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Exploring Pre-service Teachers' TPACK Development and Academic Integrity Using ChatGPT

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ABSTRACT

The rapid development of Generative Artificial Intelligence (GenAI), particularly ChatGPT, has transformed educational practices and created both opportunities and challenges in teacher education. This study explores how pre-service EFL teachers use ChatGPT to develop their Technological Pedagogical Content Knowledge (TPACK) while maintaining academic integrity during teaching practice. Employing a sequential explanatory mixed-methods design, the research involved 100 survey respondents and 10 interview participants from Universitas Pendidikan Ganesha, Bali. Data were collected through questionnaires and semi-structured interviews and analyzed using descriptive statistics and thematic analysis. The results revealed that pre-service teachers frequently used ChatGPT to explore digital tools, design lesson plans, and create interactive learning activities, indicating that ChatGPT functions as a pedagogical partner in supporting TPACK integration. Moreover, the findings showed that pre-service teachers demonstrated strong awareness of ethical principles in AI use by paraphrasing, modifying, and verifying AI-generated content to ensure originality and avoid plagiarism. These practices reflect their ability to balance innovation with responsibility in digital learning environments. The study concludes that integrating AI literacy and ethical reflection into teacher education curricula is essential to prepare pre-service teachers as adaptive, reflective, and integrity-driven educators in the era of artificial intelligence.

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INTRODUCTION

According to Bozkurt et al. (2023), the rapid emergence of GenAI has brought about significant transformations in Education such as reshaping the way teaching and learning are conceptualized and practiced, especially ChatGPT. Generative AI tools such as ChatGPT offer new opportunities to improve pedagogical practices, as they can assist teachers and teacher candidates in planning lessons, developing learning materials, and providing real-time feedback (Limna et al., 2022; Feuerriegel et al., 2024). Therefore, this development is highly relevant as prospective teachers are expected to have the ability to integrate technology into pedagogy and content knowledge in teacher education, a combination articulated through the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006).

To design effective, engaging, and contextually relevant learning experiences, the TPACK framework emphasizes the need for teachers to integrate subject matter expertise, pedagogical strategies, and technological skills (Mishra & Koehler, 2006). According to Ridha and Fithriani (2023), developing these competencies is crucial for prospective teachers to ensure readiness to face the 21st-century classroom. Previous research has shown that by supporting creative learning design, content adaptation, and individualized instructional feedback, tools such as ChatGPT can accelerate TPACK development (Hastomo et al., 2024). However, despite its undeniable potential, previous research has also shown that the integration of ChatGPT in teacher education has raised concerns about over-reliance on AI, decreased critical thinking skills, and threats to academic integrity (Hastomo et al., 2025; Lee & Zhai, 2024).

According to Hafizha (2022), academic integrity still be the foundation of higher education, which includes honesty, trust, fairness, and responsibility in academic practices. These values face new challenges in the era of generative AI (Choudhary et al., 2024). There are previous studies that show its capacity to generate entire assignments or essays may encourage plagiarism or reduce originality in students' work even though ChatGPT can facilitate academic support (Khalil & Er, 2023). This issue is particularly important for prospective teachers who are future learners and role models, who are expected to uphold and model ethical standards in their classrooms (Mufidah, 2019). During teacher preparation, uncritical or unethical use of AI can undermine their professional development and undermine their pedagogical autonomy (Kim & Kim, 2022; Holland & Ciachir, 2025).

Empirical research specifically investigating how prospective English as a Foreign Language (EFL) teachers use ChatGPT in developing their TPACK is still limited despite the growing literature on the potential and risks of ChatGPT in Education (Nguyen, 2023). Most previous studies only examine general perceptions of AI in education or highlight its technical applications, but few have explored the relationship between pedagogical skill development and ethical issues in real teaching contexts (Baskara & Mukarto, 2023). Thus, this represents a crucial gap, where efforts to integrate TPACK into teacher training are increasing but formal guidelines for the ethical use of AI are still limited, especially in Indonesia (Diktiristek, 2024).

