

Utilization of Generative AI Tools among Pre-service Science Teachers on their Practicum Performance

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Abstract

The emergence of generative artificial intelligence has marked a significant change in the landscape of educational technology and have shown importance in various tasks. Existing literatures widely explore the application of AI technologies in education however there is less attention given as to how pre-service science teachers utilize generative AI tools on their practicum teaching. Thus, there is a need to investigate the use of generative AI tools by pre-service science teachers on their practicum. An explanatory sequential design was used in this study wherein the quantitative data gathered from 87 respondents were analyzed using descriptive statistics (mean and standard deviation). Whereas, thematic analysis was used to analyze the qualitative data. The results revealed that *most of the pre-service science teachers used ChatGPT*, 84 (96.60%) out of 87 respondents. In addition, the pre-service science teachers 'agree' with the utilization of generative AI tools on practicum performance such as in lesson planning ($M = 4.04$, $SD = 1.05$), instructional skills ($M = 3.90$, $SD = 1.11$), classroom management ($M = 3.50$, $SD = 1.19$), and personal and social qualities ($M = 3.68$, $SD = 1.15$). Moreover, for the qualitative results specifically influences of generative AI tools and suggestions of pre-service science teachers, the following themes emerged: (1) *makes work easier and faster*, (2) *improves practicum performance*, and (3) *develops reflective teaching practices and (1) premium accounts for pre-service science teachers, (2) clear and specific prompts, (3) generative AI tools as supplementary aid, and (4) responsible and ethical use of AI tools*, respectively. These findings highlight the need to equip pre-service science teachers with the adequate knowledge and skills to utilize generative AI tools responsibly, ethically, and effectively on their practicum performance. This study recommends that concerned institutions should implement programs on how generative AI tools can be integrated effectively into practicum.

Keywords: Explanatory sequential design; generative AI tools; practicum performance; pre-service science teachers

1. Introduction

Artificial intelligence (AI) encompasses various technologies that have been developed in the past years up to the present. Some of these technologies include machines that need human intelligence in order to perform its job and generative artificial intelligence tools like ChatGPT, Khanmigo, Google Bard, and Microsoft Copilot that are more focused on creating new content (Dai, 2023). These developments led to several applications in different fields including healthcare and education. In educational field, AI tools have been used to enhance administrative and academic work as well as in making the teaching and learning process more interactive. Pre-service science teachers (PSTs) are using generative AI tools frequently to clarify some concepts, generate ideas and materials for lesson planning, access reading materials, understand content, as well as offer personalized learning support via real-time feedback and engagement (Nyaaba et al., 2024). In addition, case studies revealed that ChatGPT is used by pre-service teachers to prepare lessons, make assessments, or provide students feedback that is specific to them (Karatas & Yuce, 2024). Despite the several uses of generative AI tools, teachers are also mindful in using these tools and not to depend too much on AI (Kuzu, 2025). Teacher training programs focused on AI literacy and hands-on activities with generative AI tools may empower educators to guide students how to safely use and follow ethical procedures in using these technologies (Brandao et al., 2024). The use of generative AI tools by pre-service science teachers is crucial for teacher preparation programs to realize and ensure that PSTs are equipped with the skills necessary to utilize these tools effectively (Blonder et al., 2024).

The integration of generative AI tools in the field of education has been a significant interest, with its ability to transform teaching and learning practices. Some of these generative AI tools are ChatGPT, MidJourney, CodeX, DALL-E, GPT-4, and MusicLM, which also offers personalized learning experiences and promotes creativity. Based on the findings of Nyaaba et al. (2024), pre-service science teachers are familiar with generative AI tools such as ChatGPT and Google Bard which they have learned through personal searches, social media platforms, and recommendations from friends. Also, ChatGPT, MidJourney, and Google Gemini are just some of the generative AI tools that assist in lesson planning and help in content creation and enhancing the engagement of students. According to Blonder et al. (2024), the use of generative AI to design lessons and activities enable pre-service teachers to put their theoretical knowledge into practice. In addition, the study of Van den Berg and Du Plessis (2023), found out that ChatGPT generated lessons in specific subjects and levels through prompts to make objectives, steps, procedures, exercises, and worksheets. Aside from creation of lesson plan, generative AI tools also foster critical thinking, enhances teaching efficiency, promotes creativity, and provides a valuable resource for generation of instructional materials (Van Den Berg & du Plessis 2023; Yilmaz & Durmus, 2024).

Despite the advantages that generative artificial intelligence tools offer in the teaching and learning process, its integration in education has faced several challenges and ethical concerns. For instance, the originality and authenticity of the lesson plans and research outputs crafted by pre-service science teachers are found to be one of the major issues in using AI. Verma et al. (2023), emphasizes that those who provides science education should mainly focus on developing AI literacy to make sure that AI technologies can be utilized fairly and transformative. Previous studies only concentrated on the perception

of pre-service science teachers on using generative AI in science education (Ishmuradova et al., 2025). While other research studies mainly focused on pre-service language teachers not on the pre-service science teachers. In the local setting, no study has yet examined the use of generative AI tools among pre-service science teachers on their practicum.

