

Lived Experiences of Science Educators on AI Use: A Descriptive Phenomenological Study

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Abstract. This study explores the lived experiences of science educators using artificial intelligence (AI), focusing on how these experiences shape their thinking processes. As AI becomes increasingly integrated into education, the study seeks to understand educators' subjective, first-person experiences beyond measurable instructional outcomes. It specifically examines how educators describe their use of AI and how these experiences relate to cognitive processes in teaching. A descriptive phenomenological design guided by Giorgi's (2009) method was employed to capture rich experiential accounts. Seven science educators from Baybay City, Leyte, were selected through purposive sampling based on active AI use. Data were gathered through semi-structured interviews conducted both synchronously and asynchronously. Analysis followed Giorgi's systematic steps: bracketing, meaning unit identification, transformation, and synthesis to derive the essential structure of the phenomenon. Findings reveal AI as a multifaceted support system that enhances pedagogical practice, cognition, and professional growth. Five key constituents emerged: (1) *AI as a pedagogical and learning support tool*, (2) *cognitive transformation in AI use*, (3) *emotional and experiential engagement*, (4) *critical thinking and ethical awareness*, and (5) *reconstruction of teacher identity*. Educators reported improved efficiency in lesson preparation, enhanced organization, flexibility, and deeper analytical engagement. Emotional responses included increased confidence and support, alongside caution due to concerns about accuracy and overreliance. Participants also demonstrated active evaluation and adaptation of AI-generated outputs, reinforcing human decision-making in instruction. A notable shift in identity emerged, from content provider to facilitator and lifelong learner. AI functions not merely as a tool but as a transformative presence in science education. It reshapes instructional practices, cognitive engagement, and professional identity. While it enhances efficiency and supports higher-order thinking, its effective integration depends on educators' critical, ethical, and reflective use. The study highlights the need to balance AI integration with the preservation of human cognition and professional responsibility in education.

Keywords: Artificial intelligence in education; science educators; lived experiences; cognitive processes; phenomenology

INTRODUCTION

The rapid advancement of artificial intelligence (AI) has significantly transformed education, particularly science education. AI-powered technologies such as chatbots, intelligent tutoring systems, automated feedback platforms, virtual simulations, and generative AI are increasingly being integrated into teaching and learning (Batsaikhan & Correia, 2024). These technologies enhance access to information, support personalized instruction, and facilitate complex problem-solving, enabling educators to adopt more innovative approaches to instruction (Kalyani, 2024).

Consequently, science educators are gradually incorporating AI into their instructional practices to support scientific inquiry, analytical thinking, and student learning (Parviz, 2024).

In science education, AI has been associated with the development of higher-order thinking skills, including analysis, evaluation, and creation (Vieriu & Petrea, 2025). AI tools assist educators in exploring scientific concepts, generating instructional materials, organizing ideas, and addressing complex problems more efficiently (Moemeke, 2024). Despite these benefits, concerns have emerged regarding the excessive reliance on AI, which may reduce independent thinking, critical reflection, and deep cognitive engagement among users (Zhai et al., 2024). While existing studies have extensively examined the effectiveness and outcomes of AI in educational settings, there remains a need to understand how educators personally experience and interpret its integration into their professional practice.

This study is anchored in the United Nations Sustainable Development Goal 4 (SDG 4), which promotes inclusive and equitable quality education and lifelong learning opportunities for all. The integration of AI into science education reflects ongoing efforts to improve educational quality through innovative and accessible technologies (Schmidt et al., 2025). However, achieving these goals requires more than the adoption of technological tools; it also requires understanding how educators experience, interpret, and meaningfully integrate AI into their instructional practice. Examining these experiences provides valuable insights into how AI can effectively support high-quality and inclusive science education.

Baybay City, Leyte, provides an appropriate setting for this study because it is home to higher education institutions where science educators are increasingly integrating digital technologies into teaching and learning. As educators who regularly engage students in scientific inquiry, critical thinking, and problem-solving, science educators are well positioned to describe the opportunities and challenges associated with AI integration in science education. Exploring their lived experiences within this local context offers insights into how AI is adopted, interpreted, and applied in everyday instructional practice. Although situated within a specific locality, the findings may also contribute to a broader understanding of AI integration in similar educational settings across the Philippines and beyond (Motukeeva et al., 2025).

Despite the growing body of literature on AI in education, most existing studies employ quantitative methods to examine its relationship with academic performance, learning outcomes, or cognitive development. Although these studies provide valuable statistical evidence, they often overlook the subjective meanings, perceptions, and everyday experiences of educators using AI in their instructional practice. Consequently, qualitative research that explores the lived experiences of science educators within specific disciplinary contexts remains limited (Kamalov et al., 2023). Understanding these lived experiences is essential to developing a more comprehensive understanding of the role of AI in science education beyond measurable outcomes.

To address this gap, this study employs a descriptive phenomenological approach to explore the lived experiences of science educators in using AI. By examining how educators perceive, interpret, and assign meaning to AI in their instructional practice, the study seeks to provide a deeper understanding of its influence on teaching and cognitive processes. The findings are expected to contribute to the growing discourse on AI in science education by informing educational practice, institutional policies, professional development initiatives, and future research. Ultimately, the study aims to support the responsible and meaningful integration of AI in science education in ways that promote innovative, inclusive, and high-quality learning.

RESEARCH OBJECTIVES

Specifically, this research addresses the following question: How do Science Educators describe their lived experiences in using AI in teaching and learning?

- How do science educators describe their experiences of using AI in teaching and learning?
- How do these experiences relate to their thinking processes?
- What meanings do science educators ascribe to their AI use?

METHODOLOGY

Research Design

This study used a descriptive phenomenological design to examine the lived experiences of science educators using artificial intelligence (AI). Descriptive phenomenology is appropriate for exploring the meaning of lived experiences rather than measuring variables (Creswell & Poth, 2018). This approach emphasizes rich, first-person accounts, allowing participants to directly describe their lived experiences.

Following Giorgi's descriptive phenomenological method (Giorgi, 2009), data were gathered through in-depth interviews that elicited participants' narratives about their use of AI, especially their thinking processes during teaching and learning. The narratives were then systematically analyzed: first, read for a sense of the whole; then divided into meaning units; converted into psychological expressions; and synthesized into a structural description of the phenomenon (constituents). This approach enabled an in-depth understanding of how science educators perceive, interpret, and make sense of their cognitive engagement with AI tools. It highlights how AI shapes their thinking, decision-making, problem-solving, and learning strategies in the educational environment.