Previous study only discussed ChatGPT in theory, which lack of researcher explore real experience of pre service teacher using ChatGPT in real time teaching, especially about their academic integrity. That is why this study aims to explore real experience of Pre service teacher using ChatGPT to develop their TPACK skills during their teaching practicum or micro teaching courses, while maintaining academic integrity. This study overcome this gap by investigating how English language (EFL) teacher candidates at Ganesha University of Education (Undiksha) use ChatGPT to support their TPACK development during teaching practice, while addressing challenges related to academic integrity. This study emphasizes prospective teachers' real-life experiences in the classroom, ethical decision-making, and professional reflection, very different to previous research that focused on technological convenience. Thus, this study highlights the opportunities and risks of integrating ChatGPT into teacher preparation as well as offering new insights into how AI can be responsibly integrated into teacher education programs.

Furthermore, the dual focus on pedagogical innovation and ethical responsibility is novel in this research. The evolving discourse on AI in education by critically examining the strategies of prospective teachers in maintaining academic integrity in the AI era and by documenting the practical use of ChatGPT for lesson planning, content development, and classroom management is a contribution of this research. For the purpose of preparing responsible, reflective, and digitally literate educators, this dual perspective positions this research to make both a theoretical contribution by extending the TPACK framework with considerations of ethical use of AI and a practical contribution by informing teacher training curricula and institutional policies. Thus, the research questions of this study is to determine how EFL preservice teachers use ChatGPT to develop their Technological Pedagogical Content Knowledge (TPACK) skills and how much they believe ChatGPT can be used to do so without compromising academic integrity.

METHOD

This study employed a case study approach with a sequential explanatory mixed-methods design as suggested by Creswell and Creswell (2018). The setting of this research was Universitas Pendidikan Ganesha in Bali, Indonesia, a public university with a strong reputation in teacher education, particularly in English language education. Meanwhile the object of this study was the use of ChatGPT as an AI-based language model to support teaching practice, and the subjects were 12 English as a Foreign Language (EFL) pre-service teachers at Undiksha. The participants were selected purposively using criteria such as enrollment in micro-teaching or practicum classes, experience using ChatGPT during these activities, and representation of varied genders and academic performance levels.

Data analysis combined descriptive statistics and thematic analysis. In quantitative, survey data were analyzed using descriptive statistics to generate numerical summaries such as mean, median, mode, minimum, and maximum values (Kaur et al., 2018). The data were then visualized through tables and analyses using

Microsoft Excel or SPSS. This analysis revealed general trends in how ChatGPT was used for TPACK development and how concerns about academic integrity were distributed across participants. Meanwhile, qualitative data from the interviews were analyzed using thematic analysis (Clarke & Braun, 2017). To support coding and theme management, the researcher used the Taguette software.

Two instruments were used in this study: a questionnaire and an interview guide. The questionnaire applied a 4-point Likert scale adapted from Croasmun and Ostrom (2011), ranging from "Very Often" (4) to "Very Rare" (1). It was designed in Bahasa to ensure participant comprehension and distributed via Google Forms. The questionnaire domains were derived from theories of TPACK and AI in education, and items were validated using Gregory's (2000) formula. Any item that reached a validity coefficient of 0.81 or higher was considered to have "very high" validity. The interview guide, meanwhile, was developed in two stages following Yaghmaie (2003): instrument development and expert judgment. After domains and items were constructed from the literature, the guide was reviewed by two experts in education. Validation again used Gregory's (2000) formula, with results showing that the instrument was appropriate for data collection.

Data collection was carried out in two phases. The first phase was a survey administered to 100 pre-service teachers of the English Study Program. The survey consisted of multiple-choice items and short-answer questions to gather data on participants' demographics, frequency and purposes of ChatGPT use, perceived benefits and challenges in TPACK development, and perceptions of academic integrity in relation to AI tools. The survey instrument was constructed based on a review of relevant literature and validated by two experts in educational research and instructional technology to ensure clarity and content validity. The survey results also served as a basis for selecting the 10 interview participants representing different levels of ChatGPT use.

