skill learning requires a tailored approach to enhance learning outcomes. They emphasized that the Technological Pedagogical Content Knowledge (TPACK) framework should be anchored in student-centred learning, requiring educators to possess a comprehensive and in-depth understanding of TPACK Principles. Similarly, Drajati et al. (2021) found that teachers' understanding of the TPACK framework is reflected in their teaching plans; carefully designed lesson plans help teachers address challenges in technology integration and improve learning quality. In this context, investigating how pre-service teachers integrate the TPACK framework during their apprenticeship program is crucial. This phase represents a critical formative stage during which pre-service teachers translate theoretical knowledge into practical reaching experiences. Examining their application of the TPACK framework offers valuable insights onto their preparedness, pedagogical growth, and capacity to implement effective technology-enhanced instruction.

TPACK Framework

As evidenced in existing literature, the TPACK framework was introduced within the field of education as a conceptual model to guide teachers in the effective integration of technology into the teaching and learning process. Technology Pedagogical Content Knowledge, or TPACK, is a purposeful educational field that is elaborated by Schmidt et al., (2009) is facilitates teachers in effectively integrating the three core domains of knowledge – Technology, Pedagogy, and Content – within teaching and learning process.

The TPACK framework encompasses the complexity of multiple interrelated domains of teacher knowledge, resulting in a comprehensive and multifaceted understanding of effective instructional practice. It comprises the following components. First, Technological Knowledge (TK) is the understanding of various digital tools and technologies and their potential applications. Second, Content Knowledge (CK) is the mastery of subject matter that is to be taught and learned. Third, Pedagogical Knowledge (PK) is the understanding of teaching methodologies, including classroom management, assessment strategies, lesson planning, and student learning processes. Fourth, Pedagogical Content Knowledge (PCK) is the specialized knowledge of how to effectively teach specific content, blending subject expertise with appropriate pedagogical strategies. Fifth, Technological Content Knowledge (TCK) the understanding of how technology can be used to represent and transform content in innovative and meaningful ways. Sixth, Technological Pedagogical Knowledge (TPK) is the knowledge of how various technologies can support and reshape teaching strategies and pedagogical approaches. Seventh, Technological Pedagogical Content Knowledge (TPACK) is the comprehensive knowledge required to integrate technology effectively into pedagogy and content, enabling meaningful and contextually appropriate instruction across subject areas. With the knowledge of TPACK, the teachers are expected to understand comprehensively in the integration of technology in teaching and learning process to achieve the learning targets for the students.

Preparatory Program for Pre-Service Teachers for the Framework of TPACK

Given the complexity of each domain within the TPACK framework, it is essential that all seven components of knowledge are explicitly introduced to teachers. In teacher education programs, pre-service teachers must be equipped with a comprehensive understanding of these domains to effectively prepare them for the integration of technology into classroom instruction. Voogt & McKenney, (2017) emphasized the importance of implementing adequate preparatory programs to equip student teachers with the necessary competencies of effectively integrating information and communication technology (ICT) into their classroom practices. A preparatory program focused on technology integration in the classroom with

influence pre-service teachers' perceptions and deepen their understanding, which will be reflected in their teaching practices during real classroom experiences.

The experience of technology integration for pre-service teachers should encompass all stages of instruction, including lesson planning, the teaching and learning process, as well as evaluation and assessment practices. The experience that the pre-service get during the preparatory program is to give a capture of problems that might occur during educational process. (Koehler et al., 2013) explained that the integration of technology into teaching and learning requires a sophisticated and multifaceted knowledge structure that spans various context and instructional scenarios. Teachers must be capable of navigating and responding to the complexities and dynamic nature of classroom environments, enabling them to continuously adapt and refine their pedagogical understanding. Pre-service teachers should be equipped with comprehensive knowledge, including insights into student cognition and learning process, subject matter expertise, and technological proficiency. Furthermore, challenges in technology integration may arise not only form the teachers themselves but also from the students. Therefore, it is essential that pre-service teachers are also prepared to address a range of potential issues, including technical, social, and contextual challenges within the teaching and learning process.

