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Investigating Pre-Service Language Teachers' TPACK: Why Does it Matter?

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Abstract. In recent decades, the integration of technology into language classrooms has gained prominence, many studies put their focus on in-service language teachers' competencies and performances in integrating technology into their classroom activities. However, there's a gap in understanding how pre-service language teachers are prepared for technological pedagogical content knowledge (TPACK). This is crucial for ensuring future educators are equipped for digital learning environments. This study explores pre-service language teachers' perceptions of their TPACK using Schmidt, Mishra, and Kohler's framework. Through a descriptive quantitative method, 201 pre-service teachers from English Language Education (ELE) and Indonesian Literature and Language Education (ILLE) study programs were surveyed using a Likert-scale questionnaire. Results show that a significant majority perceive themselves as knowledgeable about technology relevant to literacy (73 % for ELE, 68% for ILLE) and capable of selecting technology to enhance teaching approaches (77% for ELE, 62% for ILLE). However, confidence in effectively integrating literacy, technologies, and teaching approaches in lessons is lower (61% for ELE, 53% for ILLE). Addressing this gap is vital for better preparing future language educators for digital teaching environments.

Keywords: TPACK, Pre-Service Teachers, Language Teaching

Introduction

Technological disruption in education is both a challenge and an opportunity for teachers to speed up the students' learning process while adhering to learning principles. Teachers have a very important role in the success of ICT integration into the learning process to ensure that the rapid development of technology can be aligned with the core values of education (Maharani, 2017). In the 21st-century learning process, there are seven knowledge domains that teachers need to possess, one of which is technological pedagogical content knowledge (TPACK). The study of TPACK has developed rapidly in the last two decades along with rapid technological advances (Kleickmann et al., 2013; Mishra & Koehler, 2006; Segall, 2004). The main issue underlying many studies in TPACK is the notion that teachers' general knowledge about technology cannot necessarily be automatically applied in teaching and learning activities, both from the pedagogical aspect and the content of the material. This phenomenon is often encountered when online learning policies are implemented during the pandemic where integrating ICT into the English learning process is inevitable (Amrullah et al., 2022; Dhawan, 2020; Fauzi & Sastra Khusuma, 2020; Kleickmann et al., 2013). Therefore, teachers are expected to have TPACK which is an intersection between content knowledge, pedagogy, and technology.

However, despite the increasing number of academics, researchers, and practitioners in the world of education who are aware of the importance of this issue, comprehensive TPACK studies in the field of English education are still very few compared to other fields of education (Bugueño, 2013; Nugroho et al., 2020). Preliminary data obtained

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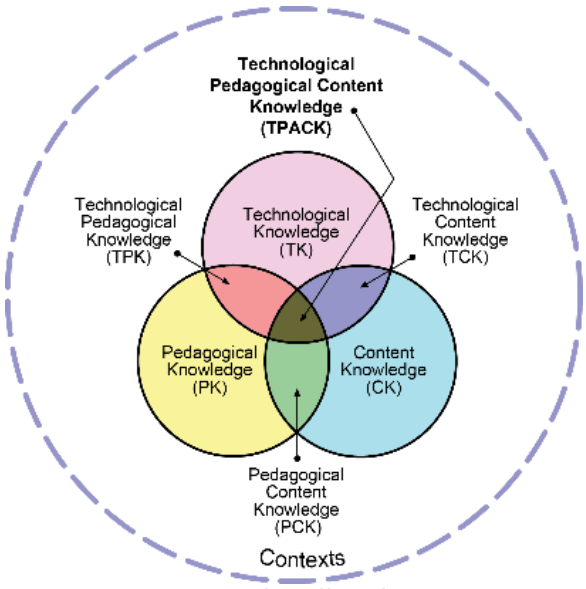
from previous research regarding self-assessment of high school and vocational school English teachers at MGMP Ogan Ilir during online learning during the pandemic shows that these teachers still have difficulty carrying out online learning activities, especially in terms of varying the use of technology and maintaining engagement. student. A study by Maharrani et al., (2023) shows that English language teachers in rural areas have an insufficient understanding of digital learning resources indicating that they may not be completely qualified to properly integrate technology into their teaching practices. This implies that some teachers still lack the requisite understanding and integration of technology in language education. Furthermore, the TESOL technology standards for language instructors emphasize the need for language teachers to obtain and retain basic knowledge and abilities in technology for professional purposes, implying that not all teachers will have this knowledge and skill set. Considering that this is closely related to the level of TPACK possessed by teachers, further investigation regarding TPACK for prospective teachers is important and a priority.