The second phase of data collection employed semi-structured interviews to gather more detailed insights into pre-service teachers' experiences. The interviews were conducted via Zoom for convenience and to allow for a comfortable environment. Each session was audio-recorded with participants' consent, transcribed verbatim, and anonymized with codes (e.g., P1, P2, P3). The interviews explored how ChatGPT was integrated into teaching practice, its perceived influence on professional development, and the ethical considerations that arose in terms of academic integrity. The interview guide was designed following the five stages suggested by Kallio et al. (2016), beginning with identifying prerequisites, drawing on prior knowledge, formulating the initial guide, validating it with experts, and finalizing the instrument. Furthermore, the study applied methodological triangulation by Thurmond (2001) to ensure trustworthiness. Triangulating across methods not only enriched the findings but also enhanced credibility and reliability, since conclusions were supported by evidence from different types of data (Bekhet & Zauszniewski, 2012). For the ethical consideration, the pre-

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service teachers will be informed about the purpose of the study before participating in the interviews. All interview recordings and transcripts will be stored securely and used exclusively for academic research purposes, but the interviews will be recorded only with participants' permission. Thus, none of the participants' real names or identifying information will be included in transcripts or reports.

RESULTS AND DISCUSSION

Results

1. Quantitative Findings

This section presents the quantitative findings of the study, derived from the questionnaire responses of 100 EFL pre-service teachers at Universitas Pendidikan Ganesha. The descriptive statistical analysis focused on four domains of ChatGPT use: (1) technology and pedagogical skill development, (2) English language teaching, (3) English language competency development, and (4) ethics and attitude in using ChatGPT.

Table 1. Technology and Pedagogical Skill Development

Item	Mean	Median	Mode	Interpretation
I used ChatGPT to find out what digital tools are available to support teaching.	3.05	3	3	Often
I use ChatGPT to understand how to use technology tools in the classroom.	2.62	3	3	Often
I use ChatGPT to generate creative ideas for utilizing technology in the classroom.	2.97	3	3	Often
I use ChatGPT to design lesson plans.	2.96	3	3	Often
I use ChatGPT responsibly to generate learning plans and learning materials.	3.06	3	3	Often
Averages	2.93	3	3	Often

Table 1 presents the descriptive statistics related to the use of ChatGPT for developing pre-service teachers' technological and pedagogical skills. As shown in Table 1, the mean values ranged from 2.62 to 3.06, indicating that participants often used ChatGPT to support their technological and pedagogical practices. The item with the highest mean 3.06 was "I use ChatGPT responsibly to generate learning plans and materials". The lowest mean 2.62 appeared in "I use ChatGPT to understand how to use technology tools in the classroom". The consistent median and mode values of 3 reinforce the regularity of ChatGPT use within this domain

Table 2. English Language Teaching

Item	Mean	Median	Mode	Interpretation
I use ChatGPT to find tips or strategies for teaching English.	3.01	3	3	Often
I used ChatGPT to find ideas for group activities that would be interesting for students.	2.52	3	3	Often

I use ChatGPT to learn how to teach with a new technology-based approach.	2.79	3	3	Often
I use ChatGPT to find teaching techniques or strategies that can help students better understand English texts.	2.74	3	3	Often
I use ChatGPT to gain new approaches and strategies for teaching writing skills.	3.16	3	3	Often
Averages	2.84	3	3	Often

Table 2 shows the descriptive results for pre-service teachers' use of ChatGPT in English language teaching contexts. The data in Table 2 reveal that the mean scores ranging from 2.52 to 3.16, fall within the "often" category. The highest mean score 3.16 belonged to "I use ChatGPT to gain new approaches and strategies for teaching writing skills". Conversely, the lowest mean 2.52 for "I used ChatGPT to find ideas for group activities that would be interesting for students".

Table 3. English Language Competency Development

Item	Mean	Median	Mode	Interpretation
I use ChatGPT to understand difficult grammar concepts.	3.16	3	3	Often
I use ChatGPT to practice writing sentences or paragraphs in English.	2.73	3	3	Often
I use ChatGPT to improve my English vocabulary.	2.83	3	3	Often
I use ChatGPT to learn new English content or specific topics (e.g., idioms, phrases, expressions, etc.).	3.05	3	3	Often
I use ChatGPT to get ideas or inspiration for writing about specific topics in English.	2.98	3	3	Often
Averages	2.95	3	3	Often

Table 3 presents the descriptive results. As reflected in Table 3, the use of ChatGPT for improving English language proficiency is also frequent among participants, with all mean scores classified as "often." The highest mean value 3.16 was for the item on using ChatGPT to understand grammar, suggesting that the tool effectively supports linguistic comprehension. Meanwhile, the lowest mean 2.83 was for ChatGPT to improve English vocabulary. Overall, the consistent medians and modes (3) demonstrate that most respondents regularly employ ChatGPT for enhancing their English competence, aligning with the goal of improving language accuracy and creativity during practicum experiences.