This study is anchored on the following frameworks namely: Technology Acceptance Model (TAM) and Technological Pedagogical and Content Knowledge (TPACK). The Technology Acceptance Model (TAM) is a theory developed by Davis et al. (1989) based on the Theory of Reasoned Action that aims to predict and explain the intended behaviors of individuals in different contexts. Whereas, the Technological Pedagogical Content Knowledge (TPACK) framework is focused on how teachers integrate technology, pedagogy, and content knowledge in teaching and it also outlines the complex relationship between these three dimensions. In the educational research field, TPACK was introduced as a theoretical framework utilized to recognize the knowledge of teachers needed for the incorporation of technology effectively (Mishra & Koehler, 2006). In relation to the study, TAM provides a framework to explore how pre-service science teachers utilize generative AI tools on their practicum performance. Meanwhile, TPACK provides a theoretical lens which might help pre-service science teachers improve their practicum performance and may also enable them to develop appropriate instructional strategies for effective teaching.

Therefore, this study aimed to determine the utilization of generative AI tools among pre-service science teachers on their practicum performance. Specifically, this research seeks to address the following objectives: (1) to identify the generative AI tools used by pre-service science teachers on their practicum performance; (2) to investigate how do pre-service science teachers utilize generative AI tools on their practicum performance; (3) to determine how the use of generative AI tools influence practicum performance; and (4) to identify the suggestions of pre-service science teachers to improve their practicum performance using generative AI tools. The significance of this study lies in its focus on pre-service science teachers. The integration of generative AI tools in education is crucial in preparing future science educators to teach effectively and confidently, whether during their practicum teaching or beyond. The involvement of generative AI tools in this study can foster awareness among educators about how pre-service science teachers utilize generative AI tools and how it can enhance their practicum performance. In line with this, it will contribute to growing field of AI-integrated teacher education and its findings will also benefit the following: in-service science teachers, administrators of the school, higher education institution, and researchers.

2. Methodology

2.1. Research design

This study used a mixed-method research design particularly the design of the study is an explanatory sequential design. It is a sequential approach and is used when the researcher is concerned in getting first the quantitative results before collecting the qualitative data. According to Subedi (2016), the explanatory sequential design consists of gathering first the quantitative data, which is the first phase, and then the second phase is collecting the qualitative data to help explain on the quantitative results. In this study, the researcher conducted two phases, the first phase was focused on the quantitative data about the kinds of generative AI tools used and the utilization of generative AI tools on practicum performance. Whereas, the second phase was focused on the qualitative data about how the use of generative AI tools influence practicum and the suggestions of pre-service science teachers to improve practicum performance using generative AI tools.

2.2. Research locale

The study was conducted in the Philippines particularly in Eastern Visayas from one of the universities at Tacloban City, Leyte during the school year 2025-2026. The university is a non-profit public higher education institution. It offers programs and courses which lead to officially known higher education degrees such as bachelor's degrees, master's degrees, doctorate degrees in many areas of study. One of the programs that it offers is Bachelor of Secondary Education (BSEd) which has various specializations such as English, Filipino, Science, Mathematics, Social Studies, MAPEH, and Values. It was awarded Level IV Re-accreditation status in the BSED program major in English, Filipino, Mathematics, MAPEH, Biological Science, Physical Science, and Social Studies, and the Doctor of Arts in Language Teaching Program by Accrediting Agency of Chartered Colleges and Universities in the Philippines (AACCUP). The Commission on Higher Education (CHED) proclaimed the university as a center of excellence for Teacher Education in Region VIII from 1996 to 2001. Moreover, from the year 2008 to 2011 the university was awarded again as center of excellence for Teacher Education by CHED.

2.3. Research respondents

A total of 87 pre-service science teachers participated in the study. This pre-service science teachers are from one of the universities in Tacloban City taking up Bachelor of Secondary Education (BSEd) major in science enrolled in the school year 2025-2026. The inclusion criteria of the respondents involved their year level which is 4th year and have completed their practicum teaching which are appropriate in investigating how they utilized generative AI tools on their practicum performance. The age group of the respondents is between 21-25 and included both males and females. In the gathering of quantitative data, all 4th year pre-service science teachers responded to the survey questionnaire via google forms. Meanwhile, for the gathering of qualitative data, 10 pre-service science teachers were chosen to participate in the interview through google meet. The respondents for the interview were selected through purposive sampling, in which the considerations for the

selection are the respondents' answers to the survey questionnaire such as the type of generative AI tools they used and their overall mean in the utilization of generative AI tools on their practicum performance. Particularly, the respondents for the interview were composed of 2 respondents who have a mean of 4.625 (strongly agree, generative AI tools: ChatGPT, Google Bard, Microsoft Copilot, DALL-E, Google Gemini, and lesson planner ph) and 4.44 (strongly agree, generative AI tools: ChatGPT, Microsoft Copilot, and Google Gemini), 2 respondents who have a mean of 4.00 (agree, generative AI tools: ChatGPT) and 4.16 (agree, generative AI tools: ChatGPT and Google Gemini), 2 respondents who have a mean of 3.16 (neither agree nor disagree, generative AI tools: ChatGPT, Google Bard, Microsoft Copilot, and Google Gemini) and 3.19 (neither agree nor disagree, generative AI tools: ChatGPT and Google Gemini), 2 respondents who have a mean of 2.00 (disagree, generative AI tools: ChatGPT and Google Gemini) and 2.03 (disagree, generative AI tools: ChatGPT and Google Gemini), and 2 respondents who have a mean of 1.28 (strongly disagree, generative AI tools: ChatGPT, Microsoft Copilot, and Google Gemini) and 1.31 (strongly disagree, generative AI tools: ChatGPT).