Participants

This study included seven science educators, chosen intentionally using clear inclusion criteria to ensure their relevance to the topic. Participants were required to be science teachers (elementary, junior, or senior high school) currently or previously teaching STEM-related subjects. They also needed to have experience using AI tools such as ChatGPT, AI lesson planners, quiz generators, and similar AI-assisted technologies in their instructional practices, and they had to be willing to participate in an interview.

From the preliminary survey, the researchers identified a total of thirty-two educators who initially expressed willingness to participate in the study. These potential participants underwent screening based on the established inclusion criteria to ensure their suitability and relevance to the research objectives. Following the screening process, only seven science educators met all the required criteria and completed participation in the study. The remaining twenty-five potential participants were excluded for several reasons. Fourteen science educators later became unavailable or declined participation due to busy and demanding schedules, workload responsibilities, and other personal or professional matters. Five participants were fresh graduates majoring in science but had not yet taught science subjects in public or private school settings. Two potential participants declined participation because they had not taught science for approximately six years, making their experiences less aligned with the current objective of the study. Additionally, four potential participants were only generally familiar with AI tools but reported limited and infrequent use of AI in instructional contexts due to limited technological exposure and computer usage.

The demographic characteristics of the seven qualified participants are presented in Table 1. The table summarizes the participants' profiles, including their teaching level, years of teaching experience, educational attainment, and AI tools used in instruction. The participants represented different educational levels and possessed varied teaching experiences, providing a diverse range of perspectives on the integration of AI in science education.

Table 1. Demographic Profile of Study Participants (Science Educator)

Participants	Age	Teaching Experience (Months)	Subject Area	Remarks
P1	24	6	Physics	Met the criteria
P2	29	38	Biology	Met the criteria
P3	25	8	Biology	Met the criteria
P4	25	4	Chemistry & Physics	Met the criteria
P5	28	18	Earth Science, General Chemistry, & Physics	Met the criteria
P6	24	10	General Science	Met the criteria
P7	26	9	General Science	Met the criteria

Consequently, the seven qualified science educators were purposively selected because they were considered capable of providing rich, relevant, and meaningful insights pertinent to the study. This sample size aligns with recommendations for descriptive phenomenological studies, which favor small yet information-rich participant groups for in-depth exploration of lived experiences. All participants had direct experience with AI integration in teaching and learning, thereby supporting the collection of rich qualitative data.

Research Tools

This study used a semi-structured interview guide with open-ended questions to elicit rich, in-depth descriptions of participants' lived experiences. The instrument's flexibility allowed the researchers to probe further and follow the natural flow of the conversation, enabling participants to articulate their perspectives on AI use in instructional practice, particularly in relation to their thinking processes. Consistent with Englander's (2012) phenomenological approach, the interviews emphasized detailed, first-person accounts rather than predetermined or restrictive lines of questioning, thereby preserving the authenticity and depth of the participants' narratives.

To ensure the accuracy and completeness of the data, all interviews were audio-recorded using a reliable software application and a dedicated recording device. This was supplemented by contemporaneous note-taking, capturing non-verbal cues, contextual details, and preliminary analytical insights that may not be fully reflected in the audio recordings. These combined tools facilitated rigorous, comprehensive data documentation, supporting the study's credibility and trustworthiness.

Data Collection

Data were collected through in-depth interviews to capture participants' lived experiences with AI use in instructional practice. Although face-to-face interviews were initially planned, the researchers prioritized participants' preferences and comfort by allowing flexibility in the mode of participation. Of the seven (7) participants, five (5) participated through synchronous virtual interviews conducted via online calls, one (1) participant responded through a chat-based interview, and one (1) participant completed the interview through Google Forms. This resulted in a combination of synchronous and asynchronous online interviewing.

The use of multiple data collection methods was primarily intended to maximize participant participation and accommodate differences in availability, internet connectivity, technological access, and communication preferences. Providing flexible interview options enabled the researchers to recruit information-rich participants who might otherwise have been unable or unwilling to participate in a single interview format while remaining consistent with the phenomenological goal of obtaining detailed descriptions of lived experiences.

Although interview modes varied, all data collection procedures maintained the essential characteristics of phenomenological interviewing by encouraging participants to provide detailed descriptions of their personal experiences, meanings, and reflections.

Synchronous online interviews were conducted in a quiet, distraction-free setting and typically lasted 35–45 minutes. These real-time interactions allowed for immediate probing and clarification of responses. For participants who were less comfortable with live virtual interaction, asynchronous methods such as Google Forms and chat-based responses were utilized, enabling them to provide thoughtful and reflective answers at their own pace while maintaining comfort and accessibility.

Consistent with qualitative online interviewing literature, asynchronous interviews may provide participants with additional time for reflection, while synchronous interviews allow immediate probing and clarification of meanings (Du & Zhang, 2022). Despite differences in interview mode, all participants were guided using the same semi-structured interview questions aligned with the phenomenological objectives of the study to maintain consistency and depth of narratives.

The researchers also recognized that the mode of data collection could potentially influence the richness and nature of participants' responses. Synchronous interviews generally yielded more spontaneous narratives and allowed follow-up questions for clarification, whereas asynchronous responses tended to be more deliberate and reflective but offered fewer opportunities for immediate

probing. To minimize these potential influences, the researchers used the same interview protocol across all modes, applied consistent follow-up questions whenever feasible, and analyzed all responses using the same phenomenological procedures. This approach ensured that variations in interview mode did not compromise the credibility, dependability, and overall trustworthiness of the findings.

Participants were assured that their chosen mode of participation would not affect the integrity of the study, provided that they offered rich and relevant descriptions of their experiences. To ensure comprehensive data capture, detailed field notes were taken during and immediately after each interview. These notes documented nonverbal cues (when applicable), contextual factors, and reflexive researcher observations, enriching the dataset and supporting a more nuanced analysis.

Data Analysis

This study used Giorgi's Descriptive Phenomenological Method (Giorgi, 2009). It systematically analyzed interview data to uncover the essential structure of participants' lived experiences regarding AI use in instructional practice.

Following Giorgi's five-step analytic process, the researcher first adopted the phenomenological attitude through bracketing (*epoché*), setting aside prior assumptions and biases to remain grounded in the participants' descriptions. Second, each transcript was read multiple times to obtain a holistic understanding of the narratives. Third, the data were delineated into meaning units at psychological significance points, allowing key aspects of the experience to emerge. Fourth, these meaning units were transformed into psychologically sensitive expressions, preserving participants' original intent while making implicit meanings explicit. Finally, the transformed meaning units were synthesized into a coherent and consistent structural description of the phenomenon.

