Research Focus

Transforming Lesson Planning with ChatGPT: A Multi-Case Study of Pre-Service and In-Service Educators

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Abstract

This multi-case study explores how generative artificial intelligence (GenAI), specifically ChatGPT, influenced lesson planning in Texas teacher education. In-service and pre-service teachers developed lesson plans, revised them using ChatGPT-generated suggestions, and reflected on the benefits and challenges of AI integration. Pre- and post-intervention surveys were used to measure changes in attitude, perceived usefulness, ease of use, behavioral intention, and actual use. Results indicated increases across all five constructs, with especially strong gains in actual use and ease of use among pre-service teachers. Qualitative data revealed that teachers valued AI for enhancing lessons, offering additional instructional ideas, and improving student engagement. In-service teachers emphasized time efficiency and alignment with classroom needs, while pre-service teachers highlighted greater confidence and support during the planning process. Reported challenges included concerns about items such as accuracy, overreliance, tool complexity, ethical use, and the lack of human connection. Cross-case findings suggest that GenAI tools can support instructional planning when thoughtfully integrated and accompanied by professional development that reinforces teacher expertise.

Keywords: *generative artificial intelligence, teachers, technology acceptance, curriculum development, instructional design, professional development*

Designing lessons that are instructionally effective and relevant to diverse student needs is a common challenge among educators at all stages of their careers (Darling-Hammond et al., 2020). For both pre-service and in-service teachers, well-aligned lesson planning involves tasks such as applying content standards, creating assessments, and designing meaningful instructional activities (Drost & Levine, 2015). However, according to research compiled by the Organization for Economic Co-operation and Development (OECD, 2019), teachers are already spending an average of 6.5 hours per week on planning and lesson preparation, making it the second most time-intensive activity after actual classroom instruction.

The versatile functionality of generative artificial intelligence (GenAI) has initiated a transformative role in education (Baidoo-Anu & Ansah, 2023). It has expanded opportunities to examine GenAI's impact on lesson planning, which is an important and cognitively demanding aspect of teaching (Gurl et al., 2025; Lee & Zhai, 2024; van den Berg & du Plessis, 2023). Among its various applications, one emerging area of interest is how GenAI can help teachers enhance and deepen lessons they have already developed, rather than generate lessons from the outset (Sung & An, 2026). Studies across disciplines such as science (Lee & Zhai, 2024; Powell & Courchesne, 2024), mathematics (Gurl et al., 2025), and general pedagogy (Kalenda et al., 2025; Karaman, 2024; van den Berg & du Plessis, 2023) have highlighted the benefits of using GenAI for planning, but specific to lesson plan revision or enhancement. Researchers also raised concerns about using AI in lesson planning due to inaccurate content suggestions (Gurl et al., 2025) and generic responses that do not meet the specific needs of students (Kalenda et al., 2025).

There is an increasing interest in how educators utilize GenAI to enrich instruction in ways that are both reflective

and responsive to the diverse needs of students. In response, this study introduces an AI-Enhanced Lesson Plan Development and Implementation model, designed to help teachers move beyond surface-level artificial intelligence (AI) use and engage in deeper reflection on its role in strengthening their instructional practices (Sung & An, 2026). Grounded in Kolb's (1984) experiential learning cycle, the framework guides both in-service and pre-service educators through the stages of concrete experience, reflective observation, abstract conceptualization, and active implementation. Consistent with this cycle, participants first develop their own lesson plans before engaging with ChatGPT, positioning the tool as a means for improving lessons already built. By encouraging teachers to consider not just what GenAI can do, but what it should do, this model supports more intentional and informed instructional design. This approach aims to raise consciousness regarding AI adaptation in education, what Mirvis (2008) described as experiences that expand awareness of the self and surroundings, increase understanding of one's identity as an educator, and shape the relationship with AI technologies in the educational world, ultimately broadening the implications for authentic teaching practices.

Literature Review

The rapid advancement of GenAI, specifically through large language models (LLMs) such as the Chat Generative Pre-trained Transformer (ChatGPT), is revolutionizing how educators design and deliver instruction. GenAI refers to a group of AI models and algorithms that can produce new content, including text, images, video, and problem-solving strategies, with a level of adaptability and creativity that resembles actual human output (He et al., 2025). ChatGPT, a GenAI chatbot developed by OpenAI, is one of the most prominent examples of AI in education (Belcic & Stryker, 2025) and since its release in November 2022, has exhibited advanced capabilities in producing accurate and meaningful responses based on user prompts, making it highly accessible and widely adopted across instructional contexts (Brown et al., 2020; OpenAI, 2023).

Benefits to Education

The LLM ChatGPT has emerged as a dynamic educational tool, enabling educators to tailor instruction, improve content delivery, streamline administrative tasks, and engage in professional learning (Delello et al., 2024; Delello et al., 2025; Kasneci et al., 2023; van den Berg & du Plessis, 2023). For example, Delello et al. (2025) found that educators most frequently used ChatGPT for instructional planning, content generation, and assessment design, reinforcing its growing role in streamlining both pedagogical and administrative tasks.

In teacher preparation settings, pre-service teachers have used ChatGPT to support the development of instructional objectives, ensure standards alignment, and adapt strategies to meet diverse learner needs (Kalenda et al., 2025). Gurl et al. (2025) reported that pre-service teachers found ChatGPT to be a helpful resource during the initial planning phases of instruction, particularly for organizing lesson content, identifying relevant prior knowledge, anticipating common student misconceptions, and suggesting real-world mathematical applications. Similarly, Egara and Mosimege (2024) found that teachers who integrated ChatGPT into instruction appreciated its ability to clarify complex concepts, strengthen instructional effectiveness, and increase student engagement.

Other researchers have identified a broad array of uses for ChatGPT in educational settings, including the use of differentiated learning activities (Powell & Courchesne, 2024), personalized learning (Ali et al., 2024; Delello et al., 2024), collaborative learning (Oranga et al., 2024) and the development of language skills (Belda-Medina & Kokošková, 2023). In fact, survey results showed that 73% of teachers believed "ChatGPT can help students learn more," and 91% agreed that technology has the potential to support students in recovering from recent learning setbacks (Impact Research, 2023, pp. 1-2). Researchers have suggested that ChatGPT provided support as both a tutor (Al-Abri, 2025) and scaffolding aid to promote accessibility (Egara & Mosimege, 2024). Additionally, ChatGPT facilitated student-centered practices through project-based learning and interactive strategies that promoted student interest (Guo & Pan, 2024).

Challenges and Ethical Considerations

While many educators are optimistic about the potential of AI tools, others expressed concerns about ethical implications, student data privacy, and reduced teacher

autonomy (Ng et al., 2025). For instance, AI tools like ChatGPT may provide incorrect, vague, or pedagogically inappropriate feedback that could mislead learners. Oranga et al. (2024) suggested that questions remain as to "whether or not ChatGPT will lead to a rise in misinformation or ultimately replace human skills" (p. 104).

The integration of ChatGPT into educational settings has also raised significant concerns about academic integrity. For example, Moorhouse et al. (2023) claimed that students may use AI to cheat and/or plagiarize their work. Likewise, Delello et al. (2025) noted that while many educators valued AI's efficiency, they also expressed concerns about academic dishonesty and the lack of clear institutional policies guiding ethical classroom use. Another frequently cited issue was overreliance on such models, which may promote superficial learning habits and reduce critical thinking of students (Hadi Mogavi et al., 2024; Kalenda et al., 2025; Tlili et al., 2023). Heavy dependence on AI may also limit opportunities for emotional, social, and interpersonal learning typically fostered through human interaction (Delello et al., 2025). Furthermore, not all students or educators have equal access to AI technologies, or the digital literacy required to use them effectively, raising concerns about widening equity gaps (Chanda et al., 2024).

Meyer et al. (2023) identified LLMs like ChatGPT or CoPilot as valuable for improving academic work efficiency in tasks such as administrative support, coding education, writing, and research, but emphasized the need to remain cautious about bias and ethical implications. Powell and Courchesne (2024) found that while ChatGPT could generate science lesson plans aligned with the 5E model in under thirty minutes, teacher oversight was still required to address incomplete or questionable content. Relatedly, Kalenda et al. (2025) reported that lesson plans generated by AI were not strong in the differentiation of student instruction.

Teacher Attitudes Toward AI Integration

Teachers' attitudes toward AI use in the classroom are shaped by a myriad of factors including perceived usefulness, ease of use, and professional self-efficacy. For example, several studies highlighted that both pre-service and in-service teachers are more likely to adopt AI when they view it as intuitive and beneficial to their instructional goals (Ali et al., 2024; Li, 2023) and prior exposure to AI, institutional training, and alignment with teacher beliefs may influence adoption (Egara & Mosimege, 2024). Teachers who directly engaged with AI tools for lesson-enhancing tasks reported positive attitudes following the experience, as they recognize the practical instructional value of using AI for lesson planning (Sung & An, 2026).