2.4. Research instrument

An adapted survey questionnaire and a researcher-made checklist and questions for the interview were used in this study. The questionnaire used for the utilization of generative AI tools among pre-service science teachers on their practicum performance was comprised of adapted statements from the summative evaluation of teacher intern's performance of Leyte Normal University (Adapted from F-COE-Practicum Office-007 (09-02-19)). There were two parts of the survey questionnaire such as Part 1 that involves checklist for the kinds of generative AI tools and Part 2 consists of 32 statements for utilization of generative AI tools. Whereas, the interview was composed of 8 questions. The instrument was validated by three experts, in which the two are members of the teaching faculty of LNU, one is a professor, a coordinator of the Research and Innovation – Graduate school and a faculty of BSEd Science unit at LNU and the second expert is a Master of Arts in Education, a coordinator of Research and Innovation – College of Education, and a faculty of science unit at LNU. While, the other one is a Master Teacher 1, a coordinator of grade 10 department, and a faculty member of Alangalang National High School. The content validity rating scale adopted from Waltz and Bausell (1983) was used for content validation. In addition, for the reliability of the questionnaire, it was pilot tested among 40 pre-service science teachers from one of the universities in Tacloban City and the results of the pilot test was used to compute Cronbach's alpha coefficient. The reliability test revealed an overall Cronbach's alpha coefficient of 0.969, hence all of the items were included in the questionnaire.

2.5. Data gathering procedure

Prior to the collection of data, the researcher applied to the Research Ethics Committee of the university for approval and an ethical clearance and certificate was obtained after a successful review. Then, a letter seeking permission to conduct the research study was given to the University President. Upon, approval the respondents were contacted via messenger and with their confirmation to participate in the study, the objectives of the study were explained and informed consent forms were given to them on their preferred method. Next, the first phase of data gathering was done using survey questionnaire through google forms that took 5-10 minutes for seven days within one week. The results for the first phase were coded using Microsoft Excel and these results were used to select the respondents for the interview. After the conduct of first phase, the second phase of data gathering was conducted through an interview via google meet that lasted for 30-45 minutes for three days within one week. The responses from the interview were encoded in Microsoft Word and were transcribed.

2.6. Data analysis

Descriptive statistics and thematic analysis were used to analyze data. In the analysis of data, Microsoft Excel and Jamovi software were used. The kinds of generative AI tools were analyzed using frequency and percentage. Whereas, the utilization of generative AI tools on practicum performance were analyzed using mean and standard deviation. Specifically, the utilization of generative AI tools among pre-service science teachers were analyzed using the following mean ranges and verbal description [description adopted from (Vagias, 2006)]: strongly agree (4.21-5.00), agree (3.41-4.20), neither agree nor disagree (2.61-3.40), disagree (1.81-2.60), and strongly disagree (1.00-1.80). On the other hand, thematic analysis was used to analyze the effectiveness of use of generative AI tools on pre-service science teachers' practicum and the suggestions of pre-service science teachers to improve practicum performance using generative AI tools.

2.7. Ethical considerations

In the conduct of the study, the researcher followed the following ethical considerations to ensure the protection of the respondents and uphold integrity during the process: (1) informed consent forms were given to the respondents to ensure that they are informed about the purpose, procedures and protocol, duration, possible risks, benefits, confidentiality, and their rights as respondents; (2) the participation of the respondents is voluntary, they have the right to choose whether they will participate or not, and can still withdraw at any time with no explanation asked and no bearing consequence or penalty; (3) study procedures are well followed and with the approval of the respondents; (4) the duration of the survey took approximately 5-10 minutes to complete and the interview lasted for about 30-45 minutes; (5) there is minimal risk associated with the conduct of the research and might cause inconvenience to the respondents especially that it covered some of their time, involves risk similar to a person's everyday use of internet, and some of the respondents' information were collected; (6) for the benefits, the respondents were not given any allowance but tokens were given to them thru GCash as an appreciation of their time and effort exerted to participate in the study; (7) for the reimbursements, the respondents were not given any

incentives to take part in the study; (8) in research dissemination plan, the findings of the study will be presented through academic presentations and will be published in a peer-reviewed journal or institutional research repository in which the results will be stated honestly and accurately to contribute to the advancement of knowledge in science education; (9) the respondents have the right to refuse or withdraw their participation in this research without any explanations and no consequences or no penalty will be given; (10) if the respondents have any questions or concerns about the study they may contact the researcher via email at 1905312@lnu.edu.ph or thru this number 09672465764 and if they have questions about their rights as respondents they may contact the LNU-REC office through this email address – ethics@lnu.edu.ph; (11) if in case a respondent needs additional support, assistance, or service that the researcher cannot provide, the researcher will refer the respondent to the appropriate professionals or organizations who can help; (12) there is no conflict of interest, be it financial, professional, or personal, that might have an impact on the study of its results; and (13) in accordance with the provisions of the Data Privacy Act of 2012, the researcher ensured that all of the information given by the respondents were treated with utmost confidentiality and were used solely for the academic and research-related purposes.

3. Results and Discussion

The results of the study both in the first phase and second phase of data gathering as well as the themes that emerged from the responses of the pre-service science teachers during the interview are presented in this section. Also, the results were discussed further and compared with the findings of other studies related to this research study.

3.1. Kinds of generative AI tools

The generative AI tools used by pre-service science teachers include ChatGPT, Google Bard, Microsoft Copilot, MidJourney, DALL-E, Google Gemini, and others.

