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Analyzing the effect of ChatGPT on lesson plan development: An experimental approach

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ABSTRACT

This study aimed to analyze the effect of ChatGPT on the lesson plan development of pre-service teachers taking up bachelor of secondary education major in Filipino. Employing an experimental design, the study involved two groups: one used ChatGPT in drafting their lesson plans, while the other did not. Both outputs were evaluated using a rubric that assessed organization, depth of content, creativity, and curriculum alignment. Results revealed that the group using ChatGPT scored higher in terms of organization and content coverage, while the non-artificial intelligence (AI) group showed higher marks in creativity. The findings highlight the value of AI as a support tool, not a replacement, for pedagogical innovation and contextualized teaching.

Keywords: ChatGPT, lesson planning, artificial intelligence in education, pre-service teachers, experimental design

INTRODUCTION

The integration of artificial intelligence (AI) into education has transformed traditional teaching and learning paradigms by introducing tools that automate tasks, support creativity, and personalize content delivery. One such tool is ChatGPT, developed by OpenAI (2023), which has attracted significant interest due to its capacity to generate coherent, context-sensitive, and human-like text. In educational settings, ChatGPT is increasingly used for generating sample activities, writing assessment tasks, and assisting in lesson planning. While this capability presents exciting opportunities for reducing teacher workload and enhancing instructional design efficiency, it also introduces critical concerns. These include the risk of overreliance on machine-generated content, potential loss of teacher agency, superficial treatment of culturally contextualized topics, and the questionable alignment of AI outputs with sound pedagogical frameworks (Holmes et al., 2019; Williamson & Eynon, 2020; Zawacki-Richter et al., 2019).

In teacher education, lesson planning is not merely a procedural task but a reflective and intellectual activity that demands deep understanding of learners' needs, curriculum standards, and appropriate methodologies. It is through lesson planning that pre-service teachers demonstrate their pedagogical reasoning, content knowledge (CK), and classroom decision-making skills (McLeod, 2025). As such, the use of AI in this context prompts a deeper inquiry: Does reliance on AI enhance the pedagogical quality of lesson plans, or does it undermine the development of critical thinking and instructional creativity among future educators?

This study aims to investigate how the integration of ChatGPT affects the quality and depth of lesson plans crafted by pre-service teachers. Through an experimental design, it compares two groups–one that used ChatGPT as a planning aid and another that relied solely on their training and personal insight. The study seeks to determine the extent to which AI-assisted planning supports or hinders the development of essential teaching competencies, particularly in terms of contextual relevance, instructional clarity, learner-centeredness, and originality. The findings of this research are expected to offer valuable implications for teacher education programs, especially in an era where digital literacy and ethical AI use are becoming indispensable components of professional practice.

THEORETICAL AND CONCEPTUAL FRAMEWORK

This study is anchored in Bruner's constructivist learning theory, which underscores the importance of active cognitive engagement in the learning process. According to Bruner, learners construct knowledge through interaction, exploration, and reflection, rather than passively receiving

information. In the context of lesson planning, this theory implies that the process should not be mechanical or merely procedural, but rather a meaning-making task that reflects the teacher's cognitive involvement and pedagogical intent. The ability to design coherent, relevant, and student-centered lessons is indicative of a teacher's capacity to organize knowledge, connect concepts, and adapt content meaningfully to meet learners' needs and contexts.

In addition, the study is grounded in the technological pedagogical content knowledge (TPACK) framework developed by Mishra and Koehler (2006), which provides a comprehensive lens for understanding effective technology integration in education. TPACK emphasizes that meaningful instructional design arises from the dynamic interaction among three core domains: CK, pedagogical knowledge, and technological knowledge. The framework posits that educators must possess not only expertise in subject matter and pedagogy but also the capacity to thoughtfully integrate digital tools in ways that enhance learning. In this study, the use of ChatGPT is examined through this lens–as a technological tool whose educational value depends on the teacher's ability to harmonize it with sound pedagogy and relevant content.

Together, Bruner's constructivism and the TPACK framework provide a dual foundation for analyzing how pre-service teachers engage in lesson planning with or without AI support. While Bruner's theory highlights the importance of teacher agency and creativity, TPACK emphasizes the strategic alignment of technology with pedagogy and content. The interplay of these perspectives offers a deeper understanding of how AI tools like ChatGPT can influence not just the outcomes of lesson planning, but also the processes of professional thinking and instructional decision-making.