Theoretical Framework

Teachers' Knowledge

As a profession that masters a special scientific field, a professional teacher is a figure who plays an important role in the progress of education and improving the quality of a country's human resources. The study of the knowledge that teachers must have, or what is called teacher's knowledge, has always been one of the main studies in the development of the world of education, as stated in the educational philosophy presented by Dewey. As a development of the basic knowledge that teachers must have in the form of content knowledge and pedagogy knowledge as stated by Dewey, Shulman (1987) stated pedagogical content knowledge, namely the teacher's pedagogical ability to convey certain subjects. Over time, technological developments which have become an inseparable part of society have had an impact on expanding the study of teacher's knowledge until technological knowledge and technological pedagogical content knowledge have emerged. Of the three main basic knowledge that teachers must have, namely content knowledge, pedagogy knowledge, and technology knowledge, there are intersections between this knowledge to form seven basic teacher knowledge as per Mishra and Koehler's TPACK framework (Mishra & Koehler, 2006) shown in Figure 1.



Source http://tpack.org

Figure 1.
TPACK Framework Mishra dan Koehler

Technological Pedagogical Content Knowledge (TPACK) in English Language Teaching

As part of the basic knowledge that teachers must have, TPACK is also something that should not be separated from studies in English language teaching, including in the field of TESOL (Teachers of English to Speakers of Other Languages). The international professional organization TESOL itself has created a standard framework regarding the role and function of technology in English language teaching (Healey et al., 2008). However, there is still very little research and in-depth discussion about TPACK in the field of English education compared to other fields of education such as mathematics education. The research results from Tseng et.al show that in the last 10 years, from 2011 to 2019, there were only 51 research and publications related to TPACK in the field of English education. Research with this study is mostly carried out in Asia and the Middle East with the distribution of studies divided into 4 categories: exploring, assessing, developing, and applying TPACK. Tseng et.al also found that most of the research that had been conducted still did not touch the realm of practical implementation in the classroom.

Previous Research

As one of the emerging forms of teacher knowledge that is a consequence of rapid technological developments and is inseparable from people's lives, TPACK studies in the field of English education have begun to be carried out, although they are not yet very comprehensive. For example, Bugueño's (2013) study examines 38 sources, including journals and books, related to the use of TPACK in English as a Foreign Language/English as Second Language classes. However, this study does not specifically explore the TPACK of pre-service teachers context. This context is explained more in a study conducted by Drajati et al. (2018) This research examines the perception and implementation of TPACK by 100 pre-service and in-service English teachers in Indonesia about multimodal literacy. The results of this research describe the demographics of teachers, the level of TPACK and their implementation along with the problems they face. This study focuses on how the TPACK is related to the teachers' multimodal literacy rather than how the pre-service teachers perceived their TPACK. In addition, a study by Ammade et al., (2020) on TPACK focuses on the TPACK level of lecturers majoring in English Education at Muhammadiyah University of Pare-Pare. The result reveals that the lecturers are at a moderate level where they can use the three main basic knowledge in the teaching process but have not optimally integrated the three. In other words, the use of technological knowledge from these lecturers has not facilitated their content knowledge and pedagogical knowledge optimally. This study also does not investigate the TPACK for the pre-service teacher context.

Research by Sari and Sumardi (2020) investigates the meta-cognitive awareness of high school teachers in Indonesia who participated in TPACK learning design training using reflection tools, focus group discussions, and reflective journals. The research results show that using these three methods provides teachers with the opportunity to recall their thoughts about the concept of technology integration that they have learned during the workshop. However, this study does not discuss the TPACK of pre-service teachers. Another study on TPACK comes from Tseng et al., (2022) which reviews the landscape of TPACK research on language teachers from 2011 to 2019. The research results reveal that in that period there were only 51 publications with this study, where the highest number of publications was in 2015, most of which were carried out in Asia and the Middle East. The 51 publications are categorized into four areas: (a) exploring TPACK, (b) assessing TPACK, (c) developing TPACK, and (d) applying TPACK. Regarding exploring TPACK, the research results show that teachers have varying levels of confidence in their TPACK competencies where the use of technology is still dominant in teacher-centered teaching. Despite the number of studies on TPACK, the previous research results show that the application of TPACK in English language teaching especially in pre-service teachers context has not been widely explored so more empirical studies need to be carried out. The TPACK studies in the field of language education are also still few and still at a basic stage. For this reason, this

research will make a significant contribution to the development of TPACK studies in the field of language education. Apart from that, this research is an initial mapping that will be followed up in development and applied research in the following years.

Materials and Method

This research uses quantitative methods where quantitative data is obtained through distributing questionnaires about TPACK to students majoring in Language at one of the universities in South Sumatra. The questionnaire used was adapted from Schmidt, Mishra, and Koehler's TPACK Survey. As key researchers in this field, Schmidt, Mishra, and Koehler (Koehler et al., 2014; Mishra & Koehler, 2006; Schmidt et al., 2009) have developed questionnaires that have been used widely to measure TPACK in various contexts and obtained reliable internal consistency for its each domain. This questionnaire consists of 39 questions which are categorized into seven domains, namely technology knowledge (TK), content knowledge (CK), pedagogy knowledge (PK), pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), technological content knowledge (TCK), and technological pedagogical content knowledge (TPACK). Each question was measured using a Likert Scale with a scale of 1 to 5 where a scale of 1 is strongly disagree and a scale of 5 is strongly agree. This questionnaire will be filled in by students of English and Indonesian language education in semesters 2, 4, and 6. Apart from that, the questionnaire also contained the demographic distribution of the sample in the form of study program, GPA, age, and teaching experience.