As educators integrate AI into curriculum design, researchers call for frameworks that move beyond surface-level adoption. For example, Van den Berg and du Plessis (2023) advocated for using ChatGPT not just as a tool for convenience, but as a vehicle for reflective inquiry. Tlili et al. (2023) stressed the importance of guiding teachers in understanding the epistemological and ethical dimensions of AI, particularly with student learning and assessment. This suggests that AI use needs to be guided with critical reflection, not just exposing the tool alone. Arranz-García et al. (2025) pointed out the growing need for AI integration models that account for pedagogical goals, teacher identity, and classroom context, where such models support iterative reflection, allow for the co-construction of knowledge, and preserve the relational core of teaching.

Theoretical Framework

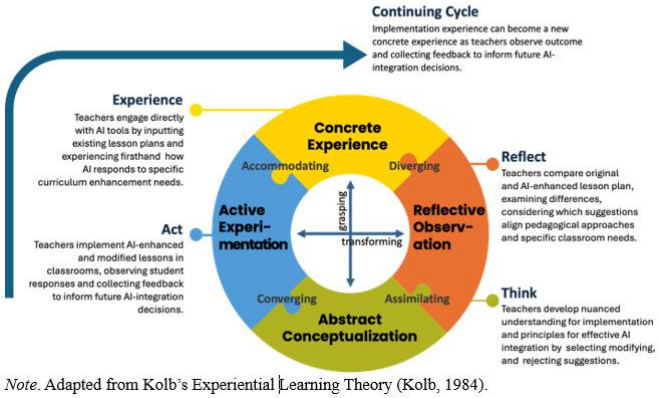
This study is grounded in a theoretical framework that combines Kolb's Experiential Learning Theory (ELT) (Kolb, 1984; Kolb & Kolb, 2009) with Mirvis's (2008) concept of consciousness-raising experiences. Kolb's ELT presents learning as a holistic and cyclical process in which individuals construct knowledge through four interconnected learning modes: concrete experience, reflective observation, abstract conceptualization, and active experimentation. These stages form a dynamic learning cycle (see Figure 1). These constructs are revisited continuously throughout the learning process, making this framework particularly relevant to pre-service and in-service teachers as they navigate how to incorporate emerging technologies like AI or GenAI into their instructional practices. Mirvis (2008) complements this framework by emphasizing the transformative nature of learning experiences that challenge existing beliefs and broaden awareness. His concept of consciousness-raising describes how individuals develop deeper insight into their

roles, values, and relationships within professional and social contexts.

Together, these theories offer complementary lenses through which educators can understand the integration of new technologies not just as a technical task, but as a reflective and developmental process. When framed through experiential learning and consciousness-raising, using GenAI in lesson planning becomes part of a broader pedagogical process, which deepens self-awareness, encourages intentional instructional decisions, and fosters thoughtful engagement with innovation in education (See Figure 1). This process progresses through a cycle of learning, beginning with concrete experience and advancing through reflection, conceptualization, and active experimentation. For example, in the concrete experience phase, learners engage directly with a phenomenon such as experimenting with AI tools to support lesson planning. This experience provides the foundation for the next phases of reflection and conceptualization. In reflective observation, participants examine their experiences from multiple perspectives and consider the broader instructional implications. Teachers may critically compare their original and AI-enhanced lesson plans to evaluate how well each addresses student engagement, differentiation, and assessment needs. Reflective observation and abstract conceptualization often occur simultaneously as participants assess and revise their lessons based on the output provided by AI. During this process, teachers may begin to better understand both the capabilities and limitations of AI within educational contexts. This leads to the development of professional judgment informed by Mirvis's (2008) concept of consciousness-raising, which encourages a deeper awareness of practice. The active experimentation phase involves implementing revised lesson plans in the classroom; this stage is not the end of the process but instead leads to new experiences that restart the learning cycle. Teachers observe how the lesson unfolds in practice and monitor student responses and engagement. Finally, participants respond to structured reflection prompts that guide them through three dimensions of awareness: Self-awareness, related to their role as educators working with new tools; interpersonal awareness, focused on how AI-enhanced instruction affects students; functional awareness, concerning AI's specific strengths and limitations in educational settings. This process fosters thoughtful reflection and supports the development of critical perspectives toward the integration of AI in teaching and learning.

Figure 1

The AI-Enhanced Lesson Planning Project Cycle: Based on Experiential Learning Theory



Note. Adapted from Kolb's Experiential Learning Theory (Kolb, 1984).

The Research Gap and Purpose

The integration of AI technologies into educational settings has evolved from a theoretical discussion to one of practical adaptation with empirical findings. Specifically, applications of LLMs such as ChatGPT have gained particular attention in K-16 education for their sophisticated text generation capabilities and responses tailored to specific instructional and research needs. Also, recent research highlighted the expanding reach of AI adoption across education. While early use centered on students' engagement with AI tools for learning, the scope has widened to include instructional design, administrative support, formative and summative assessment creation, and research facilitation (Kasneci et al., 2023; Lee & Zhai, 2024; Powell & Courchesne, 2024; Tlili et al., 2023; van den Berg & du Plessis, 2023). Despite the growing interest in the application of GenAI in education, there remains a dearth of research regarding how educators use tools such as ChatGPT to generate instructional content (Diliberti et al., 2024; Ng et al., 2025).

This multi-case study, serving as the primary research strategy, investigates teacher attitudes toward AI tools like ChatGPT as well as the benefits and challenges of using such tools to improve teaching practices. The findings aim to contribute to a deeper understanding of AI's potential to transform instructional planning and provide practical

insights into its application in curriculum design. The following research questions guided the study:

1. To what extent does the lesson plan intervention influence teachers' general attitudes toward ChatGPT and their behavioral intentions to use AI-based tools?
2. What are the perceived benefits of integrating AI tools like ChatGPT into lesson planning?
3. What are the perceived challenges of integrating AI tools like ChatGPT into lesson planning?

Methods of the Study

Research Design

This study employed a mixed-methods approach (Creswell & Creswell, 2023) within a multiple-case study design (Stake, 2006), conducted over two academic semesters with both in-service and pre-service teachers enrolled in graduate and undergraduate education courses. This design allowed for an in-depth examination of how GenAI tools, specifically ChatGPT, were integrated into lesson planning across varying teaching contexts.

The study consisted of two bounded cases and used a cross-case comparison to explore the phenomenon and to identify both shared patterns and meaningful differences across instructional contexts. Creswell and Poth (2018) emphasized the importance of defining the case clearly and describing the approach used to study it. A multiple-case approach, as outlined by Baxter and Jack (2008), allows for comparative insights across distinct cases, while Stake (2006) highlighted how a cross-case analysis helps identify both commonalities and unique features across different settings. Throughout the findings section, these two analytical units are referred to as Case 1 (in-service teachers) and Case 2 (pre-service teachers) enabling within-case analysis of each group's experiences and comparison of patterns across two cases.

The study was conducted by three faculty members at a regional university in Texas. Each researcher brought extensive experience in teaching and curriculum development, and the shared aim was to explore the potential of AI to enhance lesson planning and student engagement. This study was approved by the Institutional Review Board (IRB) at the researchers' university.

Participants

Participants in the study included both pre-service teachers in a teacher preparation program and in-service teachers who were actively working in Texas schools. All participants were enrolled in one of two education courses at the university that required a lesson plan assignment involving ChatGPT. Each course represented a separate case in the study. A total of 23 individuals participated in the study: Fourteen pre-service teachers and nine in-service teachers. Most were female (n = 21, 91.3%), with one identifying as male and one as non-identified. Ages ranged from 19 to 52 years, with a mean of 24 years. Most participants identified as White, non-Hispanic (n = 16, 69.6%), followed by Hispanic, Latino, or Spanish origin (n = 4, 17.4%) and Black or African American (n = 3, 13%). A detailed demographic breakdown by pre-service and in-service teacher groups is provided in Table 1.

Table 1

Participant Demographics by Pre-service and In-service Groups

Demographic Variable	Pre-service Teachers	In-service Teachers
Age		
Mean (SD)	21.4 (2.20)	31.6 (9.47)
Range	19-27	22-52
Gender		
Female	13 (93%)	8 (88.9%)
Male	0 (0%)	1 (11.1%)
Not identified	1 (7%)	0 (0%)
Ethnicity		
White, non-Hispanic	10 (71.4%)	6 (66.7%)
Hispanic, Latino, or Spanish origin	2 (14.3%)	2 (22.2%)
Black or African American	2 (14.3%)	1 (11.1%)
Program/Professional Status		
Junior	2 (14.3%)	Master's Program
Senior	12 (85.7%)	9 (100%)
Teaching Experience (years)		
0 year	4 (28.6%)	2 (22.2%)
1 year	0 (0%)	1 (11.1%)
2 years	3 (21.4%)	0 (0%)
3 years	1 (7.1%)	2 (22.2%)
5 years	0 (0%)	1 (11.1%)
Not specified	6 (42.9%)	3 (33.3%)
Prior AI Use Experience		
Yes	10 (71.4%)	5 (55.6%)
No	4 (28.6%)	4 (44.4%)

Within the in-service teacher group (n = 9), five participants (55.6%) were full-time teachers responsible for subjects including chemistry, social studies, science, mathematics, and college readiness. One participant (11.1%) was a substitute teacher, and three (33.3%) did not specify their roles. The pre-service group (n = 14) consisted of undergraduate students in a teacher preparation program,

with the majority (n = 12, 85.7%) in their senior year and the remainder (n = 2, 14.3%) classified as juniors. All pre-service participants were engaged in field placements during the study. Prior to the intervention, 71.4% of pre-service teachers (n = 10) reported previous experience using AI tools such as ChatGPT. Their uses included creating lesson plans, brainstorming ideas, incorporating higher-order thinking strategies, and identifying instructional activities and games. Among in-service teachers, five (55.6%) reported prior AI use, which was primarily limited to generating worksheets, drafting assignments, and communicating with parents.