Table 4. Ethics and Attitude in Using ChatGPT

Item	Mean	Median	Mode	Interpretation
I consider ChatGPT to be a tool, not a replacement for my critical thinking.	3.38	3	3	Often

I ensure that the material generated by ChatGPT is modified and adapted before using it in class.	3.40	4	4	Very Often
I believe that ChatGPT can improve learning outcomes if used ethically.	3.43	4	4	Very Often
I think ChatGPT encourages creativity rather than academic dishonesty.	2.95	3	3	Often
Averages	3.29	3.5	3.5	Very Often

Table 4 shows that pre-service teachers display a high level of ethical awareness when using ChatGPT. The mean scores range from 2.95 to 3.43, with an average of 3.29, indicating that most participants very often uphold academic integrity when using the tool. The items "I believe that ChatGPT can improve learning outcomes if used ethically", M = 3.43 had the highest mean scores. These results highlight that respondents are generally aware of the importance of ethical AI use and demonstrate responsibility in modifying AI-generated materials. The slightly lower mean 2.95 for "I think ChatGPT encourages creativity rather than academic dishonesty".

2. Qualitative Findings

The qualitative phase of this study provided deeper insights into how and why these practices occurred. Semi-structured interviews were conducted with 10 participants selected from the survey respondents to explore their experiences, perceptions, and ethical considerations when using ChatGPT for Technological Pedagogical Content Knowledge (TPACK) development. Thematic analysis of the interview data yielded 5 major themes.

Theme 1: ChatGPT as a Tool for Technological and Pedagogical Improvement

Pre-service teachers consistently described ChatGPT as a reliable aid in identifying and understanding technology applications relevant to teaching. Participants explained that the tool helped them discover and integrate suitable digital resources into their lessons. For instance, some respondents mentioned that ChatGPT guided them toward discovering various educational platforms such as Kahoot, Padlet, and Quizizz, which they later applied in their micro-teaching sessions to increase learner participation. Beyond technological discovery, participants emphasized how ChatGPT supported classroom operations and management. The tool provided them with creative solutions to manage diverse student behaviors and maintain order during class. For example, one participant described how ChatGPT suggested interactive games to maintain attention among students while still reinforcing learning objectives. Another participant noted that the application offered multiple classroom management alternatives, helping them organize activities effectively and sustain engagement. These responses indicate that ChatGPT acts as both a technological guide and a pedagogical assistant in lesson execution and planning.

Theme 2: Using ChatGPT for Teaching Material Development and Language Skill Improvement

Participants highlighted ChatGPT's usefulness in designing and enhancing learning materials. The tool was widely used to create dialogues, story-based content, and lesson outlines tailored to specific language topics. Several pre-service teachers reported that ChatGPT enabled them to produce more engaging instructional materials, such as digital storybooks, vocabulary games, or context-based reading exercises. Importantly, teachers often used the tool to refine their own ideas rather than generate content from scratch, which aligns with pedagogical autonomy.

In addition to aiding material creation, ChatGPT played a role in improving the teachers' own language proficiency. Many participants expressed that by interacting with ChatGPT, they could review grammar, check sentence structure, and learn alternative vocabulary expressions. Some used it to polish their academic writing and to practice speaking by requesting prompts, discussion topics, or role-play scenarios. This finding demonstrates that ChatGPT contributes not only to pedagogical preparation but also to the ongoing linguistic development of EFL pre-service teachers.

Theme 3: Using ChatGPT to Improve Student Engagement and Interactive Learning Experiences

A strong pattern that emerged from the data was that pre-service teachers viewed ChatGPT as a source of creative inspiration for designing active and student-centered learning. Participants explained that ChatGPT helped them develop interactive classroom tasks, such as discussions, group projects, and digital-based assignments. One participant described using ChatGPT-generated prompts during a micro-teaching session to encourage students to share daily routines via Padlet, resulting in increased interaction and enthusiasm. Furthermore, ChatGPT was considered instrumental in enhancing pedagogical strategies for student engagement. Several participants mentioned that the tool introduced them to innovative approaches, such as game-based learning and inclusive teaching for students with special needs. Through this process, pre-service teachers expanded their repertoire of teaching methods and became more reflective about adapting strategies to diverse learners. The integration of AI-assisted suggestions into classroom design encouraged both creativity and student motivation, reflecting the pedagogical dimension of TPACK.