Table 1. Frequency and percentage for kinds of generative AI tools

Generative AI Tools	<i>f</i>	%
ChatGPT	84	96.60
Khanmigo	0	0.00
Google Bard	5	5.70
Microsoft Copilot	27	31.00
Midjourney	1	1.10
DALL-E	3	3.40
Others*	2	2.20

*Lesson planner ph and AI features in Canva

Note: Total participants = 87

Table 1 shows the frequency and percentage of the kinds of generative AI tools used by pre-service science teachers on their practicum performance. The table reveals that most of the respondents used ChatGPT, 84 (96.6%). Meanwhile, there are 57 pre-service science teachers who used Google Gemini with a percentage of 65.5%. Whereas, for Microsoft Copilot there are 27 (31%) pre-service science teachers, followed by Google Bard, 5 (5.7%) users, next by DALL-E, 3 (3.4%) users, for others such as lesson planner ph and AI features in Canva there are 2 (2.2%) users, then Midjourney only 1 (1.1%) while 0 (0%) for Khanmigo. With the current literature search about this study, the researcher did not find a similar result that reveals similar percentage use of generative AI tools. However, Crompton and Burke (2023) stated that there was a rapid increase in the use of AI in education, particularly in years 2021 and 2022 based on their study of AI applications in higher education from 2016 to 2022. Some of these generative AI tools are ChatGPT, Midjourney, CodeX, DALL-E 3, GPT-4, and MusicLM. Based on the study of Mollman (2022), within a week of ChatGPT's debut there were more than one million unique users. In addition, ChatGPT, Midjourney, and Google Gemini are just some of the generative AI tools that assist in lesson planning, content creation, and enhancing engagement of students. From the interview conducted, most of the respondents stated that they have used ChatGPT in creating lesson plan, asking suggestions or ideas how to structure the flow of the lesson, asking activities that would fit for the lesson, creating instructional materials, and drafting assessment tools. However, some of the respondents stated that they both used ChatGPT and Google Gemini for suggestions of activities and ideas to structure the lesson's flow and generate some pictures as well as other kinds of generative AI tools such as lesson planner ph, Microsoft Copilot, Google Bard, and DALL-E.

3.2. Utilization of generative AI tools on practicum performance

Table 2. Utilization of Generative AI Tools in Lesson Planning

A. Lesson Planning	<i>M</i>	<i>SD</i>	Description
1. The use of generative AI tools enables me to submit lesson plan promptly.	3.98	1.09	Agree
2. Generative AI tools help me to create clear and attainable objectives.	3.94	1.06	Agree
3. Generative AI tools assist me in developing learning materials for students with different learning needs.	4.09	1.02	Agree
4. I use generative AI tools such as ChatGPT to prepare relevant and appropriate learning tasks and activities.	4.06	1.05	Agree
5. I use generative AI tools to check the alignment and congruency between the activities and the objectives in the lesson plan.	4.13	1.04	Agree
6. I use generative AI tools to choose appropriate instructional materials for the activity with media/technology-sourced teaching aids.	4.07	1.07	Agree
OVERALL	4.04	1.05	Agree

Note: Mean ranges and verbal description [adopted from (Vagias, 2006)]: Strongly agree (4.21-5.00), agree (3.41-4.20), neither agree nor disagree (2.61-3.40), disagree (1.81-2.60), and strongly disagree (1.00-1.80)

Table 2 presents data on the utilization of generative AI tools among pre-service science teachers on their practicum performance specifically in lesson planning. The table reveals that the pre-service science teachers ‘agree’ ($M = 4.04$, $SD = 1.05$) with the use of generative AI tools in terms of lesson planning based on the mean ranges and verbal description adopted from Vagias (2006). In an ongoing literature search regarding this study, the researcher did not find a similar result that reveals similar interpretations and verbal descriptions. From the study of Nyaaba et al. (2024), it revealed that pre-service teachers use GenAI as an assistant in teaching for finding teaching resources, developing lesson objectives, and with lesson planning. The findings of the study of Kilickaya and Kic-Drgas (2025), showed that the use of generative AI tools were useful especially for creating activities and lesson plans on topics that are not found on coursebooks.

Most of the respondents answered ‘agree’ with the utilization of generative AI tools in lesson planning. Specifically, the statement number 5, ‘I use generative AI tools to check the alignment and congruency between the activities and the objectives in the lesson plan’ has the highest mean while statement number 2, ‘Generative AI tools help me to create clear and attainable objectives’ has the lowest mean. Based on the interview, generative AI tools are a big help to pre-service science teachers during their internship journey. With the limited time they have and a lot of tasks to do, generative AI tools make their work easier and faster. For instance, one of the respondents stated that “Yes, I consider those generative AI because it makes my work easier and lesser time is consumed.” Along with the other respondents, they expressed that generative AI tools are very much helpful in making lesson plans and creating instructional materials especially that time is very limited. But despite generative AI tools being helpful in lesson planning and creating instructional materials, pre-service science teachers have stated that they still make some modifications and they also double or triple check the output given by generative AI tools because there are instances that there are errors or the activities do not align with the objectives.