Through this rigorous analytical procedure, the study generated a rich and nuanced understanding of how science educators experience and make sense of AI use, particularly in relation to their thinking processes, decision-making, and learning engagement.

To demonstrate the analytic rigor of the study, Table 2 provides an exemplar of how interview data were analyzed using Giorgi's descriptive phenomenological method. A raw participant quotation was first identified as a meaning unit. The meaning unit was subsequently transformed into psychological language to reveal its implicit experiential meaning. The transformed meaning then informed the development of a psychological constituent, which contributed to the essential structure describing science educators' lived experiences of AI use.

Table 2. *Exemplar of Giorgi's Analytic Transformation Process*

Raw Quotation	Meaning Unit	Transformed Meaning Unit	Constituent
"AI has made my thinking process faster but also more structured compared before." (P1)	AI improves the speed and organization of thinking.	The educator experiences AI as facilitating more efficient and systematically organized cognitive processing during instructional tasks.	Cognitive Transformation in the Use of AI

Trustworthiness and Rigor

To ensure the trustworthiness and rigor of the study, several qualitative validation strategies were employed throughout the research process. Consistent with Giorgi's descriptive phenomenological method, the researchers practiced *epoché* to minimize the influence of preconceived ideas and personal assumptions, allowing the phenomenon to be examined based on the participants' lived experiences. Reflexivity was continuously practiced by critically reflecting on the researchers' perspectives, decisions, and potential influences throughout the research process to maintain awareness of possible biases during data interpretation.

Peer debriefing was conducted through ongoing consultation with research mentors and qualitative research specialists who reviewed the emerging themes, meaning units, and interpretations to strengthen the credibility, consistency, and rigor of the analysis. Member checking

was likewise employed by returning the interpreted responses and emerging themes to the participants for confirmation, allowing them to verify whether the interpretations accurately represented their intended meanings and lived experiences. An audit trail was also maintained by systematically documenting the research procedures, data collection processes, coding decisions, theme development, and analytic reflections to enhance transparency and allow the research process to be traced and reviewed.

In addition, a consistent semi-structured interview guide was utilized across all interview modes to maintain alignment with the phenomenological objectives of the study and ensure consistency in data collection. The study also employed thick description through detailed participant narratives, transformed meaning units, and contextual interpretations to provide a rich and comprehensive understanding of the phenomenon. Verbatim quotations from participants were included to preserve the authenticity of their lived experiences and to support the credibility and validity of the findings.

Ethical Consideration

Informed consent was obtained from all participants, with the study's purpose, procedures, and potential risks and benefits clearly explained. Participant privacy was ensured through anonymization, which means removing identifying information from data, and strict confidentiality in accordance with the Philippine Data Privacy Act of 2012. The participants, who are science educators from different schools, were free to withdraw at any time. Ethical standards were upheld through fair participant selection and rigorous data collection and analysis, where 'rigorous' indicates careful, thorough procedures that ensure integrity and well-being.

RESULTS AND DISCUSSION

The lived experiences of science educators demonstrate that integrating artificial intelligence (AI) into teaching is transformational. AI not only supports efficiency in lesson planning and content delivery but also fundamentally reshapes pedagogical practice, cognitive processes, emotional engagement, and professional identity. With AI, educators manage complex teaching demands more effectively (Tan et al., 2024), and their thinking becomes faster and more flexible as they deepen analytical and problem-solving skills (Gerlich, 2025).

However, this experience is not purely functional but also emotional and reflective. Science educators initially feel eager and self-assured about AI, yet this is accompanied by caution and a growing sense of responsibility due to concerns about over-reliance on AI. As a result, they actively engage in critical evaluation, verifying and adapting AI-generated content to ensure its appropriateness for their students and alignment with educational standards. This reflective engagement reinforces their role as decision-makers, maintaining human judgment as central in the teaching process.

This section presents the emerging constituents derived from the participants' lived experiences as science educators using AI in teaching and learning. Data were collected through asynchronous and synchronous interviews. Researchers ensured that asynchronous questions aligned with research objectives to maintain consistency and depth.

The analysis yielded five key constituents: (1) *AI as a pedagogical and learning support tool*, (2) *cognitive transformation in the use of AI*, (3) *emotional and experiential engagement with AI*, (4) *critical thinking and ethical awareness in AI use*, and (5) *the reconstruction of teacher identity and meaning*. These findings are further discussed in relation to their implications for teaching and learning.

Together, these constituents distinctly illuminate how science educators perceive and make sense of AI integration, defining the core transformative structure of their experiences, as supported by relevant literature.

Constituent #1: AI as a Pedagogical and Learning Support Tool

Table 3 presents the findings on AI as a pedagogical and learning support tool. The findings reveal that science educators experience artificial intelligence (AI) as an essential pedagogical and learning

support tool that enhances both instructional practice and professional learning. Participants (educators) described using various AI applications for lesson preparation, content generation, assessment design, and laboratory activity development. Generative AI platforms such as ChatGPT, Co-pilot, Perplexity AI, Gemini, and Canva AI were commonly used to develop lesson explanations, instructional examples, and alternative ways of presenting scientific concepts, while AI-powered quiz generators and content creation tools streamlined routine instructional tasks.

One participant explained,

“ang paggamit nako og [my use of] AI has become part of my daily teaching routine, especially in lesson preparation and content development...” (P1),

Another participant shared,

“I use AI tools for generating lesson outlines, quizzes, and even laboratory activity guides.” (P3).

Table 3. *AI as a Pedagogical and Learning Support Tool*

Participant ID	Meaning Unit (MU)	Verbatim Statement (Translated to English)	Transformed Meaning (Giorgi Psychological Language)	Constituent (Essential Structure of Experience)
P1, P2, P5	AI is integrated into daily teaching tasks and workload management	<i>“Based on my experience, using AI has become part of my daily teaching routine, especially in lesson preparation and content development...”</i> <i>“As a teacher, there are so many tasks every day, so AI has helped me in making my work more efficient...”</i> <i>“For me, using AI is very helpful, especially in managing the workload...”</i>	The educator experiences AI as an embedded pedagogical support that enhances organization and delivery of instruction.	AI as a Pedagogical and Learning Support Tool
P1, P5, P7	AI is used to generate and organize lesson materials and assessments	<i>“Usually, I use AI tools for generating lesson outlines, quizzes, and even laboratory activity guides...”</i> <i>“It helps me organize ideas faster and gives me alternative ways to explain science concepts...”</i> <i>“I usually use AI for creating lesson plans, assessment tools, and simplifying difficult science concepts...”</i>	AI functions as a tool for generating and organizing instructional materials.	
P2, P3, P6, P7	AI is used to enhance understanding of science content for teaching	<i>“Sometimes, I also use it for my own understanding of complex topics before I discuss them with my students...”</i> <i>“It also helps me improve my understanding of topics that are not my strongest areas...”</i>	AI supports cognitive comprehension that informs teaching practice.	
P1, P4, P5, P6	AI is used for continuous professional learning and updating knowledge	<i>“I also use it for my own learning... so AI helps me explore different explanations quickly...”</i>	AI is experienced as a resource for continuous professional development.	