The sample of this study were all active students majoring in Languages in semesters 2, 4, and 6 with a total of 201 students. The sampling process is carried out using a convenient sampling technique where questionnaires were distributed to the population through the study program and data was processed based on the number of questionnaires returned. Data collection began by distributing questionnaires to the sample to map the TPACK level of students majoring in Language who are prospective teachers in the future. The questionnaire that will be used is adapted from Schmidt's TPACK Survey and consists of seven knowledge domains, namely technological knowledge (TK), content knowledge (CK), pedagogical knowledge (PK), pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), technological content knowledge (TCK), and technological pedagogical content knowledge (TPACK). This questionnaire has 39 questions that need to be filled in by the sample by selecting the following Likert scale: strongly disagree (1), disagree (2), neither agree or disagree (3), agree (4), and strongly agree (5). The distribution of questionnaire questions based on the knowledge domain measured is shown in Table 3 below.

Table 1.
Distribution of Questionnaire Questions Based on Knowledge Domain Category

Domain	Number of Questions
Technology Knowledge (TK)	6
Content Knowledge (CK)	6
Pedagogy Knowledge (PK)	7
Pedagogical Content Knowledge (PCK)	4
Technological Pedagogical Knowledge (TPK)	9
Technological Content Knowledge TCK)	4
Technological Pedagogical Content Knowledge (TPACK)	4

Quantitative data obtained from the questionnaire was analyzed using descriptive statistics by calculating the average value obtained in each domain. The results of this analysis provide information regarding the level of TPACK knowledge of students majoring in English Language Education and Indonesian Literature and Language Education study programs based on the knowledge domain that forms it.

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Results and Discussion

Results

The questionnaire distributed to the sample was adapted from Schmidt, Mishra, and Koehler's TPACK Survey, which is categorized into seven domains, namely technology knowledge (TK), content knowledge (CK), pedagogy knowledge (PK), pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), technological content knowledge (TCK), and technological pedagogical content knowledge (TPACK). Each question was measured using a Likert Scale with a scale of 1 to 5 where a scale of 1 is strongly disagree and a scale of 5 is strongly agree. The results obtained from the questionnaire from each study program are displayed in the diagrams below.

Technology Knowledge (can solve own technical problems, can learn technology easily, keep up with important technology, know different technologies, have technical skills to use technology)

The results in this category for the English Language Education study program showed that 17% of students strongly agree that they have knowledge related to technology, and 59% agree that they have good knowledge of technology. However, there are 24% of students who are not yet confident in their technological knowledge. Meanwhile, for the Indonesian Language and Literature study program, 11% of students strongly agree that they have technological skills, 49% agree that they have technological skills, and 38% are not sure about their technological knowledge. This information is important because having a strong foundation in technological knowledge is essential in today's contemporary digital landscape. Students who are equipped with the ability to solve technical problems independently demonstrate an independence that promotes efficiency and resilience. Additionally, the ability to quickly grasp new technologies underscores a proactive approach to staying current. In today's dynamic technological environment, the capacity to stay informed about important developments is critical, ensuring each student not only understands current trends but also anticipates future changes. Thorough technological knowledge not only includes awareness but also includes practical skills, allowing individuals to adeptly utilize a variety of technologies. These multifaceted competencies empower students not only to navigate today's technological landscape but also to adapt and thrive in the ever-evolving digital era.

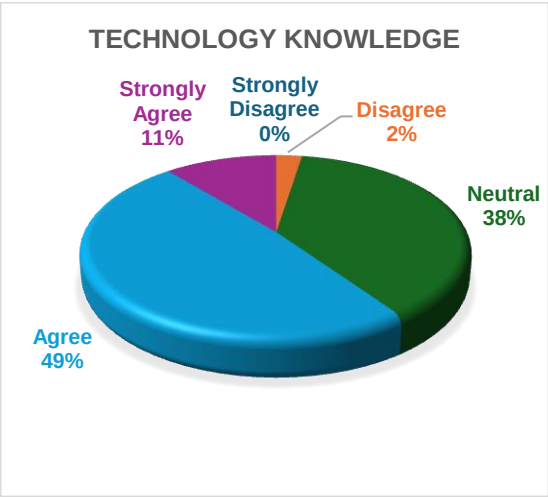

Figure 2.
English Language Education Study Program

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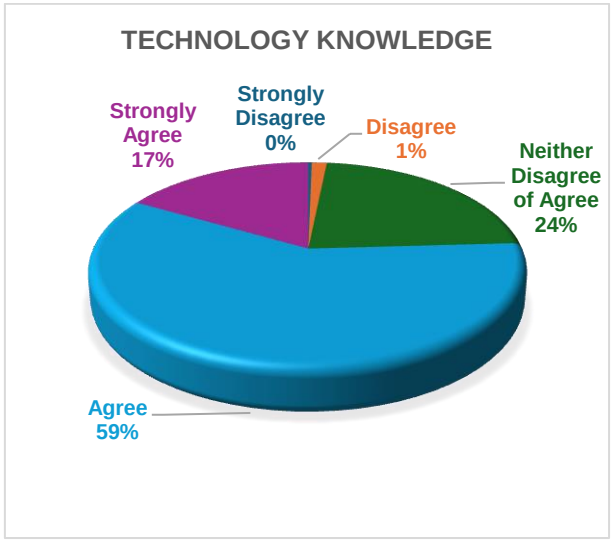