Data Collection

Data collected included teacher reflection papers, side-by-side comparisons of original and AI-enhanced lesson plans, and pre- and post-survey responses. The primary focus of the study was to examine the integration of GenAI tools, such as ChatGPT, in curriculum development. Participants used ChatGPT to enhance lesson plans aligned with the Texas Essential Knowledge and Skills (TEKS), Texas's curriculum standards (Texas Education Agency, 2026), with AI providing suggestions to improve content delivery, assessment methods, and student engagement strategies. The in-service and pre-service teachers implemented these AI-informed lessons in either classroom settings or simulated teaching environments and reflected on the outcomes. Collecting multiple sources of data allowed the researchers to document both participants' perceptions of AI and the concrete ways in which AI transformed their lesson plans and instructional decisions.

The pre- and post-surveys were adapted from Li's (2023) research, which was based on the Technology Acceptance Model, and included items related to participants' attitudes toward ChatGPT, perceived usefulness, ease of use, behavioral intention, and actual use of AI tools. The surveys served as a descriptive measure of participants' perceptions before and after they completed the AI-supported lesson plan assignment.

The lesson plans and reflection papers captured detailed accounts of participants' experiences with AI, including the specific prompts used, the instructional changes made (see Table 2), and their perceptions of the benefits and challenges. These qualitative artifacts provided insight into how teachers integrated GenAI into instructional planning and how its suggestions shaped their instructional decisions.

Table 2

Example of an AI-Enhanced Lesson Plan

Spanish I High School	Original Lesson	AI Enhanced Lesson
Warm-Up	Display a meme in Spanish and discuss its meaning in English.	Digital Meme Discussion: Display a meme and use AI to analyze cultural context. Share responses on smartboard or Google Classroom.
Instruction	Introduce 10 phrases using Canva PowerPoint. Provide English translations and real-life pronunciation guidance.	Introduce phrases with visuals on an interactive whiteboard. Use AI text-to-speech tools for pronunciation. Share QR codes for additional pronunciation practice- apps like Quizlet or Duolingo.
Guided Practice	Pair students to practice pronunciation and usage of the phrases in a scripted conversation.	Pair students for differentiated practice. Integrate AI chatbots for conversation practice, enabling students to type/speak phrases and receive feedback.
Independent Practice	Create a short dialogue using 5 phrases and present it to the class.	Differentiation: Advanced students create complex dialogues; emerging learners use templates. Record dialogues using Chromebooks. Feedback provided through AI pronunciation checkers.
Closure	Recap phrases and ask students to share their favorite one using whiteboards.	Interactive Review: Students share their favorite phrases on interactive whiteboards. Generate a real-time word cloud using AI tools to visualize responses.
Assessment	Informal observation during practice and an exit ticket where students write two phrases they learned and meanings.	Informal observation during practice and an exit ticket on Google Forms feedback. Students can write/type their responses for immediate evaluation.
Extensions	N/A	Incorporated GimKit/Kahoot! for review and AI-generated cultural insights about phrase usage.

Data Analysis

The purpose of this study was to understand how in-service and pre-service teachers utilized GenAI tools, such as ChatGPT, to enhance lesson planning. The data analysis process incorporated both within-case and cross-case approaches (Stake, 2006). Each of the cases was analyzed individually to identify key patterns and insights. The data included participants' reflection journals, pre- and post-survey responses, and side-by-side comparisons of their original and AI-enhanced lesson plans.

Quantitative data from the pre- and post-surveys were analyzed using descriptive statistics to examine changes in participants' general attitudes toward ChatGPT (4 items), perceived usefulness (5 items), perceived ease of use (5 items), behavioral intention toward AI-based systems (5 items), and actual use of AI-based systems (6 items), with all items measured on a 5-point Likert scale. Descriptive statistics were selected because the purpose of the

quantitative component was to provide an overview of changes in participants' perceptions rather than to test specific hypotheses. Table 3 presents the means, standard deviations, and Cronbach's alpha coefficients for each construct, reported overall, by pre- and post-intervention, and by pre-service and in-service subgroups. All variables demonstrated good to excellent reliability, with Cronbach's alpha values ranging from .82 to .98.

Table 3

Reliability and Sample Items for Quantitative Variables

Variables	α	Sample Items
General Attitude Toward ChatGPT	**.94**	Overall, my attitude towards the use of ChatGPT in education is positive
Pre / Post	.91/.98	
Perceived Usefulness	**.95**	Using ChatGPT helps me to learn more efficiently
Pre / Post	.93/.96	
Perceived Ease of Use	**.96**	It is easy for me to learn to use ChatGPT
Pre / Post	.95/.97	
Behavioral Intention Toward AI-based System	**.95**	I intended to adopt ChatGPT for my study
Pre / Post	.95/.93	
Actual Use of AI-based Systems	**.84**	I believe ChatGPT helps me enhance my learning efficiency
Pre / Post	.82/.85	

Note. α = Cronbach's alpha, representing the internal consistency reliability of the items for each construct, reported for the overall scale and separately for pre- and post-intervention.

The qualitative analysis began with researchers reviewing the reflection journals to gain familiarity with the content and to identify recurring ideas. An inductive approach was employed, in which the themes emerged organically from the data itself (Merriam, 2009). The analysis sought to uncover the meaning expressed in participants' reflections and to interpret how they made sense of using AI in lesson planning (Lincoln & Guba, 1985). Data were segmented into smaller units of meaning, such as phrases, sentences, or paragraphs, which were assigned descriptive codes. These codes were then refined and grouped into broader categories to capture overarching concepts. Because some teachers referred to the same topic more than once within their reflections, the number of coded statements (*n*) may exceed the number of participants. Themes were finalized through team discussion to ensure the categories reflected the full set of coded data.

A constant comparative method followed (Glaser & Strauss, 1965). Each new segment of data was compared to previously coded material to determine whether it aligned with an existing category or warranted the creation of a new one. This process supported consistent coding decisions and a clear organization of categories. After within-case analysis was complete, the research team compared patterns across the two cases to identify shared experiences, differences, and unique outliers. This cross-case analysis broadened the understanding of how GenAI influenced curriculum development across varying instructional contexts.

Trustworthiness

To ensure the credibility and reliability of the study, several trustworthiness strategies were employed (Lincoln & Guba, 1985). Triangulation was achieved by analyzing multiple data sources, including reflection journals, lesson plan comparisons, and pre- and post-survey data. Researchers also kept analytic memos during coding and analysis to document decisions and strengthen the audit trail. The collaborative nature of the research team reinforced trustworthiness. Team members jointly reviewed data, refined codes, and discussed interpretations, which allowed for multiple perspectives to inform the analysis. These efforts ensured that the coding process was both rigorous and reflective, supporting a well-grounded understanding of participants' experiences with AI-enhanced lesson planning. This systematic approach strengthened the reliability of the findings and their contribution to understanding the role of GenAI in education. The next sections present the two cases separately, followed by a cross-case analysis that highlights shared and unique findings.

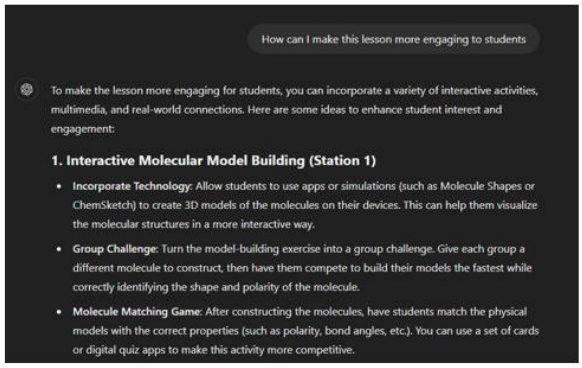
Case One: In-Service Teachers

Case One involved a bounded group of nine in-service teachers (eight female, one male) enrolled in a graduate-level educational technology course, each tasked with enhancing or developing a lesson plan using ChatGPT. The educators spanned various grade levels and subjects, including 8th grade science examining the impact of human activities on ecosystems, 1st grade social studies focused on community rules and government functions, 5th grade math involving multiplication and division of fractions, high school Spanish centered on conversational skills, high school chemistry on molecular modeling, a high school Advancement Via Individual Determination (AVID) program lesson aimed at improving note-taking skills for college readiness, 6th grade earth science covering plate tectonics, an elementary writing lesson, and a 7th grade language arts lesson analyzing elements in literature.