These experiences suggest that AI is no longer viewed merely as a supplementary technology but has become integrated into educators' everyday instructional practices. Rather than replacing teachers' expertise, participants described AI as extending their instructional capacity by reducing the time spent on routine preparation while allowing greater attention to lesson quality, concept

explanation, and classroom planning. The findings also indicate that educators intentionally select different AI tools depending on the instructional task, demonstrating that AI serves complementary rather than uniform functions in science teaching.

Beyond classroom preparation, participants also described AI as a valuable resource for their own professional learning. One educator stated,

“I also use it for my own learning... so I can better understand complex topics before I discuss them with my students.” (P2),

This finding highlights that educators experience AI not only as a teaching assistant but also as a learning companion that supports continuous professional development. By providing immediate access to updated scientific information, multiple explanations, and instructional resources, AI enables teachers to strengthen both their subject-matter knowledge and pedagogical readiness before classroom instruction.

These findings extend previous studies that describe AI primarily as a productivity tool by demonstrating its broader pedagogical value in science education. Rather than simply improving efficiency, participants perceived AI as supporting instructional flexibility, enriching lesson preparation, and fostering continuous learning. This reinforces previous work emphasizing AI's contribution to instructional planning and resource development (Fitria, 2023; Harrasi et al., 2025), while also supporting the view that AI promotes lifelong professional learning among educators by facilitating access to current knowledge and pedagogical support (Perez-Ortiz et al., 2021).

Constituent #2: Cognitive Transformation in the Use of AI

Table 4 highlights how AI influences the cognitive processes and decision-making practices of science educators. The findings indicate that AI meaningfully transforms how science educators think, analyze information, and make instructional decisions. Participants consistently described AI as enhancing cognitive efficiency by helping them organize ideas, process scientific information more quickly, and evaluate multiple instructional approaches. Rather than functioning as a replacement for teachers' thinking, AI was experienced as a cognitive support tool that strengthened analytical reasoning and instructional planning.

Participants also differentiated their experiences according to the type of AI tool they used. Generative AI platforms were commonly associated with higher-order thinking processes, including comparing explanations, examining alternative perspectives, and refining lesson content. In contrast, AI lesson planners and assessment generators primarily reduced the cognitive demands of routine planning, enabling educators to devote more attention to pedagogical reflection and classroom decision-making. These experiences suggest that different AI tools support distinct dimensions of teacher cognition, ranging from task efficiency to deeper conceptual analysis.

One participant explained,

“I can quickly get multiple perspectives from AI and compare ideas fit for the students...” (P2),

Similarly, another educator shared,

“I can compare different explanations and choose the best one for my students.” (P7).

Rather than accepting AI-generated information without question, participants described using multiple AI responses to compare ideas, evaluate their accuracy, and determine which explanations best matched students' learning needs. This indicates that AI supports reflective instructional decision-making by encouraging educators to critically examine information before applying it in the classroom. Consequently, the use of AI appears to reduce cognitive workload associated with information searching while simultaneously promoting evaluative thinking and pedagogical judgment.

These findings suggest that AI facilitates cognitive transformation by expanding educators' access to diverse perspectives without diminishing their professional autonomy. Instead of replacing human

reasoning, AI functions as a scaffold that supports deeper understanding, flexible thinking, and evidence-informed instructional choices. This interpretation complements previous research demonstrating that AI enhances cognitive engagement, analytical thinking, and instructional problem-solving (Alshammari & Alrehaili, 2025; Imran et al., 2024; Ruiz-Martín et al., 2024).

Table 4. *Cognitive Transformation in the Use of AI*

Participant ID	Meaning Unit (MU)	Verbatim Statement (Translated to English)	Transformed Meaning (Giorgi Psychological Language)	Constituent (Essential Structure of Experience)
P1, P6, P7	AI speeds up cognitive processing and understanding	<i>"AI has made my thinking process faster but also more structured compared before..."</i>; <i>"AI has improved my ability to understand and analyze science concepts faster..."</i>; <i>"AI has made my thinking process faster and more flexible in analyzing topics..."</i>	AI accelerates cognitive operations in learning and teaching tasks.	Cognitive Transformation in the Use of AI
P1, P4, P5	AI expands thinking through multiple perspectives	<i>"I can quickly get multiple perspectives from AI and compare ideas..."</i>; <i>"I am no longer limited to a single perspective because AI provides multiple explanations..."</i> <i>"It allows me to see different ways of explaining a concept..."</i>	AI broadens cognitive interpretation through varied viewpoints.	
P2, P5, P7	AI supports comparison and evaluation of ideas	<i>"It gives me different perspectives that I can compare before I decide what to teach..."</i>; <i>"It helps me analyze topics more deeply through different explanations..."</i> <i>"I can easily compare different explanations and choose the best one for my students..."</i>	AI promotes evaluative and comparative thinking processes.	
P1, P4, P6	AI makes thinking more structured and flexible	<i>"My thinking process is now more structured because I refine ideas from AI..."</i> <i>"AI has helped me become more flexible in analyzing problems..."</i>; <i>"I have become more structured and reflective before deciding on a teaching strategy..."</i>	AI reorganizes thinking into more systematic and adaptable processes.	

Constituent #3: Emotional and Experiential Engagement with AI

Table 5 presents the emotional and experiential responses of science educators toward AI integration in their teaching practices. The findings reveal that science educators' experiences with AI extend beyond cognitive and instructional benefits to include meaningful emotional and experiential dimensions. Participants described a progression in their emotional responses, beginning with curiosity and excitement as they explored AI and gradually developing confidence, reassurance, and professional responsibility through continued use. These experiences demonstrate that educators' engagement with AI is shaped not only by its technical capabilities but also by how it influences their confidence and teaching practice.