Merdeka Curriculum Framework

Merdeka curriculum is introduced as the recovery curriculum after the Pandemic Covid-19. It emphasizes on the flexibility yet adaptive to the change of the era (Rizaldi & Fatimah, 2022). The flexibility on the use of tools, media, and strategy is set to the teaching and learning process. The teachers are allowed to constantly use the digital devices. In this curriculum framework also, the activity in the classroom enables the students to use their digital devices. Hariharasudan and Kot (2018) stated that the modern educational system transform in the current revolution era urges the integration of advanced technology in the teaching and learning process in the classroom where the students are expected to achieve their learning objective based on their competence and interests. The teaching and learning process in the framework of Merdeka Curriculum demand the teachers to balance

their theoretical and practical knowledge that will optimize the students' digital skill. Thus, the arrangement of the learning activity should be effectively and creatively designed in Learning Module by integrating variety of technology so the students get meaningful learning.

The competency of teaching becomes an urgency for the teacher to actualize the knowledge of TPACK framework in the educational process. A preparatory stage of Student Teacher in teaching English in apprenticeship program evaluate the outcomes of technology integration within classroom settings during the apprenticeship program by assessing how pre-service teachers implement digital tools to support instructional objectives, enhance student learning, and navigate practical teaching challenges. In line with the curriculum of teacher training course, a media development course is needed for Student Teacher to explore their knowledge in terms of the application of technology as teaching media. Both instructionally and interaction, Pre-Service Teachers should be able to translate the TPACK framework knowledge into teaching and learning process in the classroom. To capture the actualization of Student Teacher in adopting TPACK in their educational process during apprenticeship program, this study then elaborates the research questions into:

1. How do they adopt the TPACK framework into their educational process in teaching English language?
2. How do they perceive the TPACK in teaching English skills during apprenticeship program?

METHOD

Research Design

Grounded in qualitative research, the researchers used descriptive qualitative methodology to capture the intensity in capturing how the Pre-Service Teachers adopt the framework of TPACK in their teaching and learning process during the apprenticeship program. This design is also expected to describe their perception of integrating technology in teaching and learning, especially in the English language learning context.

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The participants in this study were from the seventh semester of the English Education Department of Wiralodra University in Indramayu. Twenty students participated in the apprenticeship program for 6 months in six senior high schools in Indramayu. Their age ranges from 20-22 years old. They initially get the preparatory program for a month to get the basic knowledge of the apprenticeship program. They attended some courses to equip them to teach students in the school. One of the courses focused on Media Development, where they were asked to prepare a media to teach the material to the students. In this case, they were recommended to integrate technology into teaching English.

Before they teach their students in the classroom, they should consult their teaching module, materials, and classroom activities with their supervisor teachers. They should revise their teaching module based on the suggestions from their supervisor teacher. In the discussion session with their supervisor, they consult the media, the material, and the procedure of integrating the technology during the teaching and learning process. They were also guided to set the assessment and evaluate the teaching and learning process.

Data Collection

The data were obtained through a questionnaire adapted from (Drajati et al., 2021), designed to measure perceptions of TPACK in the teaching and learning process. The instrument comprised of 44 items, categorized into seven distinct domains corresponding to the component of TPACK framework: Technology Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK) Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and Technological Pedagogical Content Knowledge (TPACK).

Data Analysis

The data from the questionnaire will be analyzed using Likert scale analysis will be analyzed descriptively (Gray, 2014). The writers used descriptive statistics that elaborate on the central tendency and also the variability of the questionnaire. The writers used Likert Scale to collect the data by using five (5) answer categories: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Disagree.

