ADVANCE SOCIAL SCIENCE ARCHIVE JOURNAL
Available Online: https://assajournal.com
Vol. 05 No. 01. Jan-March 2026.Page#.2393-2409
Print ISSN: 3006-2497 Online ISSN: 3006-2500
Platform & Workflow by: Open Journal Systems
https://doi.org/10.5281/zenodo.19206537

AI-Powered Self-Assessment: Supercharging Future Teachers' Lesson Planning During Teaching Practice

Maimoona Naeem
PhD Education
Lecturer, Division of Education, University of Education Lahore.
Email: mamoona.naeem@ue.edu.pk
Javaid Iqbal
Punjab Higher Education Commission, Lahore
Email: Javaid.iqbal@punjabhec.gov.pk
Ayman Sahar
Division of Education, University of Education Lahore
Email: aymansahar2001@gmail.com

ABSTRACT
The advancement of artificial intelligence (AI) has introduced innovative approaches to professional learning in teacher education. Lesson planning is a fundamental teaching skill however; many future teachers face challenges in preparing effective and well-organised lesson plans during teaching practice. This study investigated the effect of AI-based self-assessment on future teachers' lesson planning during teaching practice at the secondary school. The study employed a pre-test and post-test single-group experimental action research. A sample of twenty future teachers enrolled in a teacher education program participated in the study. The participants prepared Grade 8 science lesson plans. A holistic lesson planning rubric was used to evaluate lesson plans, with each lesson plan carrying a total score of twenty. Pre-test lesson plans were assessed before the intervention. The participants then used AI-based self-assessment to review and improve their lesson plans through structured, criterion-based feedback. After revision, post-test lesson plans were evaluated using the same rubric. The findings revealed that pre-test lesson plans demonstrated average to below-average lesson planning skills, particularly in writing clear objectives, aligning instructional activities with objectives, organizing lesson sequence, and planning assessment strategies. Post-test results showed noticeable improvement in overall lesson planning quality. The use of AI-based self-assessment enhanced planning practices. The study concludes that AI-based self-assessment is an effective supportive tool for improving lesson planning skills of future teachers. It promotes reflective practice, self-regulated learning, and professional development. The study recommends integrating AI-based self-assessment tools into teacher education programs to enhance lesson planning quality during teaching practice.

Keywords: *Artificial Intelligence, Self-Assessment, Lesson Planning, Teaching Practice, Future Teachers*

Introduction

Artificial Intelligence (AI) is reshaping education in profound and far-reaching ways. Contemporary generative AI systems, particularly large language models (LLMs) such as ChatGPT, have moved beyond simple automation to act as co-pilots for both teachers and learners. These tools are not merely generating content; they can prompt reflection, suggest lesson structures, simulate classroom scenarios, and support ongoing professional development. As such, AI is increasingly positioned not only as a support for lesson planning but as a reflective scaffold that can enhance teacher training and education.

In teacher education, the demands on pre-service teachers are particularly high: they must integrate pedagogical theory, content knowledge, and classroom management into practical lesson plans, often while engaged in practicum. Traditional methods of reflection such as journaling, peer observation, and mentor-based feedback are common and valuable (Schon, 1983). However, these methods are constrained: reflections may be delayed, feedback can be inconsistent, and trainees may lack the capacity to fully critique the pedagogical coherence or creativity of their plans without external input. Generative AI offers a transformative opportunity here: by providing real-time, structured, and context-aware prompts, it can help pre-service teachers analyze their own lesson decisions more deeply and iteratively (Abualrob, 2025).

Historically, education has evolved through waves of technological innovation. In the 1960s and 1970s, Computer-Assisted Instruction (CAI) provided programmed learning sequences, but these systems lacked adaptivity and depth. Over decades, advances in machine learning and natural language processing have made it possible for AI systems to engage in dialogic, creative, and reflective tasks. Today, ChatGPT and similar LLMs are capable of generating textual feedback, brainstorming alternative activities, and even critiquing lesson structure making them potentially powerful allies in teacher preparation (Yanar & Ergene, 2025).

One of the key promises of AI-based self-assessment is that it makes reflective practice more accessible and scalable. Many pre-service teachers face cognitive overload: planning, teaching, and reflecting all compete for time and mental energy. Generative AI can act as a first “mirror,” reflecting back to the teacher what their lesson plan might look like, identifying gaps, and asking probing questions. This supports not only more efficient lesson design but also deeper pedagogical thinking (Luo & Tahir, 2025). The use of AI does not replace human mentors or supervisors; rather, it complements them by providing constant, structured feedback that can guide reflective practice.