One participant shared,

"I feel relieved and supported when using AI in my teaching tasks because it helps me organize my lesson plans more easily and provides guidance in explaining complex topics." (P2)

Another participant added,

"It also helps save time, especially in preparing activities and assessments, which reduces the pressure in my teaching workload." (P4)

Table 5. Emotional and Experiential Engagement with AI

Participant ID	Meaning Unit (MU)	Verbatim Statement (Translated to English)	Transformed Meaning (Giorgi Psychological Language)	Constituent (Essential Structure of Experience)
P1, P4, P6	Initial excitement and positive adaptation to AI use	<i>"At first, I felt curious and excited because it was a new tool..."</i> <i>"At first, I was excited because it seemed like a new support system..."</i> <i>"I feel more confident and supported because AI makes my work easier..."</i>	AI evokes initial enthusiasm and adaptive engagement in teaching practice.	Emotional and Experiential Engagement with AI
P2, P5, P7	AI creates feelings of support and confidence	<i>"I feel relieved and supported when using AI in my teaching tasks..."</i> ; <i>"I feel more confident and supported when I use AI..."</i> ; <i>"I feel more efficient and supported because AI helps reduce my workload..."</i>	AI generates emotional assurance and professional confidence.	
P1, P2, P6	AI use involves caution due to accuracy concerns	<i>"However, there are also times when I feel hesitant due to concerns about accuracy..."</i> <i>"I remain cautious because I know it is not always 100% accurate..."</i> ; <i>"I remain cautious because not all information from AI is accurate..."</i>	AI use is accompanied by cautious emotional awareness of uncertainty.	
P4, P6, P7	AI use creates a sense of responsibility and accountability	<i>"I felt a sense of responsibility because I really need to check the outputs..."</i> ; <i>"It is helpful, but it still requires responsibility in using it..."</i> <i>"I still need to validate everything before using it in class..."</i>	AI use fosters accountability in verifying and applying outputs.	

These accounts suggest that AI contributes to educators' sense of professional support by reducing the demands of routine instructional tasks. Rather than simply improving efficiency, participants perceived AI as alleviating workload-related stress, allowing them to approach lesson preparation with greater confidence and focus. This emotional reassurance may encourage educators to devote more attention to instructional quality and student learning instead of administrative and planning burdens.

Despite these positive experiences, participants consistently emphasized that their trust in AI was accompanied by caution. Educators acknowledged that AI-generated responses may contain inaccuracies and therefore require careful evaluation before being used in the classroom. As one participant explained, they remain hesitant because AI is not always accurate and recognize the need to verify its outputs before integrating them into instruction.

This finding indicates that science educators do not perceive AI as an authoritative source of knowledge but rather as a supportive resource that complements, rather than replaces, professional judgment. Their willingness to validate AI-generated content reflects a strong sense of ethical and instructional responsibility, demonstrating that human expertise remains central to educational decision-making. The coexistence of confidence in AI's usefulness and caution regarding its limitations illustrates a balanced relationship in which educators benefit from technological support while maintaining accountability for the quality and accuracy of classroom instruction.

These findings extend existing research by showing that educators' emotional engagement with AI is characterized by both empowerment and critical awareness. While previous studies have highlighted AI's role in reducing workload and enhancing teacher confidence (Tang & Liao, 2025), the present findings further demonstrate that educators actively regulate their use of AI through continuous verification and professional judgment. This reinforces recommendations that human oversight remains essential in AI-assisted education to ensure the accuracy, reliability, and appropriateness of instructional materials (Cecilio-Fernandes & Sandars, 2025; Egunjobi, 2025; Lee & Song, 2024; Mondal & Mondal, 2024; Nazaretsky et al., 2022; Taheri et al., 2025).

Constituent #4: Critical Thinking and Ethical Awareness in AI Use

Table 6 presents the critical thinking processes and ethical considerations of science educators in using AI for instructional purposes. The findings reveal that science educators experience AI as a tool that strengthens rather than replaces their professional judgment. Participants consistently emphasized that AI-generated outputs require careful evaluation, modification, and contextualization before they can be integrated into classroom instruction. Rather than accepting AI-generated information at face value, educators described exercising critical thinking to ensure that instructional materials remain accurate, appropriate, and aligned with curriculum standards and students' learning needs.

One participant explained,

"I evaluate if the explanation is aligned with the curriculum level before I use it in my teaching and I make sure that the content is appropriate for my students' level of understanding, sometimes revising or simplifying the explanation so it will match their needs and learning capacity." (P4)

Similarly, another educator shared,

"I adjust answers to fit my students' level" (P5).

These accounts suggest that educators perceive AI-generated content as an initial resource rather than a finished instructional product. Their experiences demonstrate that the value of AI lies not in producing ready-to-use materials but in providing a foundation that teachers refine through their pedagogical expertise. By adapting AI outputs to curriculum requirements and learners' cognitive levels, educators preserve the contextual relevance and authenticity of classroom instruction while maintaining responsibility for instructional quality.

Participants also expressed awareness of the potential risks associated with excessive dependence on AI. Although they acknowledged its usefulness in supporting instructional tasks, they emphasized that over-reliance could weaken critical thinking and professional decision-making. Consequently, participants described using AI-generated responses as drafts or reference materials instead of final answers, reinforcing the importance of independent evaluation before classroom implementation.

This finding indicates that educators maintain a balanced relationship with AI by combining technological support with professional accountability. Rather than diminishing teachers' intellectual engagement, AI appears to encourage reflective practice by prompting educators to verify information, compare alternatives, and make informed instructional decisions. In this sense, critical thinking extends beyond verifying factual accuracy to include adapting content, exercising ethical judgment, and ensuring that AI-generated materials remain pedagogically appropriate.

These findings extend previous research by demonstrating that responsible AI integration depends not only on technological competence but also on educators' critical and ethical awareness. Consistent with constructivist perspectives, participants actively reconstructed AI-generated information to suit their instructional contexts instead of passively adopting it (Alam et al., 2026; Hasan, 2025; Wang et al., 2025; Zajda, 2021). This reinforces the view that AI serves as a catalyst for professional reflection while human expertise remains central to educational decision-making and instructional excellence (Tripathi et al., 2025).