As part of their course assignment, each teacher submitted their original lesson plan along with specific prompts to ChatGPT, seeking suggestions for improvements. Upon receiving AI-generated recommendations (see Figure 2), the teachers evaluated these for applicability, integrated the most useful enhancements into their lesson plans, taught the revised lessons in their classrooms, and then reflected on the process. The prompting process often involved multiple iterations, with teachers refining their requests to receive more customized and specific suggestions from ChatGPT.

Figure 2

Example Lesson Plan Prompt in ChatGPT



Case One Findings

The quantitative findings revealed growth across all five measured constructs among in-service teachers: attitudes, perceived usefulness, perceived ease of use, behavioral intention to use AI, and actual use. For instance, the *general attitudes* of the in-service teachers improved from pre-intervention ($M = 3.62$, $SD = 0.93$) to post-intervention ($M = 4.06$, $SD = 0.94$). The *perceived usefulness* also increased, with mean scores rising from $M = 3.86$ ($SD = 0.71$) to $M = 4.0$ ($SD = 0.81$). Their *perceived ease of use* in using GenAI increased from $M = 3.93$ ($SD = 0.68$) to $M = 4.25$ ($SD = 0.52$). The teachers' *behavioral intention to use AI* for lesson planning also increased, as reflected in the change of $M = 3.76$ ($SD = 0.68$) to $M = 4.20$ ($SD = 0.93$). Also, their *actual usage* increased, but at a smaller rate than the other variables $M = 3.55$ ($SD = 0.57$) to $M = 3.74$ ($SD = 0.64$).

The qualitative findings supported these quantitative gains, providing a deeper understanding of how in-service teachers experienced the integration of GenAI into their instruction. All of the in-service teachers submitted written reflections after implementing their lesson plans. The reflections were coded in full, and the frequencies reported for each theme reflect the total number of excerpts assigned to that category. Representative quotes are included to illustrate the themes that emerged from the full set of coded reflections (see Table 4). The analysis of these reflections revealed several key findings, including both benefits and challenges to using AI for lesson planning.

Benefits of AI: Effective and Efficient Instruction

In exploring the use of AI for lesson planning, the thematic analysis revealed a range of benefits, which included: variety of ideas, increased student engagement, more effective differentiated instruction strategies, improved assessment and evaluation techniques, time savings, fostering of collaboration and teamwork, alongside greater real-world applications (see Table 4).

Variety of Ideas. The most frequently mentioned benefit ($n = 11$) was AI's potential to expand teachers' instructional toolkit by providing a *variety of teaching ideas*. For example, one educator stated, "AI influenced the quality of my lesson plans by providing more in-depth ideas that I wouldn't have thought about otherwise." Another educator reported, "The AI suggestions not only met my expectations but went beyond what I thought they would do, offering a much better and more thorough learning experience for my students."

Student Engagement. Eight teachers conveyed that AI-generated suggestions improved *student engagement*. Teachers observed that students were more involved and interested when lessons incorporated AI-driven activities. "When I used the new lesson in class, I noticed students were more engaged. The variety of activities kept them interested," one teacher remarked. Another commented that "during the actual teaching experience, I feel like I was able to receive more engagement along with more confidence from students…"

Differentiated Instruction. Another commonly mentioned benefit was AI's significant role in supporting diverse

learners with *differentiated instructional* strategies (*n* = 8). For example, one teacher appreciated how AI transformed their approach to inclusivity, stating:

> *One of the biggest changes AI helped me with was making the lesson more inclusive. Before, I had a one-size-fits-all approach. The AI suggested ways to support different types of learners, like using pictures for visual learners and role-playing for hands-on learners.*

Another teacher noted the practical applications for students requiring extra support: "AI also helped me think about students who need extra support, like those who struggle with writing. It suggested using sentence starters and graphic organizers, which made the lesson easier for them." In addition, the use of technology to enhance accessibility was emphasized, with one educator mentioning, "It allowed me to think outside of the box regarding scaffolding for example, the suggestion to incorporate fonts with heavy contrast for students with dyslexia." The tailored approaches extended to detailed lesson modifications, as another educator implemented AI's recommendations by providing "struggling students with a concept map that already has the key terms and concepts...and a cause-and-effect chart for them to fill out."

Time Savings. *Time savings* were benefits identified by all participants (*n* = 9). For instance, teachers appreciated the efficiency of using AI to revise lessons, with one teacher stating, "The time it took me to revise my lesson with ChatGPT was a fraction of what it normally takes." Another teacher reflected, "The time it took me to create the original lesson versus the time AI was able to generate the new lesson in a matter of seconds was insane!"

Assessment and Evaluation. Teachers mentioned specific instances where AI helped with *assessment* techniques (*n* = 5), particularly through the generation of probing questions and structuring exit tickets that provided immediate insight into student comprehension. For instance, one teacher shared: "I had CHATGPT add some thought-provoking questions after giving it my whole station rotation lab. The students answered them on their own which gave me a good idea of who understood the material and who did not." Another teacher stated, "This allowed for a wider range of instructional and assessment strategies that I had not thought of before."

Fostering Collaboration and Teamwork. Five mentions highlighted how AI suggested enhancements fostered student collaboration within the classroom environment. All five noted that peer discussions and group projects encouraged student *collaboration* and *teamwork*. One teacher illustrated this with a specific example, remarking, "Students lead the way, answering each other's questions and expanding on each other's points." Another one of these teachers specifically noted the students "started learning from each other and talking through the questions. The students this year understood the material better after collaborating with each other and having these real conversations about it."

Real-World Application. Four reflections emphasized the effectiveness of *real-world examples* suggested by AI. "During the explain sections, students responded well to using real world examples that the AI recommended," shared one teacher. Another teacher wrote:

I think they [AI] improve the lesson by helping students see the real-world implications of what they're learning. If they can see how human activities are impacting the natural world around them, they will be more interested and passionate about making changes.

Challenges of AI and Considerations

While the educators reported that AI offered substantial benefits, its integration into teaching also presented several unique challenges, which included accuracy and alignment issues, overreliance and a diminished need for a human component, prompting, ethical, cheating, plagiarism issues, tool complexity, overall workforce concerns, and preferences for or against AI-assisted planning. The teachers also noted preferences for and against the use of GenAI in instructional planning.

Accuracy. The most frequently listed challenge was that GenAI output lacks specificity, creativity, and contains errors (*n* = 13). Participants emphasized that teacher expertise and review is necessary to verify AI-generated output to enhance *accuracy and specificity* for classroom and student contexts. For example, one teacher reported, "I had to read everything thoroughly and check it for *accuracy*. I also noticed that if you asked too many

questions, they became very repetitive and asked the same questions in different ways."

Alignment Issues. Six participants highlighted the importance of teachers' expertise to review the *alignment* between AI-generated lessons and implementation contexts such as students' needs, teaching methods, and accommodation. One educator noted, "While AI was helpful, some ideas felt like they didn't fully align with the unique needs of my classroom." Another pointed out that "if not implemented correctly with the differentiation and scaffolding needed, it may not be a successful one."

Overreliance on AI. Concerns also existed about *overreliance* on AI were reported in six of the excerpts illustrating that teachers worry about increased complacency. One educator wrote, "AI can make teachers lazy in how they complete their lesson planning." Another emphasized, "The most important takeaway for educators is not to be reliant on AI to do their work completely." Teachers also expressed concerns about reduced efforts as found in the following sentiment: "Teachers may put less time into thorough planning."

Human Component. Another evident concern from the teachers was the potential for AI to diminish the *human* element in education and the need for integrating *human insights* for implementing AI-generated lessons. One teacher observed, "While AI provides accurate pronunciation, I think they lack personal student teacher connection. Students often have follow-up questions or need additional clarification, which the tools could not provide." Another educator affirmed, "AI can suggest ideas, but it can't replace the personal touch, and creativity teachers bring." Teachers also highlighted that "anyone can prepare a lesson plan-- it just has a big impact on delivery" and "It gives you a solid base to get started, but as an educator, you are the expert, you know your students' needs."

Prompt Engineering. Five participants acknowledged the need to develop effective *prompting* techniques and build AI utilization skills. One teacher noted, "The system, however, does provide a great starting point, and with proper prompting, it can eventually get to something that is usable." Another observed, "With AI, the more details one wants, then the more questions must be asked."

Ethics, Cheating, and Plagiarism. Several concerns (n = 3) were raised about *unethical* uses of AI-generated outputs, *cheating, and plagiarism*. One teacher expressed, "I feel the drawbacks could be just as similar to those that a human could also make other than the most evident concern, 'cheating'." Others worried students "will just have the AI complete it for them" and that "It can be tempting to copy and paste AI responses into the lesson plans without thoroughly reading them."

Complex and Difficult Tool Concern. Two teachers noted difficulties in using *complex AI tools* effectively due to information overload and technical barriers. One teacher noted, "I also feel that it can be overwhelming when you get a response from chat gpt, sometimes it gives too much information or ideas and it's not that simplified."

Workforce Concerns. One educator expressed a level of anxiety about the increasing role of AI, fearing it could lead to a reduction in the teaching *workforce* as highlighted in the following sentiment: "I also fear that too much use of AI can lead to not needing educators in classrooms therefore no job opportunities." Conversely, a different educator stated, "Considering how many thousands of people are rapidly leaving the education system, I believe this can assist educators and students."