Globally, teacher education programs have started to experiment with generative AI. In a recent case study involving pre-service English as a Foreign Language (EFL) teachers, researchers found that generative AI helped teachers create lesson plans more efficiently and increased their planning confidence (English Teaching, 2025). This dual role of AI as both a creative partner and a workload reducer is especially appealing in contexts where resources are limited or mentor support is not always readily available.

The integration of AI into lesson planning also raises important theoretical and practical questions, especially concerning pedagogical knowledge frameworks. The TPACK framework (Technological, Pedagogical, and Content Knowledge) becomes highly relevant: AI can support the technological and pedagogical dimensions by bridging content knowledge with adaptive design (Mishra, Warr, & Islam, 2023). By using AI in planning, pre-service teachers may develop a more nuanced TPACK because they can experiment with different instructional strategies, receive instant AI-generated feedback, and critically reflect on the pedagogical choices they make.

Experiential learning theory (Kolb, 1984) and reflective practice theory (Schön, 1983) also inform the use of AI in teacher education. In Kolb's cyclical model concrete experience, reflective observation, abstract conceptualization, and active experimentation AI can act as a facilitator in the reflective observation and active experimentation phases. Teachers can use AI to generate "what-if" scenarios, modify lesson components, and re-evaluate their plans in light of new ideas. Similarly, Schön's conception of the "reflective practitioner" is strengthened when AI becomes a partner in reflection, prompting deeper questioning and professional insight (Abualrob, 2025).

However, the adoption of AI in teacher education is not without risk. Ethical and regulatory challenges are significant. A recent systematic review highlighted key concerns, such as reduced cognitive autonomy, insufficient data regulation, algorithmic bias, and over-automation (Frontiers in Education, 2025). For instance, if pre-service teachers rely too heavily on AI-generated plans or prompts, there is a danger that their own creative and critical thinking skills might atrophy. Moreover, privacy issues emerge when using AI systems that store or analyze personal or student data (Frontiers in Education, 2025).

Academic integrity is another critical concern. Generative AI can produce content that looks polished and original, but without clear policies, its use may blur the lines between original teaching ideas and AI-generated text. These issues demand not only technical literacy but also AI ethics literacy the capacity to critically evaluate AI outputs, recognize potential misinformation, and maintain professional accountability (Nguyen & Goto, 2025).

Nevertheless, research also shows promising affective, motivational, and professional development benefits. In a mixed-methods study, teachers reported that using generative AI for their own self-directed professional development (SDPD) helped reduce burnout, re-engage motivation, and provide space for reflection (TechTrends, 2025). The instant support from AI made reflection less daunting and more embedded within daily practice, offering a personalized and iterative learning loop (Alshaikhi, Lan, & others, 2025).

In developing-country contexts, generative AI may bridge significant gaps in teacher preparation. According to Nyaaba (2024), generative AI can support pre-service teachers in settings where mentor availability is limited, resources are scarce, and pedagogical modeling is weak. By taking on supportive roles in content generation and reflective scaffolding, AI tools can free teacher educators to focus on deeper mentorship, assessment design, and building critical AI literacy among trainees.

Given all this, the central question of this research emerges: How does AI-based self-assessment (via ChatGPT) influence lesson planning among future teachers during their practicum? More specifically, the study explores not only the practical changes in lesson quality and structure but also shifts in self-efficacy, reflective depth, and AI literacy. By investigating these dimensions, this research aims to inform teacher education policy and curriculum design ensuring that AI is integrated in ways that enhance, rather than diminish, the professional growth of future teachers.

Teacher education has historically relied on a combination of theoretical instruction, practical teaching experience, and reflective practice. Pre-service teachers acquire pedagogical knowledge through coursework while simultaneously applying that knowledge in classrooms during teaching practicum. Effective lesson planning is a critical component of this preparation, as it provides a structured roadmap for achieving learning objectives, managing classroom activities, and assessing student outcomes.

Despite its importance, lesson planning remains a complex and cognitively demanding process. Pre-service teachers often struggle to integrate content knowledge, pedagogical strategies, and classroom management skills simultaneously. Additionally, limited access to mentors, lack of timely

feedback, and insufficient opportunities for reflective discussion can hinder the development of high-quality lesson plans (Abualrob, 2025). In this context, innovative approaches that support both planning efficiency and reflective practice are highly valuable.

