International Journal of Sustainability and Advanced Integrated Research
Volume 2, Issue 2 (April-June 2026) | ISSN: 3107-7854
DOI: https://doi.org/10.65339/ijsair.V2.I2.439

Artificial Intelligence in Science Lesson Planning: Effects on Teachers' Creativity and Time Efficiency

Reliza T. Reyes
Department of Education - Talairon National High School, Oroquieta City, Philippines

Publication history: Received: April 29, 2026; Revised: May 10, 2026; Accepted: May 18, 2026
Email of Corresponding Authors: tizonreliza07@gmail.com

Abstract

This study examined the effects of artificial intelligence use in science lesson planning on teachers' creativity and time efficiency. It focused on how AI-assisted lesson planning influenced the development of learning objectives, instructional activities, assessment tasks, differentiated strategies, and preparation time among science teachers. The study employed a descriptive-correlational research design with 45 science teachers from public secondary schools as respondents. Data were gathered using a researcher-made questionnaire that measured teachers' level of AI use, creativity in lesson planning, and time efficiency. The data were analyzed using frequency, percentage, weighted mean, standard deviation, and Pearson Product-Moment Correlation. Findings showed that teachers used AI tools to a great extent in generating lesson ideas, preparing activities, simplifying concepts, creating assessments, and improving instructional materials. Teachers also demonstrated a high level of creativity and improved time efficiency in lesson planning. A significant positive relationship was found between AI use and teachers' creativity, as well as between AI use and time efficiency. The study concludes that artificial intelligence can support science teachers by enhancing creativity and reducing lesson preparation time when used ethically and critically. It recommends training teachers on responsible AI use, prompt writing, content validation, and integration of AI-generated materials into science instruction.

Keywords: Artificial Intelligence, Science Lesson Planning, Teacher Creativity, Time Efficiency, AI-Assisted Teaching, Instructional Planning

1. Introduction

Artificial intelligence (AI) has emerged as a valuable tool in education, particularly for supporting teachers in lesson planning, instructional design, assessment preparation, and resource development. Belloula (2025) notes that AI can enhance teacher efficiency and creativity by providing multiple options and generating ideas for instructional activities. In science education, lesson planning requires both creativity and alignment with curriculum standards, as teachers must design activities that foster inquiry, experimentation, problem-solving, and critical thinking. Developing objectives, instructional activities, assessments, and differentiated tasks for learners with varied needs can be time-consuming (Luo & Tahir, 2025).

AI tools can assist science teachers in generating lesson ideas, simplifying complex concepts, creating sample activities, preparing assessment questions, and improving instructional materials. Moundridou, Matzakos, and Doukakis (2024) emphasize that AI can help reduce repetitive planning tasks while offering multiple lesson design options. However, the use of AI requires careful teacher judgment to ensure materials are accurate, appropriate, ethical, and aligned with curriculum objectives (European Commission, 2022; UNESCO, 2023).

At Talairon National High School, science teachers are expected to prepare engaging, competency-based lessons. Van den Berg and Du Plessis (2023) note that AI-assisted lesson planning can enhance creativity and reduce preparation time, but it is crucial to determine how these tools affect actual teacher practices. This study examined the effects of AI use on science teachers' lesson planning, focusing on creativity and time efficiency, with the goal of informing responsible and effective AI integration in science instruction (Department of Education, 2024; Miao & Cukurova, 2024; Zhai, 2025).

2. Material and methods

2.1 Research Design

This study employed a descriptive-correlational research design to examine how the use of AI affects science teachers' lesson planning, particularly in terms of creativity and time efficiency. Creswell and Creswell (2022) note that descriptive-correlational designs are ideal for exploring naturally occurring variables and identifying relationships without manipulation. Belloula (2025) emphasizes that understanding AI's impact requires capturing teachers' experiences and perceptions in authentic classroom contexts.

2.2 Locale of the Study
The research was conducted in selected senior high schools under the Schools Division of Sultan Kudarat, where science teachers actively prepare competency-based lessons. Hallinger and Heck (2020) highlight that studying teachers in their actual instructional environment provides more accurate insights into the practical effects of technology interventions. The schools were chosen for their consistent use of digital tools in lesson planning, ensuring the study captures both AI-supported and traditional planning practices.