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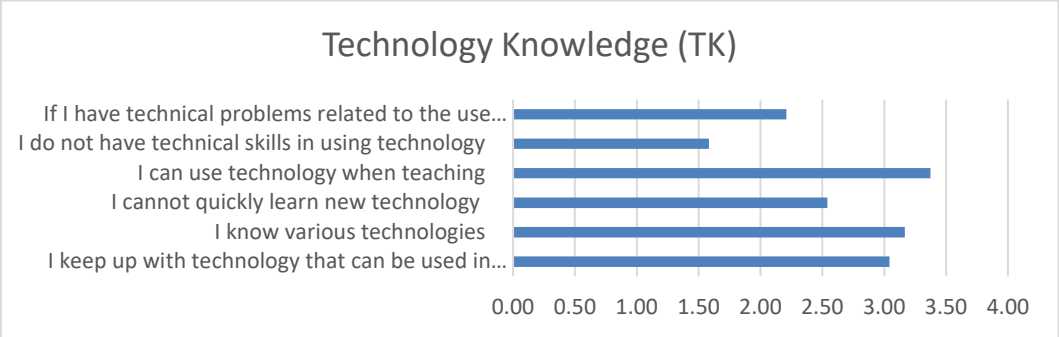
FINDINGS AND DISCUSSION

Finding

TPACK combines the complexity of the knowledge areas that resulting to a wider scope of understanding. This finding revealed each part of the TPACK: Technology Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and Technological Pedagogical Content Knowledge (TPACK). The results related to the Technology Knowledge (TK) are shown in the Chart 1.

Chart 1 Technology Knowledge (TK)



Based on Chart 1, the highest mean score was observed in the statement “I can use technology when teaching” with an average of 3.38, categorized as very high. This was followed by “I know various technologies” with an average score of 3.17 and “I keep up with technology that can be used in learning” with an average of 3.04, both falling under the high category. In contrast, lower mean scores were recorded for “I cannot quickly learn new technology” (M = 2.54) and “If I have technical problems related to the use of technology, I am not able to solve them myself” (M = 2.21), which are categorized as moderate. These findings suggest that while pre-service teachers demonstrate a strong ability to use technology in instructional settings, they still lack sufficient technical problem-solving skills, indicating a need for further training in this area. The results related to the Content Knowledge (CK) are shown in Chart 2.

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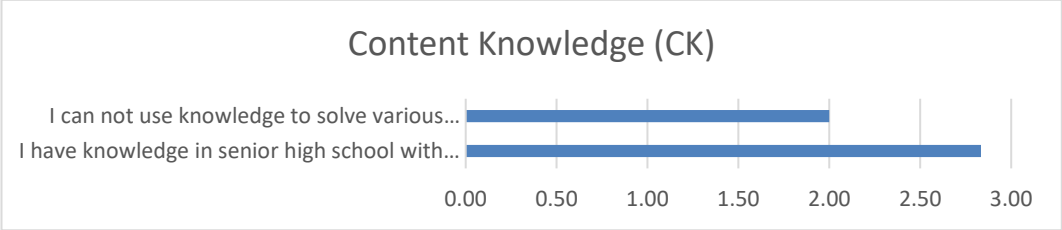
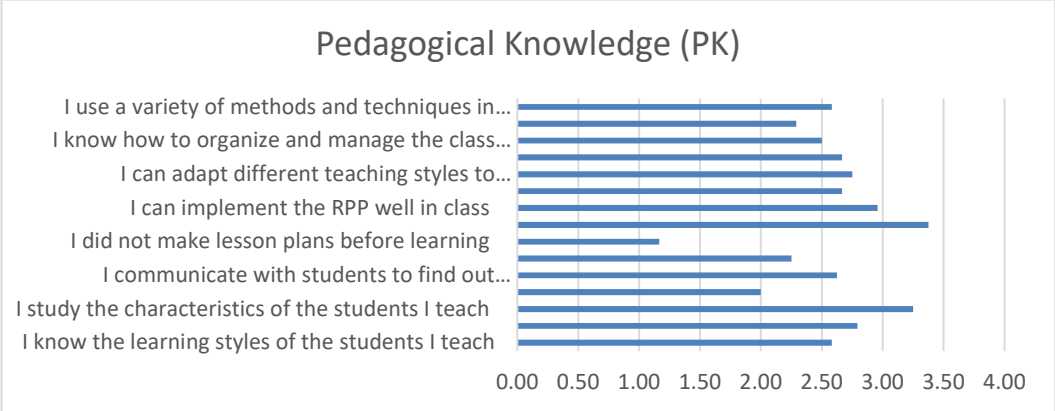
Chart 2 Content Knowledge (CK)



Based on Chart 2, the statement “I have knowledge in senior high school with good learning” received the highest mean score of 2.83, categorized as high. Conversely, the statement “I cannot use knowledge to solve various problems in senior high school” obtained the lowest mean score of 2.00, categorized as low. These results indicate that while pre-service teachers possess a foundational understanding of subject matter relevant to the senior high school level, they still encounter difficulties in applying this knowledge to address diverse classroom challenges effectively.