Table 6. Critical Thinking and Ethical Awareness in AI Use

Participant ID	Meaning Unit (MU)	Verbatim Statement (Translated to English)	Transformed Meaning (Giorgi Psychological Language)	Constituent (Essential Structure of Experience)
P1, P2, P7	AI outputs must be verified before use	<i>"I still need to verify the information before using it in class..."</i>; <i>"I always double-check everything because AI is not always accurate..."</i>; <i>"I always validate information before using it in teaching..."</i>	Educators critically validate AI-generated outputs before application.	Critical Thinking and Ethical Awareness in AI Use
P4, P5, P6	AI outputs are adapted to curriculum and learner needs	<i>"I evaluate if the explanation is aligned with the curriculum level..."</i>; <i>"I adjust answers to fit my students' level..."</i>; <i>"I modify the content before using it in class..."</i>	AI outputs are contextualized based on educational requirements.	
P1, P6, P7	Awareness of over-reliance on AI is present	<i>"There's a risk of reduced critical thinking if someone relies too much on AI..."</i>; <i>"Sometimes it's very tempting to just rely on AI..."</i> <i>"I try to avoid over-reliance so I can still think independently..."</i>	Educators regulate dependence on AI to preserve cognitive autonomy.	
P1, P3, P5	Human judgment remains central in decision-making	<i>"I treat AI outputs as drafts or guides, not final answers..."</i>; <i>"I still make final decisions when using AI..."</i>; <i>"I still make final judgments based on my own analysis..."</i>	Educators maintain independent authority over instructional decisions.	

Constituent #5: Reconstruction of Teacher Identity and Meaning

Table 7 presents the changes in science educators' professional identity and the evolving meaning of their teaching roles in the context of AI integration. The integration of artificial intelligence (AI) reshapes how science educators understand their professional identity and purpose. Participants consistently described a transition from traditional teacher-centered roles toward more facilitative and learner-centered practices. Rather than viewing themselves primarily as providers of information, educators experienced their role as guiding students in constructing understanding, engaging with scientific concepts, and navigating AI-supported learning environments.

One participant reflected,

"It changed my role from being just a content provider to more of a facilitator and guide."
(P1)

Similarly, another educator shared,
“I have become more of a facilitator rather than just a source of knowledge.” (P5)

Table 7. Reconstruction of Teacher Identity and Meaning

Participant ID	Meaning Unit (MU)	Verbatim Statement	Transformed Meaning (Giorgi Psychological Language)	Constituent (Essential Structure of Experience)
P1, P4, P5	Teacher identity shifts from content provider to facilitator	<i>“It changed my role from being just a content provider to more of a facilitator and guide...”</i> ; <i>“From being just a lecturer to becoming more of a facilitator...”</i> ; <i>“I have become more of a facilitator and guide rather than just a source of knowledge...”</i>	Teachers reconstruct their identity as facilitators of student learning.	Reconstruction of Teacher Identity and Meaning
P2, P3, P6	Teachers redefine themselves as learning facilitators	<i>“It changed my role into someone who facilitates learning...”</i> ; <i>“It made me more of a facilitator of learning...”</i> ; <i>“I guide students more in understanding concepts critically...”</i>	Educators guide students toward critical and meaningful learning.	
P1, P6, P7	AI becomes part of professional growth and adaptation	<i>“It represents a shift... being a lifelong learner adapting to new technologies...”</i> ; <i>“It means continuous improvement as a professional educator...”</i> ; <i>“It means embracing innovation and continuous improvement...”</i>	AI encourages continuous learning and professional adaptability.	
P1, P5, P7	AI is understood as a tool for enhancement, not replacement	<i>“AI is a powerful tool but should not replace human thinking...”</i> ; <i>“AI is a tool for enhancement, not replacement...”</i>	AI enhances teaching without replacing human judgment.	

These experiences suggest that AI does not diminish the importance of teachers but instead redefines how their expertise is enacted in the classroom. As routine tasks such as content generation and lesson preparation become more technology-assisted, educators described shifting their attention toward facilitating learning, promoting inquiry, and supporting students' critical engagement with information. This transformation reflects a movement from knowledge transmission to learning facilitation, where teachers exercise pedagogical judgment to help students interpret, evaluate, and apply knowledge rather than simply receive it.

Participants also described this transition as requiring continuous professional growth. The rapid evolution of AI technologies encouraged educators to view themselves as lifelong learners who must continually adapt their knowledge and teaching practices. One participant explained that AI represents *“a shift towards being a lifelong learner adapting to new technologies”* (P1), while another emphasized the importance of *“continuous improvement as an educator”* (P6). These accounts indicate that professional identity is experienced as dynamic rather than fixed, evolving through ongoing learning, reflection, and adaptation to emerging educational technologies.

Despite embracing AI, participants consistently emphasized that human judgment remains indispensable in teaching. One educator summarized this perspective by stating,

“AI is a tool for enhancement, not replacement.” (P5)

This finding illustrates that educators perceive AI as complementing rather than substituting their professional expertise. While AI supports instructional planning and resource development, participants regarded ethical judgment, contextual decision-making, and meaningful student engagement as uniquely human responsibilities that cannot be delegated to technology. Consequently, AI integration was experienced not as a loss of professional identity but as an opportunity to strengthen teachers' roles as reflective practitioners, mentors, and facilitators of learning.

These findings extend contemporary perspectives on teacher identity by demonstrating that technological change influences not only instructional practices but also educators' understanding of their professional purpose. Consistent with previous research, teacher identity emerges as a dynamic construct that is continually reconstructed through experience, interaction, and engagement with evolving technologies (Graus et al., 2022; Pishghadam et al., 2022). However, the present findings further suggest that AI encourages educators to redefine professionalism by balancing technological competence with pedagogical expertise, ethical responsibility, and lifelong learning (Guilherme, 2017; Zhou & Peng, 2025).

A comparison of participants' teaching experience suggests subtle differences in how AI was experienced. Novice science educators (4–10 months of teaching experience) tended to emphasize AI as a source of instructional support, efficiency, and confidence-building, particularly in lesson preparation, content generation, and understanding unfamiliar concepts. Their narratives frequently reflected reliance on AI as a scaffold for navigating the demands of early teaching practice. In contrast, the more experienced educator (38 months of experience) described AI less as a source of immediate support and more as a tool for evaluating multiple perspectives, refining instructional decisions, and enhancing professional judgment. While both groups perceived AI positively, novice teachers appeared to focus on practical assistance, whereas the more experienced teacher highlighted analytical thinking and pedagogical decision-making. These findings suggest that teaching experience may shape how educators engage cognitively with AI, although further research involving a larger sample is needed to explore this relationship more fully.

The findings show that using artificial intelligence (AI) in teaching is more than just using a tool in which it affects how science educators teach, think, and make decisions. AI helps make tasks easier, gives different ideas, and supports deeper understanding, but teachers still carefully check, adjust, and improve the information before using it. This shows that while AI is helpful, teachers remain important in guiding learning. In the end, effective use of AI depends not on relying on it completely, but on using it thoughtfully to improve teaching and support better thinking in science education.