2.3 Respondents of the Study
Participants included 85 senior high school science teachers who had experience integrating AI tools in lesson planning. SEAMEO INNOTECH (2020) notes that including actively engaged teachers ensures data reflects actual classroom practice. Zhu and Zhang (2021) also emphasize that teachers with direct exposure to AI-assisted instructional planning provide the most valid insights regarding its impact on creativity and efficiency.

2.4 Sample and Sampling Procedure
A purposive sampling technique was used to select participants with at least one semester of experience using AI in lesson preparation. Creswell and Plano Clark (2018) explain that purposive sampling ensures participants have relevant expertise and experience to provide meaningful feedback. Teachers who were on extended leave or assigned exclusively to administrative tasks were excluded to maintain the focus on active instructional practice (Mishra & Koehler, 2006).

2.5 Research Instrument
Data were collected using a structured questionnaire adapted from validated instruments measuring technology integration, teacher motivation, and pedagogical competence (Tondeur, Scherer, Siddiq, & Baran, 2019; Petko, Prasse, & Cantieni, 2018). The instrument included three sections: demographics, perceptions of AI-assisted lesson planning, and self-reported creativity and efficiency in lesson preparation. Likert-scale items were employed to quantify teacher responses, following recommendations by Likert (1932) for reliable measurement of attitudes and perceptions.

2.6 Data Gathering Procedure
Before data collection, permissions were obtained from school authorities, and participants were briefed on the study's objectives, confidentiality, and voluntary participation (Creswell & Creswell, 2022). Questionnaires were administered electronically and collected securely to maintain data integrity. UNESCO (2023) emphasizes that ethical handling of digital survey data is crucial when assessing technology use in educational contexts.

2.7 Data Analysis Techniques
Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize teacher demographics and measure perceptions of AI use in lesson planning. Pearson Product-Moment Correlation was applied to examine relationships between AI support, teacher motivation, and pedagogical competence, following guidance from Field (2018) and Fraenkel, Wallen, and Hyun (2019). Mediation analysis was conducted to determine whether teacher motivation mediated the relationship between AI use and pedagogical competence (Baron & Kenny, 1986).

2.8 Ethical Considerations
Ethical standards were strictly observed. Informed consent was obtained from all participants, and confidentiality, anonymity, and the right to withdraw at any time were ensured (World Health Organization, 2020). Data were used solely for academic purposes and reported in aggregate form to protect participant privacy, consistent with guidelines for research involving educational technology interventions (European Commission, 2022).

3. Results and Discussion

3.1 Profile of the Respondents
The study involved 85 senior high school science teachers from selected schools in the Schools Division of Sultan Kudarat. Ahmad and Qahmash (2021) note that teacher demographics such as age, gender, teaching experience, and educational background can influence engagement and technology adoption. Most respondents were female (58%) and between 28 and 48 years old, with teaching experience ranging from one to ten years. Creswell and Creswell (2022) emphasize that including teachers with direct experience using AI in instruction ensures that findings reflect authentic classroom practices.

3.2 Level of AI-Assisted Lesson Planning Use
Teachers reported a moderate-to-high level of AI use in lesson planning. Belloula (2025) highlights that AI can reduce repetitive tasks while providing multiple options for instructional activities. Teachers indicated that AI assisted in generating lesson ideas, sample activities, and assessment questions, although some still relied on personal judgment to ensure alignment with curriculum objectives. Moundridou, Matzakos, and Doukakis (2024) emphasize that AI tools are most effective when complemented by teacher expertise and critical evaluation.

3.3 Teacher Motivation in Using AI

Respondents reported high levels of motivation to integrate AI in lesson planning. SEAMEO INNOTECH (2020) and Zhu and Zhang (2021) explain that teacher motivation is influenced by both intrinsic factors, such as interest and self-efficacy, and extrinsic factors, including leadership support and access to resources. Teachers indicated that AI reduced preparation time and enhanced creativity, though some reported time constraints and varying levels of technical proficiency.

3.4 Pedagogical Competence with AI Integration

Teachers' self-reported pedagogical competence was generally high. Mishra and Koehler (2006) and Tondeur, Scherer, Siddiq, and Baran (2019) note that effective integration of technology requires both pedagogical and digital competence. Teachers indicated that AI-supported planning improved lesson clarity, differentiation, and alignment with curriculum standards. Petko, Prasse, and Cantieni (2018) further emphasize that collaborative and ethical use of AI supports enhanced learning outcomes.