The results related to the Pedagogical Knowledge (PK) are shown in the Chart 3.

Chart 3 Pedagogical Knowledge (PK)



Based on Chart 3, it can be seen that the aspect with the highest average is the aspect " I developed lesson plans following Permendikbud No.22 about the standard process I use when doing the learning RPP” with a mean of 3.38 and "I study the characteristics of students I teach" with a mean of 3.25 in the "very high" category. While the aspects in the "high" category were achieved by six aspects, 1) "I can implement the RPP well in class" with a mean of 2,96; 2) "I know the initial abilities of the students I teach" with a mean of 2,79; 3) "I can adapt different

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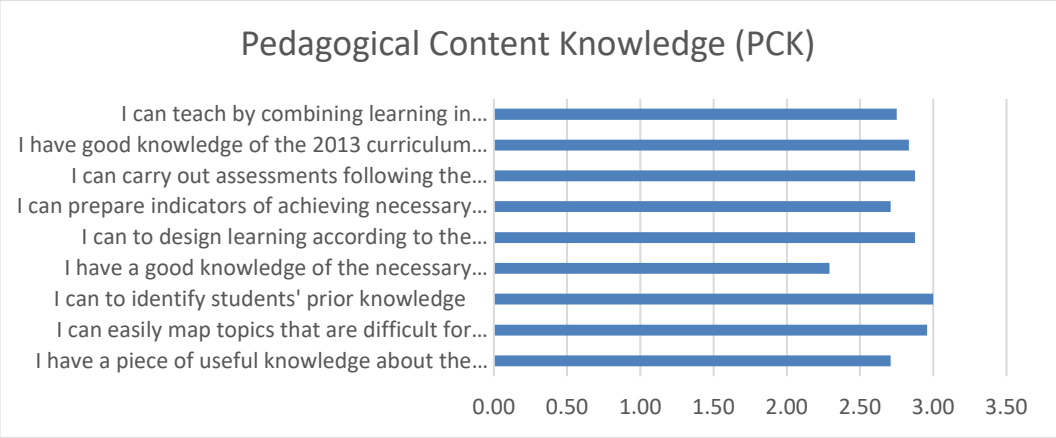
teaching styles to students, which differ by their characteristics" with a mean of 2,75; 4) "I give more attention to students who experience many difficulties in learning" with a mean of 2,67; 5) "I can use a variety of learning approaches that help students learn" with a mean of 2,67; and 6) "I communicate with students to find out students' difficulties in learning" with a mean of 2,63. There are six aspects that got the "moderate" category, 1) "I know the learning styles of the students I teach" with a mean of 2,58; 2) "I use a variety of methods and techniques in evaluating the learning process and results from students " with a mean of 2,58; 3) "I know how to organize and manage the class well" with a mean of 2,50; 4) "I do not know how to assess the performance of students in the classroom" with a mean of 2,29; 5) "I examine students' difficulties in learning" with a mean of 2,25; and 6) "I did not analyse the results of student learning to find out student difficulties" with a mean of 2,00. The aspect "I did not make lesson plans before learning" got the lowest mean score with 1,17 in the "low" category. It can be concluded that Pre-Service Teachers develop lesson plans in accordance with the Minister of Education and Culture Regulation and can implement them well. Apart from that, they also study the characteristics and learning styles of the students they teach, but they do not make lesson plans before learning.

The results related to the Pedagogical Content Knowledge (PCK) are shown in the Chart 4.