Figure 3.
Indonesian Literature and Language Education Study Program

Content Knowledge

The results in this category show that for the English Language Education study program % of students strongly agree that they have content-related knowledge, and 54% agree that they have good content knowledge. However, there are 36% of students who are not yet confident in their content knowledge. Meanwhile, for the Indonesian Language and Literature study program, 6% of students strongly agreed that they had content knowledge, 51% agreed they had content skills, and 40% were not sure about their content knowledge. Content knowledge serves as the foundation of intellectual proficiency, which includes a deep understanding of the subject matter in a specific domain. Individuals who have strong content knowledge have a comprehensive understanding of key concepts, facts, and principles relevant to their area of expertise. This knowledge base facilitates critical thinking, problem-solving, and effective decision-making. This is more than just memorizing, it also includes the ability to synthesize information, draw connections, and apply insights in practical scenarios. In an educational context, educators with deep content knowledge are better equipped to convey information clearly and engage students in meaningful discourse. Whether in academia, professional settings, or everyday life, content knowledge empowers individuals to navigate complexity, make informed choices, and make meaningful contributions to their respective disciplines.

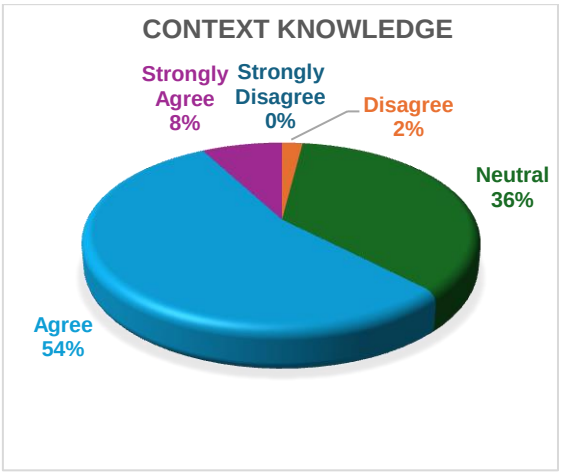


Figure 4.
English Language Education Study Program

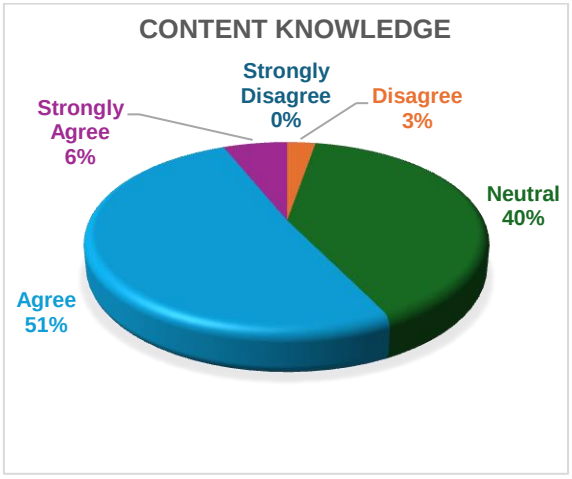


Figure 5.
Indonesian Literature and Language Education Study Program

Pedagogical Knowledge

The results in this category show that for the English Language Education study program12% of students strongly agree that they have good pedagogical knowledge, and 63% agree that they have good pedagogical knowledge. However, there are 25% of students who are not yet confident in their pedagogical knowledge. Meanwhile, for the Indonesian Language and Literature study program, 11% of students strongly agreed that they had pedagogical knowledge, 57% agreed they had pedagogical abilities, and 32% were not sure about their pedagogical knowledge. Pedagogical knowledge is an art in the science of teaching that includes a deep understanding of learning strategies, learning theories, and the dynamics of the educational environment. Educators equipped with strong pedagogical knowledge can design engaging and inclusive learning experiences, adapt teaching methods to diverse student needs, and foster a positive and conducive learning atmosphere. This knowledge goes beyond subject matter expertise to include awareness of various teaching methodologies, assessment techniques, and stages of learner development. This empowers educators to adapt their approach to meet individual learning styles, creating an environment that fosters intellectual growth and academic success. Pedagogical knowledge is the foundation of effective teaching, fostering not only the transfer of information but also the development of critical thinking skills and a lifelong love of learning among students.