Preference. Despite recognizing AI's effectiveness, some teachers (n = 2) still preferred traditional methods. For example, one of the teachers typed, "While these tools meet expectations in terms of efficiency and innovation, I found myself liking the traditional teaching method to maintain balance." Yet, one educator noted, "I had several students comment that they liked this way of learning better."

Table 4

Reflection Journal Themes, Description, and Representative Excerpts

Themes Discussing Benefits of Effective and Efficient Instruction		
Theme	**Descriptions**	**Representative Excerpts**
Variety of Ideas (n = 11)	Alternative suggestions and diverse teaching activities/approaches that expanded teachers' instructional resources	• AI influenced the quality of my lesson plans by providing more in-depth ideas that I wouldn't have thought about otherwise. • The AI suggestions not only met my expectations but went beyond what I thought they would do, offering a much better and more thorough learning experience for my students
Student Engagement (n = 8)	ChatGPT generated activities and ideas, increased students' interest, and participation in lessons	• When I used the new lesson in class, I noticed students were more engaged. The variety of activities kept them interested, and they seemed to understand the material better. • During the actual teaching experience, I feel like I was able to receive more engagement along with more confidence from students when completing the exit ticket and participating in this introductory unit.
Differentiated Instruction (n = 8)	Enhancements and suggestions that address supporting diverse students' accommodations and needs	• One of the biggest changes AI helped me with was making the lesson more inclusive. Before, I had a one-size-fits-all approach. The AI suggested ways to support different types of learners, like using pictures for visual learners and role-playing for hands-on learners. This was something I hadn't thought of but was really helpful. • AI also helped me think about students who need extra support, like those who struggle with writing. It suggested using sentence starters and graphic organizers, which made the lesson easier for them
Assessment/ Evaluation (n = 5)	Diverse assessment ideas, strategies, and insights for measuring students' performance	• I had CHATGPT add some thought-provoking questions... which gave me a good idea of who understood the material and who did not. I was then able to go back and reteach the students. • This allowed for a wider range of instructional and assessment strategies that I had not thought of before.
Time Saving (n = 9)	Significant reduction in lesson preparation and/or enhancement time	• The time it took me to revise my lesson with ChatGPT was a fraction of what it normally takes. • The time it took me to create the original lesson versus the time AI was able to generate the new lesson in a matter of seconds was insane!
Teamwork/ Collaboration (n = 5)	Enhanced lessons that fostered peer interaction and collaborative learning	• I think they improve the lesson by helping students see the real-world implications of what they're learning. • Students lead the way, answering each other's question.
Real-World Examples (n = 4)	Suggested activities and applications that demonstrated relevance to real-world problems, helping students connect concepts to their experience	• I think they improve the lesson by helping students see the real-world implications of what they're learning. • Using local examples to illustrate ecosystems helped students connect concepts to their own environment.
Themes Discussing Challenges and Considerations		
Theme	**Descriptions**	**Representative Excerpts**
Accuracy (n = 13)	Recognition of GenAI-output lacking specificity, creativity, or containing errors that require verification and expertise review	• AI outcomes can contain errors, can be vague, and lack specificity needed in lesson design • While drawbacks could be errors, potential biases, or incorrect information. • ChatGPT is very formulaic. • AI outcomes can contain errors, can be vague, lack specificity needed in lesson design • I found everything else to be very broad, basic, and uninspiring.
Alignment (n = 6)	Need for teacher review of alignment between lessons and classroom context, and critical evaluation of GenAI-generated output based on teachers' expertise	• While AI was helpful, some ideas felt like they didn't fully align with the unique needs of my classroom. • (...)if not implemented correctly with the differentiation and scaffolding needed, it may not be a successful one. • It also doesn't always account for the specific needs of your class or school, so adjustments are often necessary.
Overreliance (n = 6)	Concerns about educators becoming overdependent on AI tools	• AI can make teachers lazy in how they complete their lesson planning. • The most important takeaway for educators is not to be reliant on AI to do their work completely.

Human Component (n = 6)	Concerns about reduction in human interaction and the integration of human insights, especially teachers' professional knowledge brought into the classroom.	• While AI provide accurate pronunciation, I think they lack personal student teacher connection. Students often have follow-up questions or need additional clarification, which the tools could not provide. • AI can suggest ideas, but it can't replace the personal touch and creativity teachers bring. • [...] anyone can prepare a lesson plan-- it just has a big impact on delivery. • It gives you a solid base to get started, but as an educator, you are the expert, you know your students' needs.
Prompt Engineering (n = 5)	Recognition of the need for developing and applying effective prompting techniques and promoting AI literacy	• [...] The system, however, does provide a great starting point, and with proper prompting, it can eventually get to something that is usable. • With AI, the more details one wants, then the more questions must be asked.
Ethics/Cheating/Plagiarism (n = 3)	Concerns about unethical uses of GenAI-generated outputs, cheating and plagiarism	• I feel the drawbacks could be just as similar to those that a human could also make other than the most evident concern, "cheating". • (...)they will just have the AI complete it for them. • It can be tempting to copy and paste AI responses into the lesson plans without thoroughly reading them
Complexity/ Difficulty/ Limitations (n = 2)	Challenges in effective GenAI use, information overload, and technical barriers	• While these tools are beneficial, I think there would be some challenges that could potentially arise. For example, some students could struggle to navigate Flip, which slows down the lesson. Those with anxiety could feel self-conscious about recording themselves resulting in shying away from the activity. • I also feel that it can be overwhelming when you get a response from chat gpt, sometimes it gives too much information or ideas and it's not that simplified.
Workforce Concern (n = 2)	Anxiety about potential impact on teaching profession	• I also fear that too much use of AI can lead to not needing educators in classrooms therefore no job opportunities.
Preference (n = 2)	Students' and teachers' preferences toward GenAI-generated versus traditionally created lessons	• I had several students comment that they liked this way of learning better. • While these tools meet expectations in terms of efficiency and innovation, I found myself liking the traditional teaching method to maintain balance that all students remained engaged.

Case One Discussion

The utilization of AI in educational settings, as explored through Case One, underscores a shift in how lesson planning and curriculum alignment may be undertaken. This case revealed significant insights into teacher attitudes towards the use of GenAI and the benefits and challenges associated with integrating it into teaching practices.

The quantitative findings highlighted growth across all five constructs in the in-service teachers' perceptions and engagement with GenAI tools for lesson planning. The data suggest that exposure to such AI tools may positively influence how teachers view and use such emerging technologies. This shift was evident not only in improved attitudes and perceived usefulness but also in teachers' overall confidence and willingness to integrate AI into their instruction. Although actual use showed lower gains than the other variables, the overall pattern reflects the value of this activity.

Qualitative reflections revealed that GenAI introduced additional teaching ideas that expanded upon the lesson plans educators had already developed. Teachers reported improved student engagement, noting that students were more involved during AI-enhanced lessons. AI's support for differentiated instruction was also notable, as it suggested scaffolding strategies such as sentence starters, graphic organizers, and visually enhanced materials to address diverse learner needs. Additionally, teachers utilized AI to devise probing questions and structured exit tickets, which provided timely insight into student comprehension allowing for instructional adjustments. Teachers also shared instances where AI-suggested group projects and peer discussion promoted student collaboration. Some of the reflections even emphasized the incorporation of real-world applications, making content more relevant and meaningful to students.

Despite these benefits, integrating AI was not without challenges. Teachers reported that AI-generated suggestions for improving their own lessons often lacked specificity or contained errors requiring careful review and revision. For example, one teacher reported that ChatGPT suggested incorporating Microsoft's Flip video-based platform without recognizing it had been discontinued. While GenAI provided useful suggestions for improving existing lessons, teachers still needed to evaluate and adapt the output to meet the needs of the students and classrooms. Some teachers found that AI suggestions did not align with their teaching methods or local instructional goals, resulting in additional work to adjust or reframe the content.

Concerns around overreliance on AI were also evident, with teachers cautioning that repeated use could lead to complacency and affect the depth of teacher engagement in planning. Others found AI responses too broad or information-heavy, requiring additional effort to review relevant content. A few teachers noted that unfamiliarity with effective prompting could limit the usefulness of AI output, reinforcing the need for clearer training and more guided support. An added concern was the potential lack of the human component in education. Some teachers emphasized that AI, while helpful, could not replicate the meaningful relationships that are important to teaching and learning and may not understand students as individuals or respond to follow-up questions and emotional cues the way a human can. Concerns about the future of the workforce were also mentioned alongside risks of cheating and

plagiarism. Yet, at the same time, one participant viewed AI as a support tool especially during a period of growing teacher shortage. Finally, while many educators embraced AI, some still expressed a preference for traditional methods. These teachers acknowledged the efficiency of AI but felt more comfortable with conventional planning processes.