Table 3. Utilization of Generative AI Tools in Instructional Skills

B. Instructional Skills			
Mastery of Content Knowledge	<i>M</i>	<i>SD</i>	Description
1. Generative AI tools enable me to demonstrate mastery of content within and / or across curriculum teaching area.	3.93	1.09	Agree
2. I utilize generative AI tools to relate lessons to real-life situations.	3.90	1.05	Agree
3. I use generative AI tools to search for sufficient and concrete examples to create meaningful experiences.	4.01	1.12	Agree
OVERALL	3.95	1.08	Agree
Pedagogical and Communication Skills	<i>M</i>	<i>SD</i>	Description
1. With the use of generative AI tools, I am able to give clear directions and explanations to my students.	3.85	1.23	Agree
2. With the help of generative AI tools, I am able to use contextualization and/or differentiated activities appropriate to learner’s need.	3.92	1.14	Agree

3. Generative AI tools assist me in creating appropriate and varied types of questions to develop critical and creative thinking skills.	3.94	1.12	Agree
4. With the use of generative AI tools, I am able to see verbal and non-verbal classroom communication strategies.	3.86	1.16	Agree
5. I use generative AI tools to clarify misconceptions immediately.	3.82	1.19	Agree
6. With the use of generative AI tools for translation, I am able to display proficient use of Mother Tongue, Filipino or English to facilitate teaching and learning.	3.89	1.13	Agree
7. I use generative AI tools to generate feedback to improve student learning.	3.75	1.20	Agree
OVERALL	3.86	1.16	Agree
Assessment of Learning	M	SD	Description
1. Generative AI tools enable me to construct appropriate assessment tools and uses varied testing techniques	3.86	1.06	Agree
2. Generative AI tools enable me to record and interpret test results properly for remediations, reinforcement, and enrichment.	3.64	1.16	Agree
3. Generative AI tools assist me in designing formative and summative assessments.	3.93	0.99	Agree
OVERALL	3.81	1.07	Agree
Utilization of Instructional Materials	M	SD	Description
1. Generative AI tools provide me with instructional materials appropriate for the activity given and / or ICT.	3.94	1.08	Agree
2. Generative AI tools help me to be more creative and resourceful.	3.97	1.07	Agree
3. Generative AI tools help me save time in preparing science instructional materials.	4.11	1.05	Agree
OVERALL	4.01	1.06	Agree
GENERAL	3.90	1.11	Agree

Note: Mean ranges and verbal description [adopted from (Vagias, 2006)]: Strongly agree (4.21-5.00), agree (3.41-4.20), neither agree nor disagree (2.61-3.40), disagree (1.81-2.60), and strongly disagree (1.00-1.80)

Table 3 reveals data on the utilization of generative AI tools by pre-service science teachers in terms of instructional skills such as mastery of content knowledge ($M = 3.95$, $SD = 1.08$), pedagogical and communication skills ($M = 3.86$, $SD = 1.16$), assessment of learning ($M = 3.81$, $SD = 1.07$), and utilization of instructional materials ($M = 4.01$, $SD = 1.06$). As shown in the table, the respondents 'agree' ($M = 3.90$, $SD = 1.11$) with the use of generative AI tools for instructional skills based on the mean ranges and verbal description adopted from Vagias (2006). Currently, there is no prior study similar to the interpretation of the findings. A related finding by Nyaaba et al. (2024) showed that pre-service teachers use GenAI as a learning guide which assists them in academic tasks, such as looking for reading materials, finding for content explanations, assessment strategies, and seeking practical examples.

In the mastery of content knowledge, statement number 3, 'I use generative AI tools to search for sufficient and concrete examples to create meaningful experiences' has the highest mean while statement number 2 'I utilize generative AI tools to relate lessons to real-life situations' has the lowest mean. Meanwhile, in the pedagogical and communication skills, the statement, 'generative AI tools assist me in creating appropriate and varied types of questions to develop critical and creative thinking skills' has the highest mean while statement number 7, 'I use generative AI tools to generate feedback to improve student learning' has the lowest mean. In terms of assessment of learning the statement, 'Generative AI tools assist me in designing formative and summative assessments' has the highest mean while statement number 2 'Generative AI tools enable me to record and interpret test results properly for remediations, reinforcement, and enrichment' has the lowest mean. Whereas, in the utilization of instructional materials, statement number 3 'Generative AI tools help me save time in preparing science instructional materials' has the highest mean while statement number 1 'Generative AI tools provide me with instructional materials appropriate for the activity given and / or ICT' has the lowest mean.

This shows that pre-service science teachers utilize generative AI tools in terms of instructional skills specifically for mastery of content knowledge, pedagogical and communication skills, assessment of learning, and utilization of instructional materials. In the interview, respondents stated that they asked generative AI tools for help in simplifying complex concepts in order for them to understand and be able to explain these concepts in a simple manner to the students. In terms of communication skills, they use AI tools for reconstruction of their English in making lesson plans, paraphrase instructions, and explanations more clearly, and improving the clarity and correctness of their teaching scripts. Some of the respondents said that they also use these tools in making assessment tools but still they ensure to double check the generated assessments whether it is aligned with the objectives or not and make some modifications on the choices given as there are patterns with the choices.