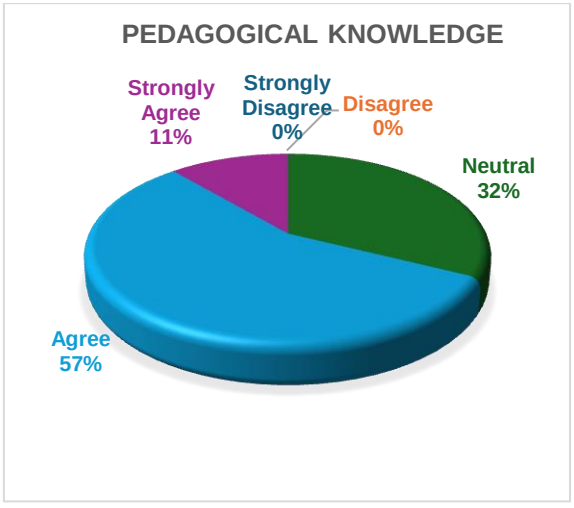


Figure 6.
English Language Education Study Program

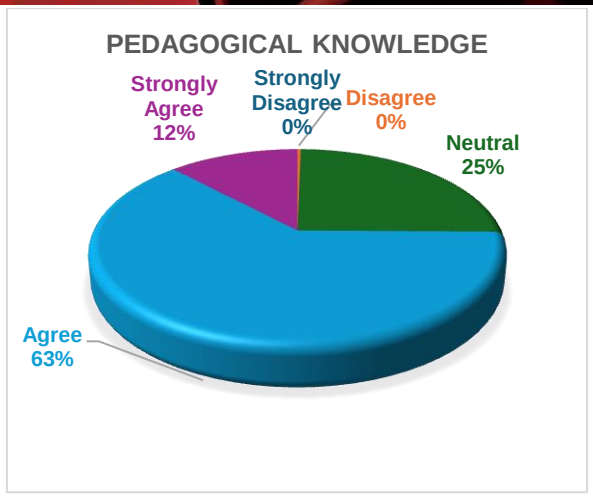
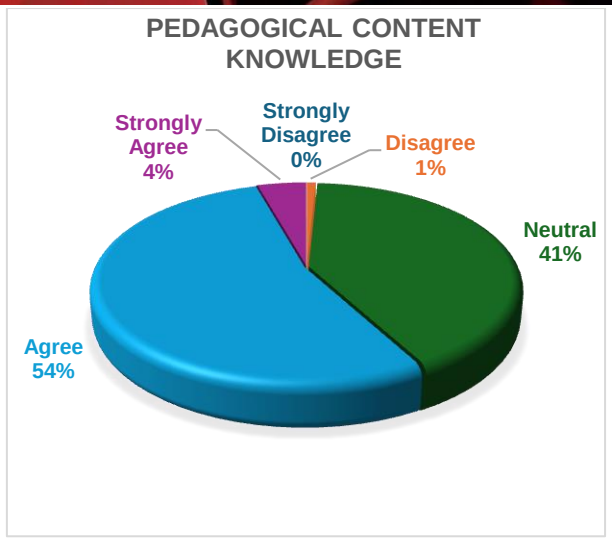


Figure 7.
Indonesian Literature and Language Education Study Program

Pedagogical Content Knowledge

The results in this category show that for the English Language Education study, program10% of students strongly agree that they have good pedagogical content knowledge, and 57% agree that they have good pedagogical content knowledge. However, there are 30% of students who are not yet confident in their pedagogical content knowledge. Meanwhile, for the Indonesian Language and Literature study program, only 4% of students strongly agree that they have pedagogical content knowledge, 54% agree that they have pedagogical content skills, and 41% are not sure about their pedagogical content knowledge. Pedagogical Content Knowledge (PCK) represents the interaction between subject matter expertise and the art of teaching. It is more than just mastery of content or effective pedagogy, combining both elements to create a holistic teaching approach. Educators with strong PCK have a differentiated understanding of how to present and facilitate learning of specific content in the context of diverse student needs and backgrounds. This specialized knowledge involves identifying misconceptions, selecting appropriate teaching strategies, and adapting instructional materials to maximize student understanding. Essentially, PCK enables educators to translate their in-depth subject knowledge into accessible and meaningful learning experiences, thereby fostering student engagement and understanding. This highlights the importance of seamlessly integrating content and pedagogy to optimize the educational journey, recognizing that effective teaching is not just about what is taught but also how it is delivered to foster lasting understanding.