Overall, the findings from Case One show that in-service teachers found value but also difficulty in using GenAI to enhance their existing lesson plans. While they identified clear benefits such as saving time, strengthening existing lesson plans with diverse activities, increasing student engagement, and supporting differentiated instruction, they also shared concerns about accuracy, overreliance, and the need to maintain the teacher's role in the learning process. Collectively, these challenges point to the need for teachers to critically review AI-generated content, ensure alignment with student needs and curriculum standards, and apply professional judgment so GenAI supplements rather than replaces critical lesson planning. Teachers may also benefit from targeted support in prompt writing and ethical use, both of which influence the quality and appropriateness of AI-generated lesson materials. These findings highlight the importance of preparing educators not just to use GenAI but to evaluate its role in instruction while ensuring that instructional quality, student engagement, and the human connection remain central.

Case Two: Pre-Service Teachers

Case Two involved 14 pre-service teachers (13 female, 1 not identified) enrolled in the third year of a four-year educator preparation program taking an undergraduate-level elementary science methods course. As an assignment in the class, the pre-service teachers were required to design a 5E inquiry lesson plan based on energy standards aligned with their grade level field placements. The submitted lesson plans included one 1st grade, two 2nd grade, seven 3rd grade, one 4th grade, and three 5th grade lessons.

Following the submission, the pre-service teachers were tasked with revising their lessons using ChatGPT. After acquiring the AI-generated feedback, the pre-service teachers integrated selected components into their lesson plans based on their evaluation of the quality of each suggestion. Then, they submitted their adjusted lesson plans along with the specific prompts they gave to ChatGPT to request feedback and recommendations for improvement. Finally, they reflected on the process, and using knowledge of the students in their field placement classes, projected possible student outcomes resulting from the refinements to the lessons. Figure 3 represents an example of a pre-service teacher prompting ChatGPT and the subsequent responses.

Importantly, the purpose of the assignment was to examine the use of generative AI as a tool for lesson plan refinement rather than lesson plan generation. The pre-service teachers independently developed and submitted complete 5E inquiry lesson plans before interacting with ChatGPT. Following submission, they received instructor feedback on their original lesson plans and incorporated that feedback into their lessons prior to beginning the AI activity. Thus, the lesson plans provided to ChatGPT had already undergone an initial cycle of instructor-guided revision. ChatGPT was then used to provide additional feedback on existing lessons and suggest potential refinements, while the pre-service teachers retained responsibility for evaluating the appropriateness and quality of the AI-generated feedback and deciding which, if any, suggestions to incorporate. This design positioned the pre-service teachers as critical evaluators and decision-makers rather than passive recipients of AI-generated instructional content.

Figure 3

Example Lesson Plan Prompt and Responses in ChatGPT

Prompt: What can I do to improve this lesson plan? Focus on the Es. Please briefly indicate the reason why you made modifications.
Suggestions: AI Generated
Engage: **Add a quick "turn and talk" moment**: After the demo, let students quickly share their thoughts with a partner before discussing as a class—this builds engagement and gives ELLs processing time. **-Include a "mystery object"**: Present a less obvious energy example (e.g., a rubber band-powered car) to spark curiosity and prediction. **Why?** Boosts student engagement, supports English Learners with oral language practice, and deepens curiosity by including something unexpected.
Explore: **-Pre-exploration prep**: Include a short "Energy Type Scavenger Hunt" around the classroom or school prior to the trip. This supports background knowledge for students who may not attend. **-Differentiate prompts** on the worksheet with sentence stems (e.g., "I saw ___ energy when ___") and visuals for ELLs or struggling readers. **Why?** Helps students build background knowledge before the field trip and ensures all learners (especially ELLs and those needing extra support) can access the task with scaffolds like visuals and sentence stems.
Explain: **-Add student voice**: Let students co-create definitions with their own examples before showing the formal one. **-Use a Frayer Model** for at least one key term (e.g., "thermal energy") to build depth of understanding. **Why?** Encourages ownership of learning and deeper vocabulary understanding. The Frayer Model promotes multiple ways of connecting with new terms (definition, characteristics, examples, non-examples).
Elaborate: **Include a reflection journal prompt** for each station (e.g., "I learned that ___ can change the way we use ___ energy.") **-Tie stations to real careers explicitly**: Add mini signs that say "This is what a ___ might do!" at each station. **Why?** Journaling supports metacognition and writing practice. Explicitly linking stations to real-world careers helps students see the relevance and application of their learning.
Evaluate: **-Add a simple rubric or checklist** for the poster/slideshow project to guide students during creation and self-assessment. **-Incorporate peer feedback**: Have students use a "Glow and Grow" system when reviewing others' posters. **Why?** Clear rubrics help guide students toward success and self-monitor progress. Peer feedback builds collaboration, critical thinking, and communication skills.

Case Two Findings

For Case Two, the quantitative findings indicated that the pre-service teachers exhibited growth across all five measured survey constructs: attitudes, perceived usefulness, perceived ease of use, behavioral intention to use AI, and actual use. In fact, the *general attitudes* of the pre-service teachers increased from pre-intervention (M = 3.62, SD = 1.02) to post-intervention (M = 4.14, SD = 0.94). Also, the *perceived usefulness* improved, with mean scores rising from M = 3.77 (SD = 0.92) to M = 4.30 (SD = 0.70). Similarly, the pre-service teachers perceived *ease of use* in using AI grew from M = 4.01 (SD = 0.83) to M = 4.51 (SD = 0.50). The teachers' *behavioral intention* to use AI for lesson planning also increased, as reflected in the change of M = 3.75 (SD = 0.99) to M = 4.18 (SD = 0.76) and their *actual usage* increased with mean scores of M = 3.57 (SD = 0.80) to M = 4.10 (SD = 0.73).

The qualitative analysis further suggested important findings that encompass both the strengths of and the concerns for utilizing AI for lesson planning. Fourteen written reflections from the pre-service teachers were analyzed thematically (see Table 5). The data analysis revealed two overarching themes related to benefits of AI each with multiple subthemes, and three themes associated with the challenges of AI integration. These findings describe the perceived advantages of AI in instructional planning, particularly for pre-service teachers as novice lesson planners, as well as the barriers to effective implementation in educational settings. The first theme regarding the benefits of AI, *instructional enhancement*, included three subthemes: improved instructional design, advancement of instructional practices, and active student engagement. The second theme pertaining to the benefits of AI, *teacher development and planning support*, was comprised of two subthemes: enhanced planning processes and increased professional confidence and reflection. The three themes concerning the challenges of AI integration included: *infrastructure and user readiness issues*, *intrinsic design limitation of AI tools*, and *ethical and practical concerns*.

Benefits of AI: Instructional Enhancement

The theme of *instructional enhancement* captured how AI transformed overall lesson design, instructional practices, and projected student engagement. Participants described multiple ways in which AI integration improved the planning and projected delivery of their instructional strategies.

Improved Instructional Design. The *improved instructional design* subtheme focused on how AI improved the structure, clarity, and planning of lessons. Participants reported that AI increased their ability to refine broad lesson structures by suggesting activities, ensuring standards aligned, attending to developmental appropriateness, and offering differentiated options. After requesting suggestions from AI for her lesson plan, one participant wrote:

> *Initially, my lesson plan included the basic structure required by the 5E model but lacked cohesion, depth, and differentiation for the diverse learners in my classroom. After consulting AI for suggestions, I was able to revise and elevate my lesson in several key ways. AI significantly enhanced the quality of each E.*

Another participant shared her experience with utilizing AI for improving lesson structure this way:

I added a reflection sheet. AI recommended I align the recurring themes and concepts (RTC) standard I picked by using different prompts. My main focus was definitely not the RTC, so AI helped me catch that. It also helped me create a reflection worksheet, so it was sure the RTC aligned.

Advancement of Instructional Practices. *Advancement of instructional practices* as a subtheme addressed how AI strengthened pedagogical strategies and instructional innovation. Participants described how AI tools encouraged inquiry-driven strategies, improved questioning techniques, enhanced formative assessment, and better integrated scientific practices and scaffolding. As one pre-service teacher reported:

> *While my original plan relied on informal observations and a written exit ticket, the AI suggested adding a Claim, Evidence, Reasoning (CER) writing task during the Explain phase. This formative assessment strategy encourages students to articulate their observations using academic language, providing me with a clearer understanding of both their content knowledge and language development.*

Another participant elaborated on her experience, saying:

> *I also revised the "Elaborate" section of my lesson, adding new extension activities like drawing scientific models, creating cause-and-effect graphic organizers, and comparing energy transformations in real-world examples, such as wind turbines and hydroelectric dams.*

Active Student Engagement. The active student engagement subtheme highlighted how AI supported the design of student-centered learning experiences to foster participation and collaboration. Pre-service teachers projected that AI-assisted lessons would facilitate active learning, collaboration, critical thinking, and inquiry, thereby promoting student voice, reasoning, and participation in interactive environments. Reflecting on her experience, one pre-service teacher noted, "In the Engage phase, I included a mystery object to boost curiosity. This change came directly from the AI's suggestion to make engagement more interactive and accessible." Another pre-service teacher insightfully reflected:

> *When implementing the enhanced lesson, I expect students to be more actively engaged and better able to articulate their understanding. I anticipate more meaningful group discussions, increased use of academic vocabulary, and stronger connections between the lesson content and students' everyday lives.*

Benefits of AI: Teacher Development and Planning Support

The theme of *teacher development and planning support* illustrated how AI reinforced pre-service teachers' growth, confidence, and efficiency during instructional planning and reflection. Participants noted that AI tools contributed to their development as emerging educators by offering feedback, sparking ideas, and promoting lesson design.