Theme 4: Positive Perceptions and Ethical Justification for the Use of ChatGPT

Most participants demonstrated positive attitudes toward ChatGPT and recognized its value in promoting professional growth. They described the tool as a supportive and ethical partner in the teaching process when used appropriately. Teachers appreciated ChatGPT's capacity to provide updated strategies, clarify concepts, and introduce innovative educational technologies. Some participants particularly

valued how ChatGPT helped them become more responsible and self-directed in integrating technology, especially for those with limited digital experience.

Ethically, participants widely agreed that ChatGPT use remains acceptable when treated as a reference or idea generator rather than as a substitute for one's original work. They emphasized that using ChatGPT responsibly—by paraphrasing, verifying content accuracy, and maintaining ownership of instructional design—does not violate academic integrity. Several participants even noted that the use of ChatGPT can reinforce integrity by teaching educators to use AI outputs critically and reflectively. In this way, ChatGPT was perceived not merely as a technological innovation but as a medium for fostering ethical digital literacy.

Theme 5: Addressing Concerns, Risks, and Prevention Strategies Related to Academic Integrity

Although pre-service teachers generally acknowledged the benefits of ChatGPT, they also expressed clear awareness of its risks. The most frequently mentioned concern was the potential for over-reliance, which could lead to reduced creativity and critical thinking among students and teachers. Several participants observed that excessive dependence on ChatGPT might discourage learners from developing their analytical skills, especially if they rely entirely on AI-generated content. Participants also recognized specific threats to academic integrity, such as plagiarism or uncredited use of ChatGPT-produced work. Some admitted having observed peers copying AI-generated answers directly into assignments without modification. These instances were identified as clear violations of integrity. In response, participants proposed concrete prevention strategies. Many emphasized the importance of using ChatGPT only as a brainstorming or revision tool rather than as a content generator. Others highlighted the need for educational boundaries—teachers should guide students on ethical AI usage by modeling responsible practices themselves.

Moreover, participants suggested combining ChatGPT with human validation. They proposed that educators cross-check AI outputs with credible sources and use their professional judgment to determine accuracy. Some pre-service teachers also adopted self-imposed limitations, such as avoiding ChatGPT for presentation slides or final content, using it only for idea generation. This balanced approach reflects a growing awareness of digital ethics and a commitment to maintaining originality and intellectual responsibility in the age of generative AI.

Discussion

The findings of this study reveal that EFL pre-service teachers employ ChatGPT in various ways to enhance their TPACK, primarily by exploring digital applications, developing instructional materials, improving language proficiency, and increasing student engagement. This multidimensional use demonstrates that ChatGPT functions

as a bridge between technological awareness and pedagogical innovation, helping pre-service teachers integrate technology into teaching practice more effectively. These results align with the Intelligent-TPACK framework proposed by Celik (2023), which underscores the importance of AI-driven tools in developing teacher competency through technology integration. Similar to Alrishan (2023), who found that pre-service teachers use ChatGPT to explore professional teaching resources without substituting their own expertise, the current study confirms that ChatGPT serves as a reference and cognitive aid rather than a replacement for pedagogical reasoning. Such usage patterns may be linked to participants' limited teaching experience, prompting them to rely on ChatGPT as a rapid, reliable, and varied source of instructional ideas.

Moreover, the use of ChatGPT to develop lesson materials and language skills reinforces findings from Pesce and Blanco (2024), who demonstrated that generative AI tools can simultaneously enhance material design and linguistic competence. Participants frequently used ChatGPT to check grammar, refine vocabulary, and structure written texts, echoing Siminto et al. (2023), who argued that ChatGPT supports both personal learning growth and professional role development among pre-service teachers. In this sense, ChatGPT operates as a dual-purpose instrument—enhancing teachers' pedagogical output while improving their communicative competence. Another important dimension is the tool's contribution to student engagement. Participants described using ChatGPT to design interactive learning experiences, such as discussion questions, technology-based games, and collaborative activities. These findings extend Shah (2023) argument that ChatGPT should not be perceived as a pedagogical threat but as an agent of creativity and innovation. By facilitating game-based learning or interactive classroom tasks, ChatGPT encourages teachers to diversify their instructional strategies and focus more on student-centered pedagogy. As Kim et al. (2022) assert, AI can act as a cognitive collaborator that stimulates creativity and problem-solving in learning design. The present study therefore suggests that ChatGPT supports pre-service teachers not only in enhancing TPACK components but also in cultivating reflective, creative, and adaptable teaching behaviors.