REVIEW OF RELATED LITERATURE

ChatGPT in Education

Mollick (2023) emphasized the transformative potential of ChatGPT in generating instructional content, highlighting its ability to assist teachers in streamlining lesson planning, producing differentiated materials, and even simulating classroom interactions. This potential, he argues, can significantly reduce teachers' administrative burden and open new avenues for creativity in pedagogy. However, Mollick (2023) also warned of the risks of overreliance on such tools, cautioning that dependence on AI may diminish teachers' critical engagement with content and limit their professional growth as reflective practitioners.

Similarly, Holmes et al. (2019) recognized that AI tools like ChatGPT can simplify complex concepts and translate them into accessible, learner-friendly formats. This feature is particularly valuable in promoting inclusive education and catering to diverse learning needs. Yet, they stressed that without proper guidance and contextual framing by educators, AI-generated outputs may result in overly generalized or decontextualized content. This can potentially hinder the development of higher order thinking skills among learners.

Both Mollick (2023) and Holmes et al. (2019) emphasize that while AI can augment educational processes, it cannot replace the nuanced decision-making, ethical judgment, and socio-emotional intelligence that human educators bring to the learning environment. The previous mentioned study highlights the deliberate integration of AI into pedagogical practices, wherein technology functions as a collaborative partner rather than a replacement, thereby ensuring that innovation enriches, rather than diminishes, the quality of education.

Lesson Planning as Pedagogical Practice

Corpuz and Salandanan (2015) explained that a lesson plan serves as a comprehensive roadmap for teaching and learning, encapsulating the teacher's preparation, instructional decisions, and alignment with curriculum goals and standards. It functions as both a planning and reflective tool, enabling educators to articulate clear learning objectives, select appropriate materials and strategies, and design assessment methods that monitor student progress. More than just a written document, a lesson plan embodies the teacher's pedagogical reasoning and foresight, ensuring that instruction is purposeful, coherent, and responsive to learners' developmental levels and socio-cultural backgrounds.

Corpuz and Salandanan (2015) further emphasized that creativity and contextual relevance are vital components of effective lesson planning. Creative lesson plans allow room for innovation, flexibility, and student-centered activities, which foster engagement and deeper understanding. Contextual relevance, on the other hand, ensures that the content and methods used resonate with students' real-life experiences, interests, and community contexts, making learning more meaningful and sustainable.

Additionally, Corpuz and Salandanan (2015) highlighted that a well-crafted lesson plan serves as a critical tool for classroom management and time allocation, helping teachers maximize instructional time while anticipating potential challenges. It also facilitates professional accountability and collaboration, as lesson plans may be shared, reviewed, and improved through peer feedback and administrative evaluation. In teacher education, the ability to create developmentally appropriate and pedagogically sound lesson plans is considered a core competency, reflecting a teacher's readiness to deliver effective instruction in diverse learning environments.

Artificial Intelligence and Instructional Design

Studies by Zhang and Wang (2023) found that AI-assisted lesson planning significantly enhanced the clarity, coherence, and structural organization of instructional content. These tools, particularly large language models like ChatGPT, were able to generate well-organized learning materials that align with standard pedagogical frameworks. Such efficiency can be especially valuable in reducing teacher workload and supporting the design of instructional materials under time constraints. This study also noted a critical limitation: AI-generated content often lacks sensitivity to cultural nuances and local contextual factors. Because AI systems draw from generalized datasets, they may overlook region-specific examples, culturally relevant language, and the lived experiences of learners, which are essential components of inclusive and meaningful education. This shortcoming

underscores the irreplaceable role of the teacher in localizing, humanizing, and contextualizing content for diverse classrooms.

The integration of AI tools like ChatGPT, therefore, demands more than passive use. It requires the teacher to maintain an active, critical, and creative role in curating, modifying, and ethically evaluating AI-generated materials. Educators must not only assess the factual and pedagogical accuracy of the content but also ensure that it promotes values of inclusivity, equity, and learner-centeredness. Rather than serving as a replacement for professional judgment, AI should function as a collaborative partner–enhancing instructional planning while reinforcing the teacher's responsibility as the ultimate designer of the learning experience.

METHODOLOGY

Research Design

The study employed a true experimental design, wherein participants were randomly assigned to two groups: the experimental group, which utilized ChatGPT in developing a lesson plan, and the control group, which created lesson plans without the assistance of any AI tools.