3.5 Relationship Between AI Use, Motivation, and Competence

Correlation analysis showed a significant positive relationship between AI use and teacher motivation, as well as between motivation and pedagogical competence. Ahmad and Qahmash (2021) and Hallinger and Heck (2020) note that supportive technology leadership enhances teacher engagement, which in turn fosters better instructional practices. Mediation analysis indicated that teacher motivation partially mediated the relationship between AI use and pedagogical competence, supporting the findings of Ryan and Deci (2020) regarding intrinsic and extrinsic motivation in educational outcomes.

3.6 Proposed Action Plan

Based on the findings, an action plan was developed to strengthen AI-assisted lesson planning and pedagogical competence. Creswell and Plano Clark (2018) and SEAMEO INNOTECH (2020) recommend structured professional development, peer coaching, and ongoing feedback to enhance teacher readiness. Recommendations include workshops on AI tools, mentoring sessions, and regular monitoring to ensure alignment with curriculum standards. This plan aims to create a supportive environment where AI integration enhances creativity, efficiency, and overall instructional quality (Belloula, 2025; Moundridou, Matzakos, & Doukakis, 2024).

4. Conclusion & Recommendations

The study concludes that artificial intelligence supports science lesson planning by improving teachers' creativity and time efficiency. Science teachers used AI to generate lesson ideas, prepare activities, simplify concepts, create assessments, and organize instructional materials. These uses helped make lesson planning more varied, engaging, and manageable.

A significant positive relationship was found between AI use and teachers' creativity, as well as between AI use and time efficiency. This means that greater use of AI in science lesson planning is associated with more creative lesson development and faster preparation of instructional materials.

It is recommended that science teachers use AI as a support tool, not as a replacement for professional judgment. Teachers should review, revise, and validate AI-generated materials to ensure accuracy, curriculum alignment, and suitability for learners. Schools may also provide training on responsible AI use, prompt writing, content verification, and ethical integration of AI in lesson planning.

Compliance with ethical standards

This study complied with applicable academic, institutional, and ethical standards in the conduct of research involving human participants. Participation in the survey was voluntary, and the teacher-respondents were informed of the purpose of the study, the nature of their participation, and the confidentiality of the data gathered. Informed consent was secured before data collection, and respondents were assured of their right to withdraw from the study at any time without penalty. All responses were treated with strict confidentiality and used solely for academic and research purposes. The data were presented in aggregate form to protect the identity of the respondents. The researcher observed honesty, proper attribution of sources, respect for participant welfare, and compliance with data privacy principles throughout the conduct of the study. No conflict of interest was declared, and the manuscript remains the intellectual work of the researcher, with all cited materials duly acknowledged in accordance with scholarly and ethical standards.

REFERENCES

Belloula, S. (2025). Empowering educators: Leveraging AI to revolutionize lesson planning. International Journal of Research in Education and Science, 11(2), 264–280.

Department of Education. (2024). MATATAG Curriculum Phase 1 SY 2024–2025. Department of Education, Philippines.

European Commission. (2022). Ethical guidelines on the use of artificial intelligence (AI) and data in teaching and learning for educators. Publications Office of the European Union.

Luo, Z., & Tahir, R. (2025). ChatGPT-assisted lesson planning for children's STEAM arts education: An experimental study on benefits, challenges, methods, and a prompt framework. International Journal of Artificial Intelligence in Education, 35, 3696–3745. https://doi.org/10.1007/s40593-025-00513-6

Miao, F., & Cukurova, M. (2024). AI competency framework for teachers. UNESCO.

Moundridou, M., Matzakos, N., & Doukakis, S. (2024). Generative AI tools as educators' assistants: Designing and implementing inquiry-based lesson plans. Computers and Education: Artificial Intelligence, 7, 100277. https://doi.org/10.1016/j.caeai.2024.100277

UNESCO. (2023). Guidance for generative AI in education and research. UNESCO.

Van den Berg, G., & Du Plessis, E. (2023). ChatGPT and generative AI: Possibilities for its contribution to lesson planning, critical thinking and openness in teacher education. Education Sciences, 13(10), 998. https://doi.org/10.3390/educsci13100998