The study also explored how EFL pre-service teachers perceive ChatGPT in relation to academic integrity. The findings indicate that most participants view ChatGPT as a supportive and ethical learning tool that enhances TPACK development without compromising integrity. This perception was reflected in the quantitative data, where the domain of ChatGPT use ethics achieved a "very often" average score, showing strong awareness of responsible use. Participants typically employed ChatGPT in the early stages of lesson planning or writing to generate ideas, frameworks, and examples, ensuring that final outputs were independently revised and verified. This finding diverges from the observations of Holland and Ciachir (2025), who reported that some students use ChatGPT unethically by submitting AI-generated work without paraphrasing. In contrast, the participants in this study demonstrated higher ethical consciousness through practices such as paraphrasing, modifying, and cross-checking

content. Their behavior supports Liang (2023) notion of human-AI balance, emphasizing that sustainable educational integrity requires critical evaluation of AI outputs rather than blind reliance. Furthermore, the results expand on Kush (2025), who discussed AI regulation and penalties, by presenting actual preventive strategies adopted by pre-service teachers—showing that awareness and habit formation can be more effective than punishment alone.

Despite these positive tendencies, participants expressed concerns about over-dependence on ChatGPT, fearing a decline in creativity and critical thinking. Such apprehensions are consistent with Bouzar et al. (2024), who found that over-reliance on AI reduces academic self-efficacy and independent reasoning. However, unlike prior studies that only highlighted risks, the present research contributes new insights by showing that pre-service teachers actively developed self-regulatory practices to manage those risks. Many participants consciously limited ChatGPT's use to idea generation or revision, maintaining human control over final decision-making. This aligns with Andewi et al. (2025) and Shah (2023), who emphasized that ChatGPT can serve as a creative partner if guided by ethical rules and reflective judgment. Hence, rather than viewing AI as a threat to academic integrity, the participants framed it as an opportunity to strengthen digital ethics and professional responsibility.

CONCLUSIONS

With the limitations of this study that mentioned the number of participants was relatively small, with only 10 EFL pre-service teachers involved. A larger sample size could have provided stronger and more generalizable results. The scope of this study was limited to pre-service EFL teachers at Ganesha University. Future researchers could develop this study by expanding the sample size and involving participants from various universities or diverse educational settings. This study concludes that ChatGPT plays a vital role in supporting pre-service EFL teachers in developing their Technological Pedagogical Content Knowledge (TPACK). The findings reveal that pre-service teachers use ChatGPT to explore digital tools, design lesson plans, and create interactive, technology-based learning activities. Through these practices, ChatGPT functions not only as a technological aid but also as a pedagogical partner that helps them integrate technology meaningfully into teaching preparation and instructional design. This demonstrates their growing ability to synthesize technological, pedagogical, and content knowledge in a cohesive and practical manner.

In relation to academic integrity, the study found that pre-service teachers exhibit a strong awareness of ethical principles in using AI tools. They employ ChatGPT responsibly, primarily as a reference and source of inspiration during the early stages of idea generation and material development, rather than as a provider of final products. Strategies such as paraphrasing, modifying, and verifying AI-

generated information are consistently applied to ensure originality and prevent plagiarism. These practices illustrate that pre-service teachers not only understand the potential risks of AI misuse but also actively adopt preventive measures to uphold academic honesty in their academic and professional work. Thus, this study proposes that teacher education programs should combine thorough training on the use of AI, notably ChatGPT, within the scope of TPACK skill development. Additionally, pre-service teachers are urged to fully utilize ChatGPT as a helpful tool to improve their TPACK abilities, especially when it comes to coming up with ideas, drafting instructional materials, producing engaging learning activities, and honing their language skills.

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