Table 4. Utilization of Generative AI Tools in Classroom Management

C. Classroom Management	M	SD	Description
1. Checks the learner's attendance systematically using generative AI tools.	3.14	1.30	Neither Agree nor Disagree
2. Maximizes utilization of instructional time with the help of generative AI tools.	3.70	1.09	Agree
3. With the help of generative AI tools, I am able to exhibit sensitivity to learner's personal, cultural, gender differences and disabilities.	3.60	1.18	Agree
4. By using generative AI tools, I am able to address learner's weaknesses.	3.45	1.19	Agree
5. By using generative AI tools, I am able to maintain appropriate demeanor despite unexpected problems that arise during conduct of classes.	3.59	1.15	Agree
6. Generative AI tools increase my confidence in managing classroom tasks.	3.55	1.19	Agree
OVERALL	3.50	1.19	Agree

Note: Mean ranges and verbal description [adopted from (Vagias, 2006)]: Strongly agree (4.21-5.00), agree (3.41-4.20), neither agree nor disagree (2.61-3.40), disagree (1.81-2.60), and strongly disagree (1.00-1.80)

Table 4 above shows data on the utilization of generative AI tools among pre-service science teachers in classroom management. The table reveals that the pre-service science teachers 'agree' ($M = 3.50$, $SD = 1.19$) with the utilization of generative AI tools in terms of classroom management based on the mean ranges and verbal description adopted from Vagias (2006). There are no findings found by the researcher with similar results obtained in this study. But, Zhang and Zhang (2024) indicated that teacher education programs recognized the capability of generative AI tools to enhance classroom management and inclusive learning through personalized instruction.

In classroom management, the statement number 2 'Maximizes utilization of instructional time with the help of generative AI tools' has the highest mean while statement number 1 'Checks the learner's attendance systematically using generative AI tools' has the lowest mean. This only shows that generative AI tools help pre-service science teachers manage or handle their class despite the students' differences. Also, it enables pre-service science teachers to look for ways on how they will manage their students effectively. Based on the interview conducted, some of the respondents said that GenAI tools are somewhat helpful in terms of classroom management wherein they ask for ways on how students will listen to them without shifting their attention to other things and to make their topic interactive and motivating to the students. Also, it suggested effective ways to maintain discipline, engage students and manage time better which made their classes more organized and productive. However, from the interview conducted, some of the respondents stated that classroom management is already on the control of the teachers and on how they will handle the classroom. They have their own style in managing their students inside the classroom.

Table 5. Utilization of Generative AI Tools in Personal and Social Qualities

D. Personal and Social Qualities	M	SD	Description
1. By using generative AI tools, I am free from bad speech and mannerisms.	3.55	1.19	Agree
2. Using generative AI tools, I am able to exude self-confidence and commands learners' respect and attention.	3.59	1.17	Agree
3. By using generative AI tools, I am able to show initiative and resourcefulness in teaching.	3.80	1.12	Agree
4. With the help of generative AI tools, I am able to display pleasant and logical dispositions even when confronted with difficult and challenging circumstances.	3.78	1.15	Agree
OVERALL	3.68	1.15	Agree

Note: Mean ranges and verbal description [adopted from (Vagias, 2006)]: Strongly agree (4.21-5.00), agree (3.41-4.20), neither agree nor disagree (2.61-3.40), disagree (1.81-2.60), and strongly disagree (1.00-1.80)

Table 5 presents data on the use of generative AI tools by pre-service science teachers in personal and social qualities. The table reveals that the pre-service science teachers 'agree' ($M = 3.68$, $SD = 1.15$) with the utilization of generative AI tools in terms of personal and social qualities based on the mean ranges and verbal description adopted from Vagias (2006). Currently, there is no prior study similar to the interpretation of the findings. However, Nyaaba et al. (2024), conceptualized that the use of generative AI in academic learning functions as a learning buddy that supports tasks such as explaining concepts, accessing personalized content, and completing coursework. In addition, the actual engagement of pre-service teachers with AI and their competence in AI-supported pedagogy predict their confidence and intention to integrate AI in the classroom setting (Harakchiyska, 2025; Liu et al., 2025).

In personal and social qualities, statement number 3 'By using generative AI tools, I am able to show initiative and resourcefulness in teaching' has the highest mean while the statement number 1 'By using generative AI tools, I am free from bad speech and mannerisms' has the lowest mean. This only means that the use of generative AI tools enables the respondents

to show proper and pleasant dispositions when interacting with the students and when facing with unexpected challenges. It also helps them improve their self-confidence and be consciously aware of their behavior. However, from the interview conducted the respondents have stated that the practicum performance in terms of personal and social qualities is about the teacher already, generative AI tools does not directly help in this aspect since it requires direct interaction, observation, and personal strategies.

3.3. Influences of generative AI tools on pre-service science teachers' practicum performance

Theme 1: Makes work easier and faster

Generative AI tools make the work of pre-service science teachers easier and faster. With the limited time they have and a lot of tasks to do, generative AI tools assisted pre-service science teachers to make lesson plans, instructional materials, and quizzes faster. Along with the other respondents, they have expressed that they have saved time in creating these materials. According to Walker (2023), several studies stated that teachers spend a lot of time in planning and preparing educational tools. Hence, it is essential to look into some methods that makes this task more efficient and still of good quality. Here are some of the respondents' responses:

Significant response 1: "Yes, I consider those generative AI as helpful because it makes my work easier and lesser time is consumed." (P₃, L₂₂₆₋₂₂₇)

Significant response 2: "It saved time in lesson planning, provided creative ways to present topics and assisted in designing quizzes and worksheets aligned with learning objectives." (P₇, L₆₆₉₋₆₇₁)