Enhanced Planning Processes. *Enhanced planning processes* as a subtheme revealed how AI functioned as a collaborative planning partner helping pre-service teachers structure lessons with greater intentionality and efficiency. Pre-service teachers valued AI's support in brainstorming, idea generation, and clarifying lesson content, leading to more efficient and structured planning. Several participants echoed this sentiment, with one saying, "AI served as a valuable co-planner, helping me refine and rethink aspects of my lesson in ways that made it stronger, more inclusive, and more engaging." Another participant thoughtfully shared, "AI can act as a collaborative thought partner, especially for newer teachers or for those designing lessons across unfamiliar content areas."

Increased Professional Confidence and Reflection. The subtheme of increased professional confidence and reflection captured how AI contributed to teachers' professional confidence and reflective practice by providing supportive responses, offering feedback for lesson refinement, and scaffolding reflective practice, thereby strengthening instructional decision-making. Considering the assistance provided by AI tools, one participant offered, "AI's strength lies in its ability to provide fast, well-organized feedback that prompts reflection and pushes instructional decisions beyond surface-level design." Another participant remarked, "This gave me more confidence in the instructional choices I was making."

Challenges of AI Integration

Pre-service teachers recognized substantial benefits in using AI for lesson planning, yet their reflections also produced three themes centering around AI integration challenges. They encountered *infrastructure and user-readiness issues*, *intrinsic design limitations of the AI tools*, and *ethical and practical concerns*.

Infrastructure and User-Readiness Issues. Participants noted barriers to AI integration, including inconsistent access to technology and varying levels of digital literacy among educators. Pre-service teachers reported that effective use of AI required substantial effort in prompting, resource searching, and adaptation. When addressing this, one participant shared, "For example, if you do not prompt the AI correctly it can give you a lesson or activity that is at a third-grade level which would be way too hard for a first-grade class if that was the grade level you were teaching at." Additionally, another participant stated, "There are concerns about equity, as underfunded schools may lack access to advanced AI tools."

Intrinsic Design Limitations of AI Tools. Pre-service teachers expressed concerns about the limitations of AI-generated content itself. Issues included superficial learning, lack of depth, inaccuracies, generic lesson suggestions, developmental inappropriateness, and a perceived misalignment with inquiry-based or active learning practices. Pre-service teachers emphasized that AI output frequently required significant revision to ensure content suitability and relevance for specific learners. According to one participant, "AI focused a lot on vocabulary instruction in a way that felt too academic and not very engaging for younger learners." Another participant voiced additional concerns, "AI is not always accurate. AI generates information based on many sources and not all sources have the correct information."

Ethical and Professional Practical Concerns. Pre-service teachers worried about overreliance on AI tools, warning that excessive dependence could lead to reduced creativity, teacher passivity, and erosion of critical instructional judgment. Concerns were also raised about potential long-term risks, such as dehumanizing classroom interactions and diminishing the teacher's role in fostering authentic, responsive learning experiences. In relation to AI concerns, a participant commented, "If lessons are being robot produced, the lessons may lose their touch of personal connection." Mirroring this view, another participant pointed out:

> *AI lacks the human touch; it doesn't know your specific students, their interests, or classroom dynamics. There is also a risk of becoming too reliant on it and not fully engaging in the deep thinking that effective lesson design requires.*

Table 5

Reflection Themes, Description, and Representative Excerpts for Pre-Service Teachers

Themes Discussing the Benefits of Instructional Enhancement		
Themes	**Description**	**Representative Excerpts**
Improved instructional design (n = 39)	Improvements in the structure, clarity, and planning of lessons	• a significant impact on both the quality and depth of the final product • influenced the quality and depth of my lesson plan, particularly in refining its structure • ensuring alignment with learning standards • developmentally appropriate strategies that were well-aligned with the learning standards and student needs
Advancement of instructional practices (n = 45)	Enhancement of pedagogical strategies and instructional innovation	• included more formative strategies like exit tickets and peer feedback • I added a "turn-and-talk" component • added scaffolds and student-choice elements • more intentional, scaffolded questioning strategies to prompt deeper thinking • I adapted my lesson plans to accommodate better English Language Learners (ELL) and students with learning disabilities • integrated peer discussions and reflection prompts
Active student engagement (n = 71)	Support for the design of student-centered learning experiences to foster participation, and collaboration	• enhancing student engagement and accessibility • meaningful group discussions • enhancement of student voice • make engagement more interactive • supports engagement and autonomy
Themes Discussing the Benefits of Teacher Development and Planning Support		
Themes	**Description**	**Representative Excerpts**
Enhanced planning processes (n = 42)	A collaborative planning partner helping pre-service teachers structure lessons with greater intentionality and efficiency	• a powerful tool for brainstorming, expanding ideas • helped me organize my thoughts in a way that I wouldn't normally do it • It helped me see gaps, pushed my creativity • access to a wide range of research-based strategies • exposure to new ideas that might not surface in isolated planning
Increased professional confidence and reflection (n = 26)	Contributions to teachers' professional confidence and reflective practice through supportive responses	• teacher support in the content area will improve teachers' confidence • confidence and greater independence • think not just about what I was teaching, but how I was teaching and for whom. • encourages reflection and can offer useful reminders

Themes Discussing the Challenges		
Themes	**Description**	**Representative Excerpts**
Infrastructure and User Readiness Issues (n = 13)	Barriers including inconsistent access to technology and varying levels of digital literacy among educators	• widen the digital divide • AI is only effective if you give it more information to work from • Some teachers are not tech-savvy • effectiveness of AI depends greatly on how well you can describe your needs
Intrinsic Design Limitations of AI Tools (n = 31)	Limitations including superficial learning, lack of depth, inaccuracies, generic lesson suggestions, developmental inappropriateness, and a perceived misalignment with inquiry-based or active learning practices	• vocabulary-heavy suggestions felt too lecture-based or worksheet-focused and didn't fit the active learning style • need to adjust the activities • suggestions would have made the lesson more passive and less interactive • more appropriate for older learners and didn't align well with the developmental needs of young children
Ethical and Professional Practical Concerns (n = 16)	Overreliance and dependence leading to reduced creativity, teacher passivity, and erosion of critical instructional judgment	• AI doesn't know your students like you do • less personable lessons for teachers and students • risk of losing teacher creativity or professional judgment • overreliance on AI could result in lessons that lack personal or cultural relevance • enhance it rather than having it create the whole lesson • some people may start to rely heavily on AI • Teachers might no longer think for themselves

Case Two Discussion

The exploration of AI for lesson planning in teacher education in Case Two provided an informed view of how pre-service teachers perceive the benefits and challenges of AI integration into curriculum design, examined through the lens of novice educators.

Regarding instructional enhancement, pre-service teachers described their experience with AI as allowing them to add depth and coherence to 5E inquiry lesson plans they constructed. They refined lesson structures using AI-suggested activities, with particular attention to differentiated options appropriate for developmental stages. Several participants noted that AI helped them uncover misalignments with the science standards, specifically in areas related to scientific and engineering practices and recurring themes and concepts. Moreover, AI contributed to the advancement of instructional practices including the addition of more sophisticated pedagogical strategies and innovative approaches. Many participants described how AI encouraged the use of inquiry strategies including expanded questioning, scaffolding, assessment techniques, and the inclusion of CER processes to make students' thinking visible. Furthermore, AI supported the facilitation of active student engagement. Many student-centered learning experiences focused on participation and collaboration, which became central to revised lesson plans. Using these adapted lessons, participants envisioned incorporating more active learning strategies that promoted critical thinking and student voice within interactive environments. For pre-service teachers newly introduced to inquiry-based learning and the three-dimensional nature of the science standards, AI helped strengthen lesson plans they had developed by filling gaps in lesson alignment and instructional depth. Throughout this process of enhancing lesson plans using AI tools, participants maintained autonomy by evaluating AI recommendations and integrating only those that aligned with their teaching style and need.

The second area of perceived benefit involved teacher development and planning support. AI encouraged growth and planning efficiency through collaborative feedback, supporting brainstorming, idea generation, and content clarification. Participants described AI as a co-planner or collaborative coach, offering timely, relevant suggestions that helped refine existing lessons and prompted deeper consideration of overlooked details. This type of support was viewed as particularly valuable where access to mentors, coaches, or individualized guidance was limited. AI's feedback mechanisms also supported iterative lesson revisions, scaffolded reflective practice, and contributed to professional confidence in instructional design. Several pre-service teachers described how AI responses prompted critical reflection on the lesson design or instructional strategies. According to participants, this iterative process of suggestion, questioning, assessment, and review of AI outputs encouraged deeper thinking, exploration of multiple perspectives, and expansion of their vision for curriculum design.