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English Language Education Study Program

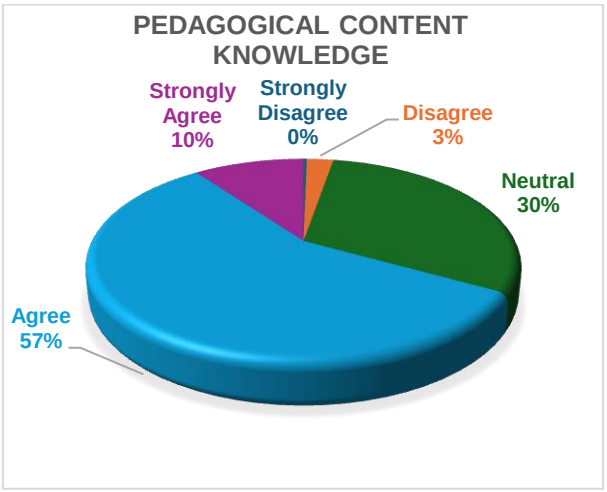
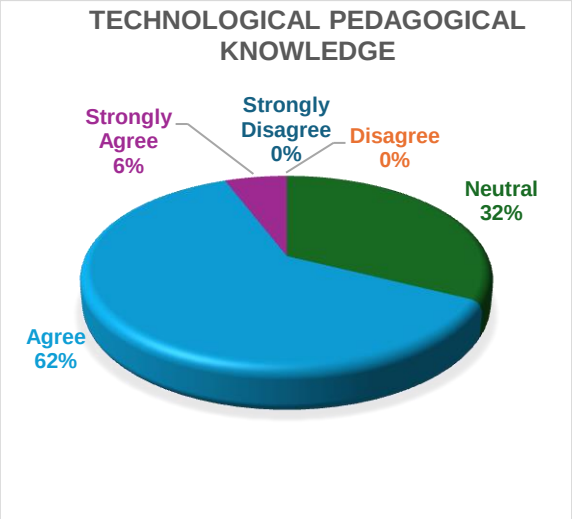


Figure 9.
Indonesian Literature and Language Education Study Program

Technological pedagogical knowledge

The results in this category show that for the English study program, 7 % of students strongly agree that they have good technological pedagogical knowledge, and 67% agree that they have good technological pedagogical knowledge. However, there are 25 % of students who are not yet confident in their technological pedagogical knowledge. Meanwhile, for the Indonesian Language and Literature study program, only 6% of students strongly agreed that they had technological pedagogical knowledge, 62% agreed they had technological pedagogical skills, and 32 % were not sure about their technological pedagogical knowledge. Technological Pedagogical Knowledge (TPK) is a combination of the ability to use technology and pedagogical understanding, creating a dynamic approach to teaching and learning in the digital era. Educators with strong TPK not only have proficiency in utilizing a variety of technological tools but also understand how to integrate them into learning strategies to enhance the learning experience. This knowledge goes beyond technical skills to include the strategic and thoughtful application of technology in achieving specific educational goals. This involves determining which technologies are best suited for different learning objectives, adapting to varying student needs, and leveraging digital resources to encourage engagement and understanding. TPK underscores the importance of aligning technology with pedagogical principles, ensuring that the integration

of digital tools enhances rather than hinders the learning process. In other words, TPK empowers educators to navigate the ever-evolving educational landscape by harnessing the potential of technology to create meaningful and effective learning environments.



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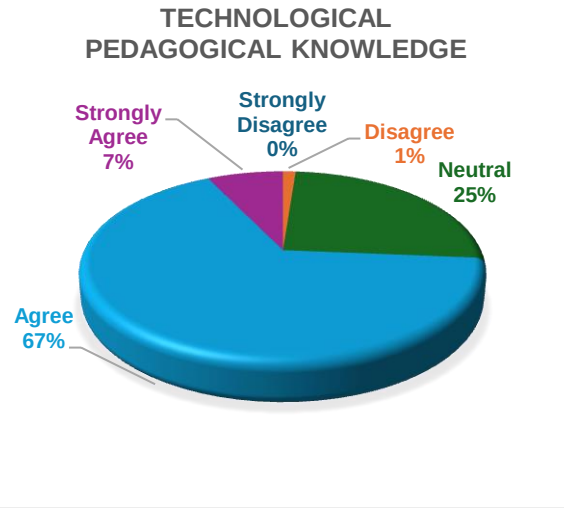
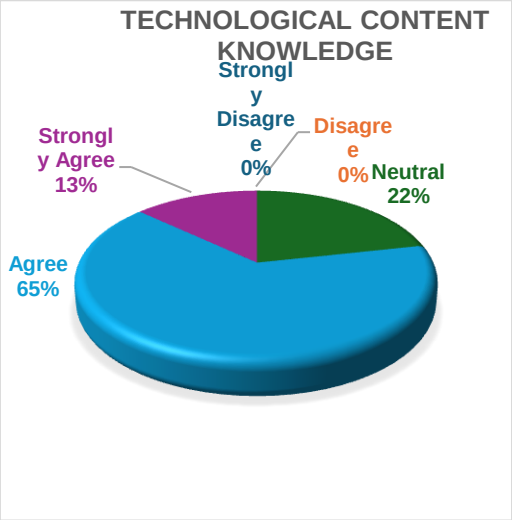