Significant response 3: "First for lesson planning, of course generative AI helped me a lot because of course it helped me make activities easier because every day I need to make lesson plan so it will really take time. So, through the use of AI, I can make my lesson plan quickly and creatively." (P₂, L₁₁₁₋₁₁₄)

Theme 2: Improves practicum performance

Most of the respondents stated that the use of generative AI tools helps in improving practicum performance. They expressed that the utilization of generative AI tools can effectively support practicum performance. Also, it helped them to become prepared, focus more on delivery and student engagement, and survive their internship. Based on the study of Kilickaya and Kic-Drgas (2025), it was revealed that respondents highly valued GenAI tools since it helped them in making efficient lesson plans and exercises, especially when there were topics that are not found in the coursebooks. Below are some of the responses of the respondents:

Significant response 1: "Yes, we cannot deny that using AI really helps and improves the performance of a pre-service teacher." (P₉, L₈₅₀₋₈₅₁)

Significant response 2: "I am not that creative in terms of making activities so through the use of AI, I made a well-crafted activity, good activities that my students needed." (P₂, L₁₅₆₋₁₅₈)

Significant response 3: "The use of ChatGPT improved my practicum performance to a significant extent. It enhanced my preparation, reduced stress, and allowed me to focus on actual teaching and interaction with my students." (P₇, L₆₈₅₋₆₈₇)

Significant response 4: "Yes, I believe AI tools can effectively support practicum performance, particularly in the preparation phase." (P₄, L₃₅₇₋₃₅₈)

Theme 3: Develops reflective teaching practices

The use of generative AI tools by pre-service science teachers on their practicum performance requires a lot of considerations and big responsibility. Pre-service science teachers were able to reflect from their teaching practices whether they are going to use directly the generated outputs on their practicum performance or verify it first to ensure alignment and appropriateness of the materials or activities for the lesson. Some of the respondents have expressed not to fully rely on what generative AI tools give but also ensure that you have contribution and cross-checking is done with the information given by these tools. Kilickaya and Kdraga (2025) concluded that generative AI tools can be effective to enhance lesson plans and activities provided that there is an appropriate training in a collaborative environment and ethical use are followed such as checking the output and evaluating it. Here are some of the respondents' responses:

Significant response 1: "Although, I use AI in creating my lesson plan and crafting instructional materials and other activities, at the end of the day it is still my decision that will be followed" (P₁, L₅₈₋₆₀)

Significant response 2: "I think it is okay to use AI tools, but you must always check the work to make sure it matches your topic correctly." (P₁₀, L₉₂₁₋₉₂₂)

Significant response 3: "As a developing educator, I view the integration of generative AI tools as a beneficial addition to teaching practice. However, I recognize the importance of critically evaluating and refining AI-generated outputs to ensure they are accurate, relevant, and appropriate for the intended learning objectives." (P₄, L₃₆₃₋₃₆₆)

Significant response 4: "We do not input it directly into our lesson plan. We also read it whether it is aligned with what is given by ChatGPT for our lesson plan." (P₅, L₄₁₄₋₄₁₆)

3.4. Suggestions of pre-service science teachers to improve practicum performance using generative AI tools

Theme 1: Premium accounts for pre-service teachers

Generative AI tools have free access while others do not have. However, despite of being free there are limitations as to how many prompts you can only make every time you access these tools. With the limitations of generative AI tools, pre-service science teachers are hindered to create lesson plans and instructional materials creatively. The limited access to these tools is one of the major challenges of pre-service science teachers. From the study of Khajavi and Ezhdehakosh (2025), pre-service teachers reported that they encounter technical difficulties such as low internet connections and access restrictions. These issues do not only hinder the effective use of AI tools but also highlight the digital divide which can worsen inequities in educational access and quality. Below are some of the responses of the respondents:

Significant response 1: "I could suggest that for example the school can give premium accounts to the practice teachers because of the limitations of AI" (P₂, L₁₇₂₋₁₇₃)

Significant response 2: "My account is not premium so I only have limited access to AI. Sometimes, I lose hope especially when the discussion is already good and suddenly it will be cut off because of not having a premium account." (P₆, L₆₃₂₋₆₃₇)

Significant response 3: "Sometimes there are limits on how much I can use it, which is difficult when I have not finished my lesson plan and need to wait until the next day to continue." (P₁₀, L₉₂₉₋₉₃₁)

Significant response 4: "If your account is not premium, you only have limited access so, it would be better if we have premium accounts." (P₁, L₈₃₋₈₄)

Theme 2: Clear and specific prompts

Some of the respondents stated that prompts should be clear and specific in order to obtain better response and not compromise the remaining chances for prompts. According to Perna et al. (2024) pre-service teachers must learn how generative AI tools work, how to craft effective prompts, how to evaluate AI-generated information critically, and how to address ethical considerations. In addition, Kilickaya and Kic-Drgas (2025) mentioned that teachers must be careful about privacy and issues on security in which they must ensure to protect their privacy as well as the learner's privacy when interacting with those tools. Below are some of the suggestions of the respondents:

Significant response 1: "You should make sure your prompts are clear and detailed so you get better results" (P₁₀, L₉₂₅₋₉₂₆)

Significant response 2: "It is important to provide clear, specific, and well-structured prompts. This allows the AI to generate more accurate and relevant outputs." (P₄, L₃₆₉₋₃₇₁)

Significant response 3: "It is also important to learn how to write clear and specific prompts so that we can get more accurate and useful outputs." (P₉, L₈₆₅₋₈₆₆)