A true experimental design is a type of research that randomly assigns participants to groups, usually an experimental group and a control group to test how one factor (independent variable) affects another (dependent variable). It has three main parts: randomization, control, and manipulation (Creswell & Creswell, 2018). Random assignment gives each participant an equal chance to be in any group, reducing bias and strengthening the study's accuracy. The control group serves as a basis for comparison, helping to see the real effect of the treatment. Manipulation means intentionally changing the independent variable–or example, using ChatGPT in lesson planning to observe its impact on outcomes like lesson quality or teaching effectiveness.

Participants

The study involved 16 third-year pre-service teachers enrolled in the Bachelor of Secondary Education major in Filipino program. Participants were randomly assigned into two equal groups, with eight (n = 8) in the experimental group and eight (n = 8) in the control group.

Instrument

A standardized rubric was used to evaluate the lesson plans across four key criteria:

1. Organization of content
2. Depth and breadth of content
3. Creativity and innovation
4. Alignment with curriculum and learners

Each criterion was rated on a 5-point scale by three expert raters in Filipino pedagogy, using a blind scoring method.

Data Collection

Both groups were provided with the same lesson topic and set of instructional objectives. An equal amount of time was allotted for the development of their lesson plans to ensure fairness in task execution. However, only the experimental group was permitted to utilize ChatGPT as a tool during the planning process, while the control group completed the task without access to any AI assistance.

Table 1. Mean scores comparison between groups

Evaluation criteria	ChatGPT group	Non-AI group	p-value
Organization	4.6	4.2	< 0.05
Depth of content	4.7	4.3	< 0.05
Creativity	4.1	4.5	< 0.05
Curriculum alignment	4.3	4.4	NS

Data Analysis

The study employed independent samples t-tests to determine significant differences between the two groups' scores in each criterion.

RESULTS AND DISCUSSION

Table 1 presents the comparison of mean scores between the ChatGPT-assisted group and the non-AI group across four evaluation criteria: organization, depth of content, creativity, and curriculum alignment. The data indicates statistically significant differences ($p < 0.05$) in the first three criteria, while no significant difference (NS) was observed in curriculum alignment.

The findings show that the ChatGPT group performed better in terms of structure and content richness, supporting previous research by Zhang and Wang (2023), who noted that AI-assisted lesson planning enhances clarity, coherence, and content organization. This suggests that AI tools like ChatGPT can effectively support the technical dimensions of instructional design. On the other hand, the non-AI group scored higher in creativity, which aligns with the observations of Mollick (2023), who warned that overreliance on AI may limit the educator's critical and imaginative contributions. The higher creativity scores among human-generated lesson plans may reflect more personalized and contextually grounded approaches, as emphasized by Corpuz and Salandanan (2015), who underscored the importance of contextual relevance and teacher innovation in lesson planning.

Interestingly, NS was found in curriculum alignment, implying that both groups were able to meet formal instructional objectives. This supports Holmes et al. (2019), who argued that while AI can simplify complex ideas and ensure content alignment, the presence of human oversight ensures that instructional integrity is maintained. Overall, these results suggest that while AI can streamline technical aspects of lesson planning, it may inadvertently suppress creative expression and contextual responsiveness when used uncritically or in isolation. The findings reinforce the call for a balanced and collaborative integration of AI in education–where technology complements rather than replaces the pedagogical expertise of the teacher.

CONCLUSION AND RECOMMENDATIONS

The study concludes that the use of ChatGPT in lesson planning can significantly enhance organizational clarity and content coverage, making the planning process more efficient and structured. However, these benefits may come at the cost of creativity and contextual depth, as AI-generated content tends to lack the nuanced understanding of learners' cultural, social, and local contexts. As such, AI should be regarded as a supplementary tool–one that supports, but does not replace, the teacher's intellectual agency, professional judgment, and cultural sensitivity. Effective integration of AI in education requires a balanced approach, wherein technological assistance is combined with the teacher's pedagogical insight to ensure both efficiency and meaningful learning experiences.

Recommendations

Considering the findings, several recommendations are proposed to guide future practice and research. First, there is a need to integrate AI literacy into teacher education programs to ensure that pre-service teachers are equipped with the knowledge and skills to effectively and ethically use AI tools in instructional planning. Alongside this, teacher training should include opportunities to critically evaluate and refine AI-generated content, fostering discernment rather than dependence. Moreover, institutions should promote blended approaches that combine the efficiency of technological tools like ChatGPT with the irreplaceable value of human creativity, cultural awareness, and pedagogical insight. Finally, to strengthen the generalizability of findings, further research should be conducted with larger and more diverse participant samples, across various subject areas and educational settings.