Chart 4 Pedagogical Content Knowledge (PCK)



According to the Chart 4, it can be seen that eight aspects got the “high” category, 1) “I can to identify students' prior knowledge” with mean ,.00; 2) “I can

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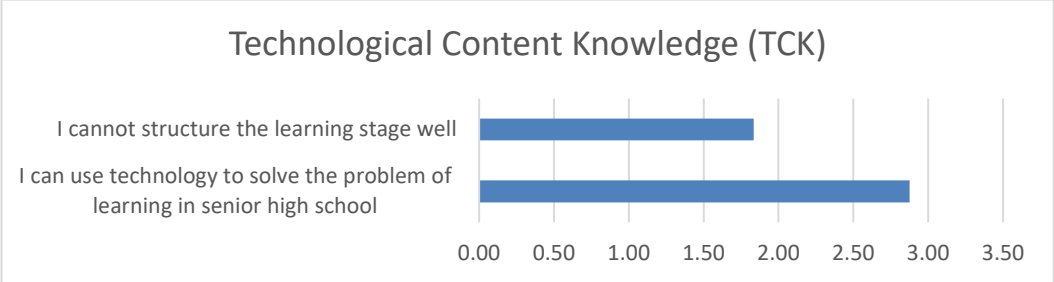
easily map topics that are difficult for students to learn" with mean 2,96; 3) "I can to design learning according to the curriculum standards in 2013 revised" with mean 2,88; 4) "I can carry out assessments following the assessment standards applied to the 2013 curriculum revised" with mean 2,88; 5) "I have good knowledge of the 2013 curriculum revised" with mean 2.83; 6) "I can teach by combining learning in elementary school, technology, and a specific learning approach" with mean 2,75; 7) "I have a piece of useful knowledge about the causes of a rigid material studied" with mean 2,71; 8) "I can prepare indicators of achieving necessary competencies well" with mean 2,71. While, the lowest mean score is the aspect, "I have a good knowledge of the necessary competencies to be achieved following the teaching in senior high school curriculum revision in" with mean 2,29 in "moderate category". It can be concluded that Pre-Service Teachers prepared well in teaching process.

The results related to the Technological Content Knowledge (TCK) are shown in the Chart 5.

Chart 4 Technological Content Knowledge (TCK)



Based on the Chart 5, it can be seen that the highest mean score is the aspect "I can use technology to solve the problem of learning in senior high school" with mean 2,88 in "high" category. While, the lowest aspect is "I cannot structure the learning stage well" with mean 1,83 in "moderate" category. It can be concluded that some Pre-Service Teachers still cannot structure the learning stage well.

The results related to the Technological Pedagogical Knowledge (TPK) are shown in the Chart 6.

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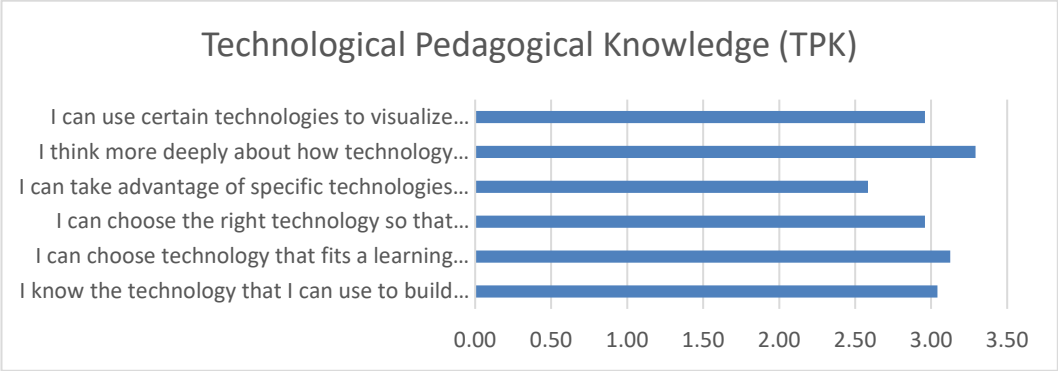
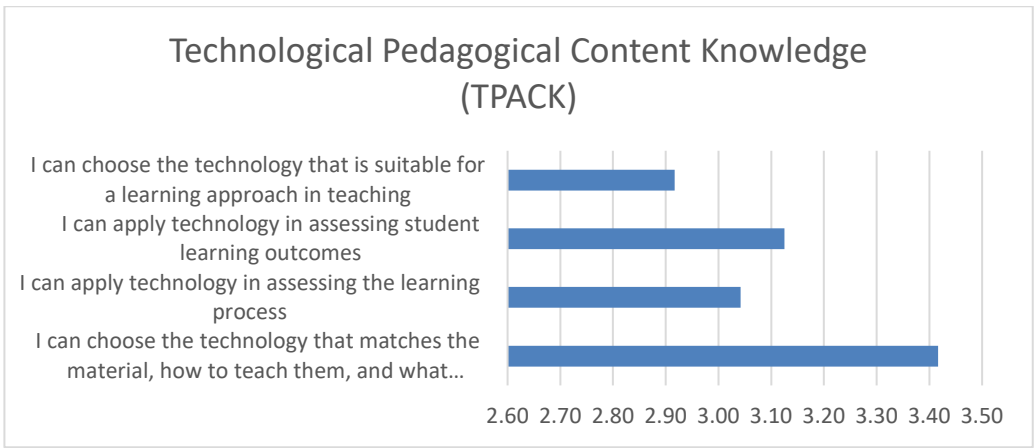
Chart 5 Technological Pedagogical Knowledge (TPK)