Theme 3: Generative AI tools as supplementary aid

Generative AI tools should be used as supplementary tools to enhance teaching performance and creativity not as a replacement to teachers' ability and capability to decide on their own. In the study of Meegan and Young (2025), it was mentioned that while generative AI tools can support learning and support reflection, there is a risk that pre-service teachers might rely on AI-generated answers which will diminish their capability to think critically and solve problems. In addition, there should be a focus on the training programs that emphasize AI as a supportive aid instead of an absolute answer. Also, generative AI tools can be used as a very significant supplement for the short and limited time that is spent with the learners in order to have more time for interaction, discussion, and sharing in and outside the classroom (Gazaille et al, 2023; Yee et al., 2023). Some of the respondents have also the same sentiments and below are their responses:

Significant response 1: "I suggest that we use generative AI tools as a supplementary aid rather than a replacement." (P₉, L₈₆₃₋₈₆₄)

Significant response 2: "Although, we are using AI we need to remember that AI cannot replace humans so we should not fully rely 100% in AI." (P₁, L₇₃₋₇₄)

Significant response 3: "Maybe use it wisely because there are others who really rely on AI, there is no own input anymore." (P₃, L₂₉₃₋₂₉₄)

Theme 4: Responsible and ethical use of generative AI tools

Generative AI tools must be used responsibly and wisely. Over-reliance to these tools is not good and will not result to a productive performance. The respondents have shared that those who uses these tools should be responsible enough because not all information given are reliable. Kilickaya and Kdraga (2025) mentioned that GenAI outputs should be evaluated

and edited carefully by teachers themselves using reliable and credible sources. Also, teachers must ensure that they are well-aware about the AI policies in their institutions before using generative AI tools. In addition, Brandao et al. (2024) stated that teacher training programs that focuses on AI literacy and hands-on activities with generative AI tools may empower educators to assist students in ethical and safe use of these tools. Here are some of the respondents' suggestions on how generative AI tools can be used effectively to improve practicum performance:

Significant response 1: "I could suggest that those people who uses these tools should be responsible by their actions because not all AI gives us a 100% reliable and credible information." (P₆, L₆₀₇₋₆₀₈)

Significant response 2: "Train teachers on responsible and ethical use of AI." (P₇, L₆₉₆)

Significant response 3: "We should verify the information it provides and customize it to fit our own teaching style." (P₉, L₈₆₄₋₈₆₅)

Significant response 4: "For me, in terms of practicum performance we can use AI but with limitations." (P₅, L₄₈₆₋₄₈₇)

Conclusion

The study aimed to determine the utilization of generative AI tools among pre-service science teachers on their practicum performance. The findings revealed that most of the pre-service science teachers used ChatGPT, 84 (96.60%) on their practicum performance and found to agree with the utilization of generative AI tools on practicum performance such as lesson planning ($M = 4.04$, $SD = 1.05$), instructional skills ($M = 3.90$, $SD = 1.11$), classroom management ($M = 3.50$, $SD = 1.19$), and personal and social qualities ($M = 3.68$, $SD = 1.15$). With regards to the influences of generative AI tools on pre-service science teachers' practicum performance, the following themes emerged in the study: *makes work easier and faster, improves practicum performance, and develops reflective teaching practices*. It assisted them to make lesson plans, generate instructional materials, helped in preparation phase, focus more on delivery, student engagement, and enable them to survive their internship. The influences of generative AI tools during practicum highlights the need to ensure that pre-service science teachers are using generative AI tools effectively and look into how they utilize these tools in creating educational tools. Moreover, pre-service science teachers have expressed the following suggestions to improve their practicum performance using generative AI tools: *premium accounts for pre-service teachers, clear and specific prompts, generative AI tools as supplementary aid, and responsible and ethical use of generative AI tools*. These suggestions of the respondents were based on the experiences they had during practicum. These results are anchored with the theoretical frameworks such as Technology Acceptance Model (TAM) and Technological Pedagogical and Content Knowledge (TPACK) since both of these frameworks provide a theoretical lens to explore how generative AI tools are utilized and how it helps in improving practicum performance.

Despite generative AI tools being effective in improving practicum performance, pre-service science teachers mentioned that they still double check the generated outputs by AI and make some modifications since there are instances that the activities do not align with the lesson objectives. They have also raised concerns about the information or resources given by generative AI tools as not reliable that is why prompts should be made clearly and specific. Also, respondents have stated that users of generative AI tools must not fully rely on these tools and not make it as a replacement of their own judgment. Several benefits can be gained from the integration of generative AI tools in science education but it is important to look into the suggestions of pre-service science teachers to ensure better access to these tools, to obtain reliable and credible information, to maintain professionalism and foster critical thinking, and to instil responsibility and ethical use of generative AI tools.

Recommendations

In view of the findings of the study, the researcher recommends the following: (1) Teachers should be responsible, wise, and must not solely rely on the generated outputs given by generative AI tools. They should use these tools as supplementary tools not as replacement of their ability to make own judgment. (2) Administrators of the school should design for alternative strategies that will help pre-service science teachers improve their practicum performance using generative AI tools. (3) Higher education institutions must design programs or trainings on how generative AI tools can be integrated effectively into practicum and identify the risks of AI in teacher development. (4) Future researchers could conduct a similar study in other universities for a larger number of participants to ensure the generalizability of the results and to determine if the results obtained have similarities or differences.

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