Figure 11.
Indonesian Literature and Language Education Study Program

Technological content knowledge

The results in this category show that for the English study program, 13% of students strongly agree that they have good technology content knowledge, and 65 % agree that they have good technology content knowledge. However, there are 22% of students who are not yet confident in their technology content knowledge. Meanwhile, for the Indonesian Language and Literature study program, only 9% of students strongly agreed that they had technology content knowledge, 53% agreed they had technology content skills, and 38% were not sure about their technology content knowledge. Technology Content Knowledge (TCK) is a specialized form of knowledge that bridges the gap between subject matter expertise and technology proficiency. It involves a deep understanding of how to use technology to enhance and enrich teaching and learning in a specific content area. Educators with strong TCK are adept at integrating relevant technology tools and resources into their teaching practices, aligning them with the nuances of the subject matter being taught. This knowledge allows educators to design content-specific learning experiences that

leverage the capabilities of technology, fostering more dynamic and engaging educational environments. TCKs don't just use technology for their purposes; rather it involves the strategic and targeted application of digital tools to facilitate a deeper understanding of content and foster meaningful connections for learners. At its core, TCK empowers educators to navigate the intersection of technology and content, ensuring seamless integration that enhances the overall educational experience.



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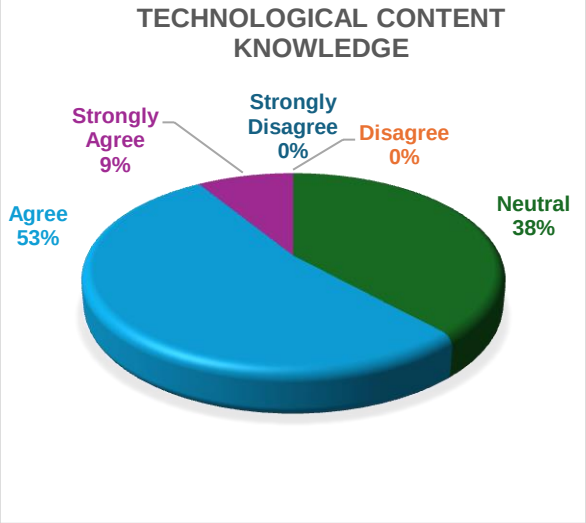

Figure 13.
Indonesian Literature and Language Education Study Program

Technological pedagogical content knowledge

The results in this category show that for the English Language Education study program, 8 % of students strongly agree that they have good technological pedagogical content knowledge, and 52 % agree that they have good technological pedagogical content knowledge. However, there are 38 % of students who are not yet confident in their technological pedagogical content knowledge. Meanwhile, for the Indonesian Language and Literature study program, only 3% of students strongly agreed that they had technological pedagogical content knowledge, 50% agreed they had technological pedagogical content skills, and 47% were not sure about their technological pedagogical content knowledge. Technological Pedagogical Content Knowledge (TPACK) represents the synergy between

technology, pedagogy, and content expertise in education. This unique form of knowledge underscores the importance of integrating these three dimensions to optimize the teaching and learning experience. Educators who have strong TPCK not only have proficiency in utilizing technological tools but also understand how to apply them purposefully in the context of specific subject matter and effective pedagogical strategies. TPCK is more than the sum of its parts—it involves a nuanced understanding of how technology can be leveraged to enhance content delivery, meet diverse learning styles, and meaningfully engage students. This comprehensive knowledge empowers educators to navigate the dynamic educational landscape, ensuring that technology is not just an add-on but an integral and strategic component that enriches the overall learning process. In essence, TPCK represents the intersection where technology, pedagogy, and content meet to create a powerful catalyst for effective teaching and learning.