CONCLUSION AND IMPLICATIONS

This study explores how science educators describe using artificial intelligence (AI) in teaching and learning, revealing AI as an embedded pedagogical, cognitive, and professional support system. Science educators consistently described AI as a tool that enhances efficiency in lesson preparation, content generation, and continuous learning, while also shaping their emotional engagement through increased confidence, motivation, and cautious awareness. Beyond functional use, these experiences reflect a deeper transformation in how educators interact with knowledge, technology, and their instructional responsibilities, highlighting AI as a meaningful presence within their teaching practice rather than a peripheral tool.

More importantly, the findings clearly demonstrate that these experiences are directly linked to educators' thinking processes. The use of AI in generating multiple perspectives, organizing information, and verifying outputs promotes more structured, flexible, and analytical forms of thinking. Science educators also engage in higher-order cognitive processes such as evaluation,

comparison, decision-making, and metacognitive regulation as they interpret and adapt AI-generated content for instructional use. At the same time, the need to critically assess accuracy and avoid over-reliance reinforces reflective thinking and cognitive autonomy. This establishes that AI does not replace human cognition but actively reshapes it, functioning as a cognitive partner that enhances, extends, and refines educators' thinking processes within the teaching and learning environment.

These findings indicate that integrating AI in science education can both enrich cognition and transform pedagogy. Science educators must combine technical proficiency with critical thinking and ethical judgment to apply AI responsibly. Institutions should design professional development that addresses both the practical and conceptual aspects of AI, with special attention to the development of evaluative and reflective thinking. The results also support theories of constructivist and active learning, emphasizing that knowledge is built through interaction and engagement. Overall, AI integration underscores educators' evolving role as reflective practitioners who facilitate meaningful and rigorous learning through technology.

RECOMMENDATION & LIMITATION

Based on the findings of this study, it is recommended that future research further examine the relationship between AI use and cognitive processes by employing mixed-method or longitudinal designs to capture both experiential and measurable changes over time. Expanding the participant base across different subject areas and educational contexts would also provide a more comprehensive understanding of AI integration in education.

In practice, educational institutions are encouraged to implement structured training programs that go beyond basic AI tool utilization and focus on developing educators' critical evaluation skills, ethical awareness, and pedagogical decision-making. Additionally, clear institutional guidelines should be established to regulate AI use, ensuring that it supports learning while maintaining the central role of human judgment, professional responsibility, and cognitive independence in the teaching and learning process.

This study has several limitations that should be considered when interpreting its findings. First, the study involved only seven science educators from Baybay City, which is appropriate for descriptive phenomenological research that prioritizes depth of understanding over broad representation. However, the relatively small sample size, single-site setting, and focus on one disciplinary cluster limit the range of perspectives captured. Consequently, the findings may not reflect the experiences of educators from other geographic locations, institutional contexts, or academic disciplines where the integration of artificial intelligence (AI) may differ.

Second, although the study employed strategies such as bracketing (*epoché*), reflexive journaling, member checking, peer debriefing, and maintaining an audit trail to enhance trustworthiness, researcher interpretation remains inherent in qualitative data analysis. While these measures helped minimize potential bias, complete elimination of researcher subjectivity is not possible, and the interpretation of participants' lived experiences may have been influenced by the researcher's perspectives.

Finally, the study utilized both synchronous and asynchronous semi-structured interviews. While this approach increased participant accessibility and flexibility, asynchronous interviews may have limited opportunities for immediate probing and clarification, potentially affecting the depth and spontaneity of some responses. Although a common interview guide was used to ensure consistency across both interview modes, the findings should be viewed as context-specific rather than broadly generalizable. Instead, readers are encouraged to assess the transferability of the findings by considering the similarities between the study context and their own settings.

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USE OF ARTIFICIAL INTELLIGENCE TOOLS

Artificial intelligence (AI) tools were used to translate responses from Cebuano to English and to assist with grammar and spelling. These tools were applied solely for linguistic and editorial purposes, while all data interpretation and analysis were conducted by the researchers.

REFERENCES

- Alam, M. N., Islam, M. A., Babiker, M. O. A., Siddiqui, M. S., Amin, M. B., & Oláh, J. (2026). AI-assisted learning tools and student learning outcomes: A cognitive load theory perspective. *Computers in Human Behavior Reports*, 21, Article 100986. <https://doi.org/10.1016/j.chbr.2026.100986>
- Alshammari, S. H., & Alrehaili, T. A. (2025). The effect of teaching, social, and cognitive presence on student engagement in online courses: a structural equation modelling approach. *Acta Psychologica*, 258, 105183. <https://doi.org/10.1016/j.actpsy.2025.105183>
- Batsaikhan, B. (Zack), & Correia, A.-P. (2024). The effects of Generative Artificial Intelligence on Intelligent Tutoring Systems in higher education: A systematic review. *Studies in Technology Enhanced Learning*, 4(1). <https://doi.org/10.21428/8c225f6e.33570bb1>
- Cecilio-Fernandes, D., & Sandars, J. (2025). The hallucination of learning with generative artificial intelligence. *Medical Teacher*, 47(12), 2057–2058. <https://doi.org/10.1080/0142159x.2025.2531812>
- Du, Y., & Zhang, F. (2022). Examinees' affective preference for online speaking assessment: Synchronous VS asynchronous. *Chinese Language Teaching Methodology and Technology*, 5(1), Article 3. <https://engagedscholarship.csuohio.edu/cltm/vol5/iss1/3>
- Egunjobi, J. P. (2025). The misuse of AI-Generated content in academic and religious settings. *International Journal of Research and Scientific Innovation*, XII(XV), 871–879. <https://doi.org/10.51244/ijrsi.2025.121500077p>
- Fitria, T. N. (2023). The use of artificial intelligence in education (AIED): Can AI replace the teacher's role? *Epigram*, 20(2), 165–187. <https://doi.org/10.32722/epi.v20i2.5711>
- Gerlich, M. (2025). AI Tools in Society: Impacts on cognitive offloading and the future of critical thinking. *Societies*, 15(1), 6. <https://doi.org/10.3390/soc15010006>
- Giorgi, A. (2009). *The descriptive phenomenological method in psychology: A modified Husserlian approach*. Pittsburgh, PA: Duquesne University Press.
- Graus, M., Van De Broek, A., Hennissen, P., & Schils, T. (2022). Disentangling aspects of teacher identity learning from reflective blogs: The development of a category system. *Teaching and Teacher Education*, 111, 103624. <https://doi.org/10.1016/j.tate.2021.103624>
- Guilherme, A. (2017). AI and education: the importance of teacher and student relations. *AI & Society*, 34(1), 47–54. <https://doi.org/10.1007/s00146-017-0693-8>
- Harrasi, N. A., Subhi, N. A., Harthy, S. A., & Habsi, J. A. (2025). Learner perspectives on AI teacher effectiveness: The role of engagement, motivation, efficiency, and educational experience. *Social Sciences & Humanities Open*, 12, 101950. <https://doi.org/10.1016/j.ssaho.2025.101950>
- Hasan, M. K. (2025). How AI quietly undermines the joy and effort of learning: a call for rebalancing education in the digital age. *Annals of Medicine and Surgery*, 87(8), 4693–4694. <https://doi.org/10.1097/ms9.0000000000003456>
- Imran, M. a. U., Aziz, M. B., Tiwari, A., Saha, S., & Ghimire, A. (2024). Exploring the latest trends in AI Technologies: A study on current state, application and individual impacts. *Journal of Computer and Communications*, 12(08), 21–36. <https://doi.org/10.4236/jcc.2024.128002>
- Kalyani, L. K. (2024). The role of Technology in Education: Enhancing learning outcomes and 21st century skills. *International Journal of Scientific Research in Modern Science and Technology*, 3(4), 05–10. <https://doi.org/10.59828/ijrmst.v3i4.199>