Based on the Chart 6, it can be seen that the aspect "I think more deeply about how technology affects the learning approach I use in the classroom" got the highest mean with 3,29 in "very high" category. While for the "high" category were achieved by four aspects, 1) "I can choose technology that fits a learning approach in teaching" with mean 3,13; 2) "I know the technology that I can use to build understanding and explore the learning of senior high school" with mean 3,04; 3) "I can choose the right technology so that learning can run efficiently" with mean 2,96; and 4) "I can use certain technologies to visualize specific learning concepts in senior high school" with mean 2,96. For the lowest mean is the aspect "I can take advantage of specific technologies that students can explore independently" with mean 2,58 in "moderate" category. It can be concluded that Pre-Service Teachers can use and take advantage of technologies in the learning process.

The results related to the Technological Pedagogical Content Knowledge (TPACK) are shown in the Chart 7.

Chart 6 Technological Pedagogical Content Knowledge (TPACK)



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Based on Chart 7, it can be seen that the highest mean score is the aspect "I can choose the technology that matches the material, how to teach them, and what material students will learn" with mean 3,42 in the "very high category". While the for the "high" category were received by three aspects, 1) "I can apply technology in assessing student learning outcomes" with mean 3,13; 2) "I can apply technology in assessing the learning process" with mean 3,04; and 3) "I can choose the technology that is suiChart for a learning approach in teaching" with mean 2,92. It can be concluded that Pre-Service Teachers can choose and apply the technology that matches the material and is suitable for students.

The data presented above indicated that the pre-service teachers demonstrate a solid foundational understanding across the TPACK framework during their apprenticeship program. They exhibit high confidence in using technology for teaching (TK), developing lesson plans aligned with curriculum standards (PK), and integrating content knowledge into pedagogical practice (PCK). Particularly, their ability to choose appropriate technology that aligns with both teaching methods and content (TPACK) scored the highest, indicating that the apprenticeship program effectively supports the theoretical integration of the TPACK components into practical classroom application.

In the other side, some challenges were reflected based on the data. Some pre-service teachers struggle with technical aspects, such as solving technology-related problem independently and adapting quickly to new toolsAlthough pre-service teachers demonstrated an awareness of students' learning characteristics, their competencies in assessing learning outcomes, analyzing student difficulties, and effectively structuring the stages of instruction—reflected in the relatively lower scores in Pedagogical Knowledge (PK) and Technological Content Knowledge (TCK)—remain in the developmental stage. Their use of technology tends to be more teacher-centred, with limited evidence of strategies that support student autonomy through technological exploration (TPK).

Discussion

The questionnaire by (Drajati et al., 2021) was adopted to measure the perception of TPACK in the process of teaching and learning. The finding has

revealed each part of the TPACK; Technology Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK) Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK) and Technological Pedagogical Content Knowledge (TPACK).