Regardless of the perceived benefits, the integration of AI presented notable challenges including infrastructure and user-readiness issues, inherent design limitations of AI tools, and ethical and practical concerns. First, participants pointed out differences in access to technology and varying levels of digital literacy among educators. Some pre-service teachers navigated AI tools with ease, while others required assistance logging in and understanding the purpose and structure of the prompts. Technical difficulties arising from outdated devices compounded these issues, with participants noting that such barriers could be amplified in under-resourced districts. Pre-service teachers who received training had higher digital competencies, providing more detailed prompts and actively seeking reasoning behind AI recommendations. This suggests that

prompt quality directly influenced the usefulness of AI suggestions for lesson improvement.

Regarding limitations, participants also raised concerns about output inaccuracies, generic lesson suggestions, developmental inappropriateness, and misalignment with inquiry-based or active learning practices. The participants emphasized that AI-generated output often requires significant revision to ensure content suitability and relevance for specific learners. However, several mentioned that these issues diminished as their prompting skills improved.

Finally, pre-service teachers expressed concerns about overreliance on AI, noting that excessive dependence could reduce teacher agency, stifle creativity, compromise instructional judgment, and weaken the teacher's role in fostering meaningful student-centered learning. Overall, participants viewed AI as a promising tool for enhancing the quality of instructional planning and advancing pre-service teacher growth, reflection, and confidence in lesson design. While the benefits were evident, incorporating AI into instructional planning for novice teachers can be complex. Critical engagement with GenAI recommendations, sustained teacher judgment, and professional development support are needed to ensure meaningful and ethical integration.

Cross-Case Findings

Across both cases, the participants reported generally positive attitudes toward ChatGPT, with an overall mean of *M*=3.84, *SD*=0.96) and higher scores following the intervention (*M*=4.12, *SD*=0.91) (see Table 6). Perceived usefulness and ease of use also increased post-intervention, showing consistent improvement across both pre-service and in-service groups. Increased attitudes and perceived usefulness and ease of use show consistent trends, indicating participants not only found ChatGPT tool beneficial overall but also realized its usability and easy functionality. For behavioral intention and actual use, the data indicated positive shifts as well. Pre-service teachers demonstrated an increase in actual use from pre-intervention (*M*=3.57, *SD*=0.80) to post intervention average (*M*=4.10, *SD*=0.73) reflecting a stronger intention to apply ChatGPT in their teaching practice. Both pre-service and in-service groups showed similar increasing patterns, highlighting increased acceptance and integration of AI tools into lesson planning.

Table 6

Descriptive Statistics for Variables as a Whole, and Between Pre- and In-service Teachers

Variables	Mean	SD
General Attitude Toward ChatGPT	**3.84**	**0.96**
Pre / Post	3.62/4.12	0.97/0.91
Pre-service Pre/Post	3.62/4.14	1.02/0.94
In-service Pre/Post	3.62/4.06	0.93/0.94
Perceived Usefulness	**3.98**	**0.81**
Pre / Post	3.80/4.22	0.84/0.71
Pre-service Pre/Post	3.77/4.30	0.92/0.70
In-service Pre/Post	3.86/4.00	0.71/0.81
Perceived Ease of Use	**4.19**	**0.70**
Pre / Post	3.99/4.45	0.78/0.50
Pre-service Pre/Post	4.01/4.51	0.83/0.50
In-service Pre/Post	3.93/4.25	0.68/0.52
Behavioral Intention Toward AI-based System	**3.95**	**0.85**
Pre / Post	3.76/4.18	0.89/0.77
Pre-service Pre/Post	3.75/4.18	0.99/0.76
In-service Pre/Post	3.76/4.20	0.68/0.93
Actual Use of AI-based Systems	**3.76**	**0.74**
Pre / Post	3.56/4.02	0.72/0.71
Pre-service Pre/Post	3.57/4.10	0.80/0.73
In-service Pre/Post	3.55/3.74	0.57/0.64

Note. Pre/Post refers to the pre-intervention and post-intervention means for each variable. *Pre-service Pre/Post* and *In-service Pre/Post* indicate the respective pre- and post-intervention means for each teacher group.

The qualitative analysis of in-service and pre-service teachers revealed consistent perceptions of the benefits and challenges of utilizing GenAI for lesson planning. Teachers across both cases recognized AI's value in enhancing instruction by generating alternative lesson ideas, introducing diverse pedagogical strategies, and providing access to useful resources and assessments. Both groups also described AI's role in increasing student engagement through student-centered learning, the incorporation of real-world problem-solving, and the promotion of collaboration.

Yet, the way these benefits were perceived was shaped by the teachers' experience levels. For example, in-service teachers placed a stronger emphasis on AI's support in improving time efficiency and facilitating differentiated instruction. This indicates that in-service teachers may have experienced excessive workloads related to lesson planning and found AI to be an efficient, time saving tool, with one noting that "the time it took me to revise my lesson with ChatGPT was a fraction of what it normally takes." The in-service teachers also specifically valued AI's capacity to support the varied needs of their students. In contrast, pre-service teachers, still in the process of developing their

teaching resources, pedagogical approaches, and professional identities, highlighted how AI contributed to their confidence and supported reflective practice. For these novice educators, GenAI served as an assistant, helping them build their lesson plans and complete professional tasks.

Regarding challenges, both groups shared concerns over the accuracy and appropriateness of GenAI content, ethical considerations such as potential overreliance or student misuse, and limitations related to creativity or content specificity. The persistent need for content revision and alignment verification implies that ChatGPT functions effectively as a generative starting point than a comprehensive instructional design solution. Teachers must apply rigorous instructional design principles to integrate AI-generated content into pedagogically sound lesson plans that meet specific context of the lesson. From an instructional design perspective, the accuracy and specificity issues identified by both groups directly impact lesson quality. When AI outputs lack contextual appropriateness or contain errors, teachers need to verify content and curricular alignment which require pedagogical expertise to produce instructionally sound outcomes. Teachers will serve as the essential bridge between AI-generated suggestions and classroom-appropriate instruction. Furthermore, both in-service and pre-service teachers raised concerns about the diminished human element in AI-supported instruction reinforcing the need for authentic teacher-student interactions.

Nevertheless, differences emerged between the groups. Pre-service teachers expressed greater concern about infrastructure issues, such as unequal access to technology and disparities in AI literacy levels, which may reflect their limited exposure to classroom environments. In contrast, in-service teachers focused more on the implementation challenges such as the need for professional judgment to review and correct misalignment issues in the AI-generated lessons. They also emphasized the importance of prompt engineering, creating questions in specific ways based on teachers' knowledge and expertise.

Discussion and Conclusion

The cross-case analysis and the integration of quantitative and qualitative findings reveal that, while both teacher groups recognized similar benefits and challenges, their attitudes and intention to use GenAI differed based on their teaching context and experience levels. This multi-case study highlights the potential of AI in education and calls attention to the need for frameworks that support the ethical and effective integration of AI tools in teaching, ensuring they complement rather than replace the fundamental elements of quality instruction. Across both cases, AI functioned effectively as a tool for improving lessons teachers already developed, rather than generating new instructional materials. These findings reflect the experiential learning process described by Kolb (1984), with teachers cycling through the use, reflection, conceptualization, and experimentation in the context of enhancing existing lesson plan with GenAI tools. Moreover, the elements of self-reflection and professional insight, especially among pre-service teachers, align with Mirvis's (2008) concept of consciousness-raising, suggesting that AI can raise a deeper awareness of professional identity and instructional decision-making.

Through critical perspectives and educator-specific understanding of Gen-AI, teachers recognized their irreplaceable role in evaluating and adapting AI-generated outputs for specific educational purposes. This realization fostered greater self-awareness of their professional expertise. Pre-service teachers, in particular, reported increased confidence in viewing AI as a collaborative tool rather than a replacement. This awareness led teachers to critically evaluate AI's capabilities and limitations in their own context. Through reflection and implementation, teachers developed a more informed understanding of when and how GenAI could effectively support instructional planning.

Despite the valuable insights gained from this study, there were some limitations. First, this study was conducted at a single university in Texas, over one semester, which may limit generalizability. Secondly, the pre-service teachers' reflections were based on projected outcomes rather than direct classroom implementation. Also, this study relied on self-reported data based on teachers' perceptions, which may have been influenced by biases or limited exposure to AI tools. Future research should consider a longitudinal

design to explore how continued engagement with GenAI for lesson enhancement influences instructional practices, teacher attitudes, and professional growth.

In conclusion, the findings point to a more focused understanding of how GenAI can support improving existing instructional planning and practices. While this study was conducted in Texas, the findings have implications that extend beyond state boundaries. The results offer insights into how teacher preparation programs in various contexts can support both pre-service and in-service educators in making informed use of GenAI tools.

These findings suggest that support is needed where pre-service teachers are provided with foundational training to build their confidence and awareness, and in-service teachers need more advanced strategies such as prompt engineering and differentiation strategies. Job-embedded professional development that includes structured time for practice and reflection can help educators feel more confident in their use of AI technologies. As AI becomes more widely integrated into education, ensuring equitable access and clear policy guidance will be vital.

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