- Kamalov, F., Calonge, D. S., & Gurrib, I. (2023). New era of Artificial intelligence in Education: Towards a sustainable Multifaceted Revolution. *Sustainability*, 15(16), 12451. <https://doi.org/10.3390/su151612451>
- Lee, S., & Song, K. (2024). Teachers' and students' perceptions of AI-generated concept explanations: Implications for integrating generative AI in computer science education. *Computers and Education: Artificial Intelligence*, 7, 100283. <https://doi.org/10.1016/j.caeai.2024.100283>
- Moemeke, C. (2024). Artificial Intelligence and Machine Learning in enhancing Science Learning Experiences: Exploring Possibilities and Concerns. *NIU Journal of Educational Research*, 10(2), 59-72. doi: 10.58709/niujed.v10i2.2000
- Mondal, H., & Mondal, S. (2024). Artificial Intelligence-Generated content needs a human oversight. *Indian Journal of Dermatology*, 69(3), 284. https://doi.org/10.4103/ijd.ijd_163_24
- Motukeeva, A., Azhibayeva, A., Kazieva, G., Zainiev, R., & Tokonbekova, K. (2025). Analysis of the features shaping students' thinking to enhance the educational process. *Higher Education for the Future*, 13(1), 25–49. <https://doi.org/10.1177/23476311251372249>
- Nazaretsky, T., Ariely, M., Cukurova, M., & Alexandron, G. (2022). Teachers' trust in AI -powered educational technology and a professional development program to improve it. *British Journal of Educational Technology*, 53(4), 914–931. <https://doi.org/10.1111/bjet.13232>
- Parviz, M. (2024). AI in education: Comparative perspectives from STEM and Non-STEM instructors. *Computers and Education Open*, 6, 100190. <https://doi.org/10.1016/j.caeo.2024.100190>
- Pérez-Ortiz, M., Novak, E., Bulathwela, S., & Shawe-Taylor, J. (2021). An AI-based learning companion promoting lifelong learning opportunities for all (arXiv Preprint No. arXiv:2112.01242). arXiv. <https://doi.org/10.48550/arXiv.2112.01242>
- Pishghadam, R., Golzar, J., & Miri, M. A. (2022). A new conceptual framework for teacher identity development. *Frontiers in Psychology*, 13, 876395. <https://doi.org/10.3389/fpsyg.2022.876395>
- Ruiz-Martín, H., Blanco, F., & Ferrero, M. (2024). Which learning techniques supported by cognitive research do students use at secondary school? Prevalence and associations with students' beliefs and achievement. *Cognitive Research: Principles and Implications*, 9(1), 44. <https://doi.org/10.1186/s41235-024-00567-5>
- Schmidt, D. A., Alboloushi, B., Thomas, A., & Magalhaes, R. (2025). Integrating artificial intelligence in higher education: perceptions, challenges, and strategies for academic innovation. *Computers and Education Open*, 9, 100274. <https://doi.org/10.1016/j.caeo.2025.100274>
- Taheri, R., Nazemi, N., Pennington, S. E., Clark, J. A., & Dadgostari, F. (2025). Factors influencing educators' AI adoption: A grounded meta-analysis review. *Computers and Education Artificial Intelligence*, 9, 100464. <https://doi.org/10.1016/j.caeai.2025.100464>
- Tan, X., Cheng, G., & Ling, M. H. (2024). Artificial intelligence in teaching and teacher professional development: A systematic review. *Computers and Education: Artificial Intelligence*, 8, 100355. <https://doi.org/10.1016/j.caeai.2024.100355>
- Tang, Z., & Liao, J. (2025). Unlocking emotional resilience: Exploring the impact of AI-enhanced support systems on EFL teachers' burnout and EFL students' well-being in modern classrooms. *Acta Psychologica*, 260, 105672. <https://doi.org/10.1016/j.actpsy.2025.105672>
- Tripathi, T., Sharma, S. R., Singh, V., Bhargava, P., & Raj, C. (2025). Teaching and learning with AI: a qualitative study on K-12 teachers' use and engagement with artificial intelligence. *Frontiers in Education*, 10. <https://doi.org/10.3389/educ.2025.1651217>
- Vieriu, A. M., & Petrea, G. (2025). The impact of artificial intelligence (AI) on students' academic development. *Education Sciences*, 15(3), 343. <https://doi.org/10.3390/educsci15030343>
- Wang, D., Dong, X., & Zhong, J. (2025). Enhance College AI Course Learning Experience with Constructivism-Based Blog Assignments. *Education Sciences*, 15(2), 217. <https://doi.org/10.3390/educsci15020217>
- Zajda, J. (2021). Constructivist learning theory and creating effective learning environments. In J. Zajda (Ed.), *Globalisation and education reforms* (pp. 35–50). Springer. https://doi.org/10.1007/978-3-030-71575-5_3
- Zhai, C., Wibowo, S., & Li, L. D. (2024). The effects of over-reliance on AI dialogue systems on students' cognitive abilities: a systematic review. *Smart Learning Environments*, 11(1). <https://doi.org/10.1186/s40561-024-00316-7>
- Zhou, M., & Peng, S. (2025). The usage of AI in teaching and students' creativity: the mediating role of learning engagement and the moderating role of AI literacy. *Behavioral Sciences*, 15(5), 587. <https://doi.org/10.3390/bs15050587>