Technology Knowledge (TK)

Technological Knowledge (TK) refers to an understanding of various forms of technology and their potential applications in educational contexts. In this regard, teachers are expected to utilize and integrate technological tools effectively within the classroom environment. The findings indicate that pre-service teachers' ability to incorporate technology into the teaching process falls within the high category, with most items receiving high average scores. This suggests that pre-service teachers possess a sufficient level of familiarity with using technology as a digital teaching aid. However, they tend to lack the technical proficiency required to troubleshoot issues independently when technical problems arise. Consequently, it is essential that pre-service teachers are further exposed to potential challenges related to technology integration, including technical, social, and contextual issues, to enhance their overall readiness for classroom implementation. (Koehler et al., 2013) explained that It has been emphasized that integrating technology into teaching and learning requires a complex and nuanced knowledge structure that spans diverse cases and contexts. Teachers must be capable of navigating the intricacies of dynamic classroom environments, allowing them to continuously adapt and refine their understanding of technology-enhanced pedagogy. This adaptive expertise is essential for effectively responding to varying instructional demands and for fostering meaningful learning experiences through technology integration.

Content Knowledge (CK)

Content Knowledge (CK) refers to a teacher's understanding of the subject matter that is to be taught and learned. Based on the results, it is evident that pre-service teachers demonstrate a moderate level of content knowledge. This suggests that while they possess a foundational understanding of the subject area, there is still room for further development to enhance their depth of knowledge and ability

to convey subject matter effectively in the classroom. Pre-Service Teachers still face some problems to solve various problems in senior high school even though they have knowledge about it. Thus, further refinement of such knowledge is needed. This in line with the research conducted by Ismail, et al. (2023) that showed the content knowledge possessed by the teachers was categorized as high.

Pedagogical Knowledge (PK)

Pedagogical Knowledge (PK) that refers to the methods and processes of teaching and includes knowledge in classroom management, assessment, lesson plan development, and student learning. Based on the results, it can be seen that the Pre-Service Teachers possess a high category of Pedagogical Knowledge (PK), because eight statements of fifteen statements is categorized high and very high. The findings of Sojanah et al. (2021) indicate that Pedagogical Content Knowledge (PCK) has the most significant influence on the development of TPACK. In this study, the PCK component was categorized as high, suggesting that pedagogical knowledge is effectively aligned with content knowledge. This aligns with the perspective of Mishra and Koehler (2013), who argue that effective teaching arises when instructional strategies are appropriately tailored to the specific nature of the content, allowing for more coherent and impactful learning experiences.

Pedagogical Content Knowledge (PCK)

Pedagogical Content Knowledge (PCK) refers to the specialized knowledge that connects subject matter content with appropriate teaching strategies, enabling teachers to effectively deliver content in ways that are understandable and meaningful to students. Based on the results, pre-service teachers demonstrated a high level of PCK, as evidenced by eight out of nine statements falling within the high category. This finding is consistent with the study conducted by Ismail et al. (2023), which reported that teachers' pedagogical content knowledge was also categorized as high, with a mean score of 3.90. These results suggest that pre-service teachers are developing a strong foundation in aligning pedagogy with content to support effective teaching practices.

Technological Content Knowledge (TCK)

Technological Content Knowledge (TCK) that refers to the knowledge of how technology can create new representation for specific content. Based on the results, it can be seen that Technological Content Knowledge (TCK) were in the high and moderate category. So, the Pre-Service Teachers can use technology to solve the problem of learning in senior high school, but they cannot structure the learning stage well. This is due to the lack of experience of Pre-Service Teachers, so they cannot structure the learning stage well. As Ottenbreit-Leftwich, et al. (2010) stated that Pre-Service Teachers who are in the first year of their teaching professions use information technologies in their classrooms in a very narrow about technology integration and utilization.