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Ethics declaration: This study involved minimal-risk educational classroom-based activities and did not collect personal or sensitive information. According to the policies of the Northwest Samar State University Research Ethics Committee, studies of this nature are exempt from full ethics review. Nonetheless, informed consent was obtained, confidentiality was ensured, and no identifying information was collected.

Declaration of interest: The author declares that there are no competing interests.

Availability of data and materials: All data generated or analyzed during this study are available for sharing when appropriate request is directed to corresponding author.

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APPENDIX A

Table A1. Sample brief lesson plan

AI generated	Written by student
Paksa: *Paggamit ng pang-uri sa paglalarawan* ***Antas:*** *Baitang 7* ***Oras:*** *1 oras* ***Layunin:*** • *Matutukoy ng mga mag-aaral ang mga pang-uri sa pangungusap.* • *Magagamit ang pang-uri sa pagbibigay ng paglalarawan.* ***Paksang-Aralin:*** • *Paksang gramatika: Pang-uri* • *Kagamitan: PowerPoint presentation and worksheet* ***Pamamaraan:*** 1. ***Panimula–****Magpapakita ng larawan ng isang parke. Tatanungin ang mga mag-aaral kung paano nila ilalarawan ang parke.* 2. ***Paglalahad****–Ipaliwanag ang kahulugan ng pang-uri at mga uri nito.* 3. ***Pagsasanay****–Ipagawa ang worksheet: Kilalanin ang pang-uri sa mga pangungusap.* 4. ***Paglalapat–****Magpapagawa ng 3 pangungusap na gumagamit ng pang-uri sa paglalarawan ng kanilang tahanan.* 5. ***Paglalahat****–Balikan ang mga natutunan at magtanong ng follow-up.* ***Pagtataya:*** • *Worksheet (10 items)* • *Oral recitation* ***Takdang-aralin:*** • *Gumawa ng maikling talata (5* pangungusap*) gamit ang 5 pang-uri.* ***Pagsusuri:*** *Organisado at malinaw ang estruktura, ngunit medyo pangkalahatan at hindi masyadong nakaangkla sa aktwal na sitwasyon ng mga mag-aaral.*	***Paksa:*** *Paglalarawan gamit ang Pang-uri* ***Antas:*** *Baitang 7* ***Oras:*** *1 oras* ***Layunin:*** • *Matutukoy at magagamit ng mga mag-aaral ang pang-uri sa paglalarawan ng mga bagay sa kanilang komunidad.* ***Paksang-Aralin:*** • *Paksang gramatika: Pang-uri* • *Kagamitan: Manila paper, colored pens, larawan ng paligid ng barangay* ***Pamamaraan:*** 1. ***Motibasyon****–Ilalabas ng guro ang larawan ng palengke sa kanilang barangay. Itatanong: "Ano ang nakikita ninyo? Paano ninyo ito ilalarawan?"* 2. ***Pagtalakay–****Ipapaliwanag ang pang-uri at ipapakita ang mga halimbawa mula mismo sa sagot ng mga mag-aaral.* 3. ***Pagsasanay****–Hahatiin ang klase sa grupo. Bawat grupo ay maglalarawan ng isang larawan (paaralan, palengke, plaza, dagat) gamit ang pang-uri.* 4. ***Paglalapat****–Magpapagawa ng isang talatang paglalarawan tungkol sa kanilang paboritong lugar sa calbayog (o sariling bayan).* 5. ***Paglalahat****–Pagbabahaginan ng piling mag-aaral ng kanilang gawa.* ***Pagtataya:*** • *Rubric para sa talatang isinulat.* ***Takdang-aralin:*** • *Magdala ng isang larawan mula sa kanilang sariling pamilya at gumawa ng maikling paglalarawan gamit ang pang-uri.* ***Obserbasyon:*** *May lokal na konteksto at mas makatao ang dating at nagging malikhain ang mag-aaral sa pagbibigay ng gawain ngunit hindi kasing linaw ang teknikal na estruktura kumpara sa AI-generated.*

Note. The lesson plan is written in Filipino language since the respondents are students taking up bachelor of secondary education major in Filipino