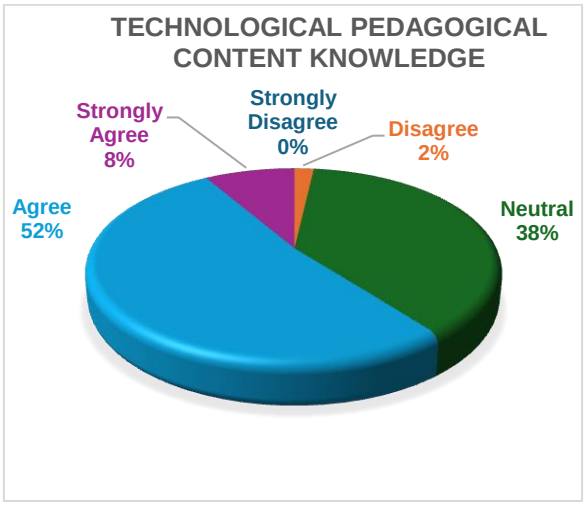

Figure 14
English Language Education Study Program

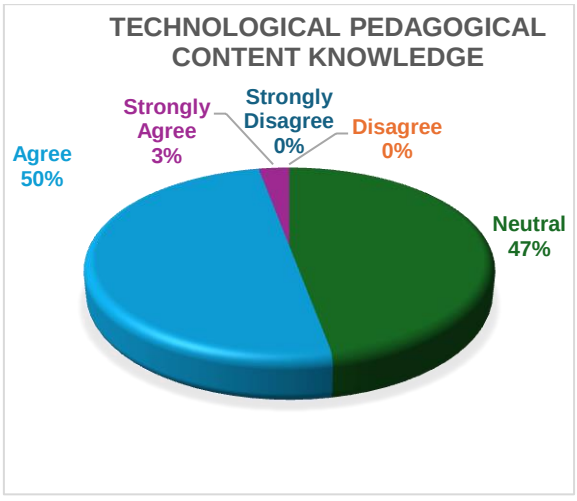

Figure 15
Indonesian Literature and Language Education Study Program

Discussion

The integration of ICT (Information and Communication Technology) has been described as complex, multifaceted, and situated (Mishra & Koehler, 2006). The results of this study reveal that most likely only around 50% to 60% of the pre-service teachers are confident that they can use technology appropriately for pedagogical reasons. Although (Ringotama's (2020) study indicates that most pre-service teachers tend to use common

technology in the classroom especially online media sources such as e-books and other digital resources in a lesson, they have insufficient knowledge on how to optimize the technology to teach. Nazari et al., (2019) believe that there are some differences in the understanding of technology between inexperienced EFL teachers and experienced EFL teachers. They claim that qualified teachers, on the one hand, have extensive knowledge of PK and PCK, and how to develop their pedagogical and content knowledge for their professional development. Yet, they lack technical expertise, so they need a professional development course on technology integration tailored to their needs. These findings are aligned with the Maharrani et al. study (2023) which reveals that English language teachers in rural regions possess inadequate comprehension of digital learning materials, suggesting a potential lack of qualifications to effectively incorporate technology into their teaching methodologies. This issue might come from their limited experience and knowledge of TPACK when they were pre-service teachers.

TESOL technology standards for language instructors emphasize the need for language teachers to obtain and retain basic knowledge and abilities in technology for professional purposes, implying that not all teachers will have this knowledge and skill set. Czaja et al., (2006) insist that technology adoption is a complex issue driven by various factors, such as sociodemographic characteristics, attitudes, and cognitive aspects. The interaction between these factors is very complicated. Therefore, a person's decision to use a particular technology in teaching activities cannot be explained solely based on their age or education. Other psychological considerations such as attitudes and cognitive abilities also need to be considered. In other words, teachers' adoption of technology is influenced by a complex combination of personal, social, and psychological characteristics. It is important to note that the level of technology skills of English teachers includes not only technical aspects but also the dimension of creativity in designing learning activities involving technology. Technology integration challenges teachers' traditional teaching methods and develops new skills such as applying constructivist approaches to teaching, learning, and orchestration, where teachers perform multiple roles and methodically organize different activities with technology, depending on students' needs (Wake & Whittingham, 2013). Teachers who have creative skills in utilizing technology can create more engaging and relevant learning experiences for students. Improved technology skills can also empower teachers to use various tools and platforms, such as digital educational apps, online learning platforms, and social media, to enhance student interaction and participation.

According to Moursund and Bielefeldt (2019), teachers who have a positive perception of the potential of technology tend to choose technology-based teaching approaches. They realize that technology-based teaching can increase student engagement and enable more adaptive and personalized learning. Research by Lee and Choi (2021) notes that teachers who have a positive perception of the role of technology in teaching tend to adopt a technology-based approach, emphasizing the role of innovation and technology utilization in providing more effective and engaging learning for students. In contrast, teachers who are skeptical of the benefits of technology tend to choose traditional methods. Teachers' skeptical perceptions of the benefits of technology can be a serious barrier to the adoption of technology-based approaches. In addition, So et al. (2018) argue that teachers who have a positive perception of the benefits of technology in improving student understanding tend to be more active in integrating technology into curriculum development. Technology integration in curriculum development is an extension of teachers' perception of the added value of technology in the context of learning. Teachers who understand the complex relationship between technology, pedagogy, and content can create a more relevant and adaptive curriculum (Mishra & Koehler, 2006). Thus, teachers' understanding and attitudes towards technology become a determining factor in determining the teaching and curriculum development approaches used. The integration of technology in curriculum development signifies a paradigm shift in education, where technology is considered an essential component in designing a relevant and responsive curriculum. Mishra and Koehler (2006) suggest that the TPACK approach is a key foundation for understanding how technology can be effectively integrated in a curriculum context. Teachers who have a

mature understanding of the relationship between technology, pedagogy, and content can create a curriculum that is more contextualized and engaging for students.

Conclusion

The results of this research show that not all Language Education Department students have the knowledge and abilities of Technological Pedagogical Content Knowledge (TPACK). This could be caused by several things, including the lack of teaching experience and also the lack of integration of TPACK in the lecture curriculum they take so that they have minimal learning experience related to TPACK. Therefore, to prepare prospective language teachers who have good TPACK skills, it is necessary to consider implementing a holistic integration of TPACK in the language teacher education curriculum.

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