Technological Pedagogical Knowledge (TPK)

Technological Pedagogical Knowledge (TPK) that refers to the knowledge of various technologies can be used in teaching and to understand that using technology may change the way teachers teach. Through this Technological Pedagogical Knowledge, the teachers can understand the advantages and disadvantages of technology in teaching and use it as evaluation. Based on the results, The results indicate that pre-service teachers demonstrate a high level of understanding in Technological Pedagogical Knowledge (TPK), reflecting their ability to integrate technology effectively within pedagogical practices. This finding aligns with the study conducted by Ismail et al. (2023), which reported that teachers' TPK was also categorized as high, with a mean score of 3.91. This suggests that pre-service teachers are increasingly competent in selecting and applying technological tools to support and enhance their instructional methods.

Technological Pedagogical Content Knowledge (TPACK)

Technological Pedagogical Content Knowledge (TPACK) refers to the comprehensive and integrated knowledge that teachers need to effectively incorporate technology into their instructional practices across various content areas. It represents the intersection of technological, pedagogical, and content knowledge, enabling educators to design and deliver meaningful, technology-enhanced learning experiences that are pedagogically sound and content-

appropriate. The study results implied that Pre-Service Teachers can choose and apply the technology that matches with the material and suiChart for students. Almost all the aspects from TPACK received "high" category and "very high" category. In other words, the Pre-Service Teachers have the technological knowledge. According to Tondeur et al. (2017), The depth and breadth of teachers' technological knowledge are essential for advancing their understanding of the integration between technology, pedagogy, and content knowledge. In alignment with the findings of the present study, pre-service English teachers exhibited a strong level of preparedness to incorporate technology into their instructional practices. These English Pre-Service Teachers have advanced to comprehend TPACK, despite the fact that utilizing ICT resources is not always simple (Valtonen et al., 2019). The TPACK framework lies at the core of effective teaching, as it delineates the specific type of knowledge educators must possess to meaningfully integrate technology into the learning process.

This study highlights the complex interplay among the seven TPACK components and their manifestation in the teaching practices of pre-service teachers during their apprenticeship. The high score in TK, PK, PCK, and TPACK suggest that pre-service teachers are equipped with foundational knowledge to plan and deliver instruction using technology. These findings are consistent with Drajati et al (2021) and Koehler et al. (2013), who assert that effective technology integration requires both content mastery and pedagogical fluency. However, as also noted by Valtonen et al. (2019), challenges arise in technical aspects and contextual ability, particularly in real-time problem-solving and promoting student-centered digital learning experiences.

The moderate results in TCK and aspects of PK point to a gap between theory and practice. While teachers may understand what technology to use, structuring content-rich digital instruction remains difficult, likely due to limited classroom exposure and experience. Ottenbreit-Leftwich et al. (2010) support this, emphasizing that novice teachers often have a limited scope of technology integration. Similarly, their struggles with reflective assessment practices align with Mishra and Koehler's (2013) view that pedagogical effectiveness relies on both

formative and summative, which pre-service teachers may not yet fully grasp.

Nevertheless, the strong performance in the TPACK domain indicates that the apprenticeship program has played a significant role in helping pre-service teachers bridge the gap between theory and application. As Chai et al. (2011) point out, the synergy of the seven TPACK components leads to better instructional design and implementation. This suggests that pre-service teachers are moving toward an integrated understanding of content, pedagogy, and technology, although continued support in technical troubleshooting and flexible instructional planning remains essential.

CONCLUSIONS

The integration of technology into education has fundamentally reshaped the teaching and learning process, prompting a paradigm shift in educators' perceptions of instructional methodologies. Technological advancements possess the capacity to transform pedagogical practices, functioning not only as tools for content delivery but also as interactive platforms that enhance learner engagement. The Technological Pedagogical Content Knowledge (TPACK) framework underscores the significance of the dynamic interplay among technological knowledge, pedagogical understanding, and content expertise, highlighting the imperative for their cohesive integration to support effective, technology-enhanced learning environments. The Merdeka Curriculum promotes interactive learning, fostering students' exploration of subjects and character development. However, challenges persist in effectively integrating technology, especially in language learning, due to limited attention to early literacy knowledge. Pre-service teachers play a crucial role in mastering the TPACK framework to enhance technology integration skills, requiring preparatory programs to ensure successful implementation in the classroom. This research reiterated the importance of educational institutions' framework practice to prepare English Pre-Service Teachers' teaching skills in school.

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