The emergence of AI-based tools, particularly generative AI like ChatGPT, represents a significant innovation in teacher education. These systems are capable of analyzing text, generating teaching suggestions, and providing reflective prompts that guide pre-service teachers through the planning process (Luo & Tahir, 2025). Unlike traditional feedback, AI-based self-assessment is immediate, consistent, and scalable. For instance, a pre-service teacher can submit a lesson plan and receive suggestions on improving learning objectives, sequencing of activities, differentiation strategies, or alignment with curriculum standards all within minutes.

Globally, teacher education programs are beginning to adopt AI-supported lesson planning to complement traditional mentorship. In the United States, pilot programs have used ChatGPT to provide reflective prompts for pre-service teachers in STEM and language subjects, with reports of enhanced planning efficiency and increased confidence in lesson design (Kalenda et al., 2025). In Europe and Asia, AI tools are integrated into practicum programs to scaffold reflective practice and encourage experimentation with instructional strategies. These studies suggest that AI can enhance creativity, self-efficacy, and pedagogical alignment, supporting the professional development of future teachers (Yanar & Ergene, 2025; Wolfeetal., 2025).

Theoretical frameworks provide a lens to understand the potential of AI in teacher education. Reflective practice theory (Schön, 1983) emphasizes iterative reflection on action, while Kolb's (1984) experiential learning model highlights the cyclical process of concrete experience, reflective observation, abstract conceptualization, and active experimentation. AI can facilitate both frameworks by prompting pre-service teachers to critically analyze their lesson plans, experiment with different teaching strategies, and reflect on the outcomes of simulated or real classroom activities. Additionally, the TPACK framework (Technological, Pedagogical, and Content Knowledge) provides a model to evaluate how AI integration can enhance teachers' technological and pedagogical expertise in conjunction with content knowledge (Mishra et al., 2023).

While the potential benefits are significant, challenges must be considered. Over-reliance on AI-generated suggestions may reduce critical thinking and limit teacher autonomy. Algorithmic bias, cultural insensitivity, and ethical concerns regarding student data privacy are central issues that must be addressed when implementing AI in education. Therefore, pre-service teachers must develop both AI literacy and ethical awareness to ensure that AI is used responsibly, supporting rather than replacing professional judgment (Nguyen & Goto, 2025).

In developing countries, AI offers additional benefits by addressing resource gaps. In contexts where mentor support may be limited, or educational materials are scarce, AI can serve as a scalable tool for scaffolding lesson planning and reflective practice (Nyaaba, 2024). By guiding pre-service teachers through planning, assessment design, and reflective questioning, AI helps build pedagogical competence even in resource-constrained environments.

Overall, the integration of AI-based self-assessment into teacher education represents a paradigm shift: it transforms lesson planning from a largely solitary and cognitively burdensome task into a guided, reflective, and iterative process. By enhancing reflective practice, improving alignment between objectives and activities, and building AI literacy among future teachers, AI-supported tools have the potential to contribute significantly to both the quality and effectiveness of teacher training programs worldwide.

Despite growing research on generative AI in education, there is limited evidence regarding its impact on lesson planning during actual teaching practicum. Most studies focus on simulated settings or general teacher development programs, leaving a gap in understanding the practical effects of AI-based self-assessment. Without this knowledge, teacher education programs risk either underutilizing AI or adopting it without sufficient understanding of its potential benefits and limitations. This research addresses this gap by exploring how AI-based self-assessment influences future teachers' lesson planning practices during practicum, focusing on plan quality, self-efficacy, and reflective skills.

Research Objective

The objective of this study is designed to provide a comprehensive understanding of the impact of AI-based self-assessment on lesson planning for future teachers.

1. To determine whether AI-based assessment improves lesson planning of future teachers during teaching practice. Research question is To what extent AI-based assessment improve lesson planning of future teachers during teaching practice?

Review of Related Literature

In recent years, rapid technological advancement has significantly influenced educational practices, particularly in assessment and instructional planning. Teacher education programs are increasingly expected to prepare future teachers who are reflective, adaptive, and capable of using digital tools to enhance teaching effectiveness. The integration of artificial intelligence into self-assessment practices offers new opportunities for improving professional skills, especially lesson planning. Therefore, reviewing literature related to AI-based self-assessment becomes essential to understand its theoretical grounding and practical implications in teacher education.

Lesson planning is a deliberate and systematic process through which teachers organize instructional objectives, teaching strategies, learning activities, assessment procedures, and instructional materials before entering the classroom. According to Richards and Bohlke (2011), a lesson plan serves as a blueprint that ensures coherence and structure in teaching. Effective lesson planning enables teachers to anticipate learners' needs, allocate instructional time efficiently, and select appropriate teaching methodologies.

Brown (2007) states that lesson planning is not merely a formal requirement but a reflective activity that helps teachers clarify what they intend students to learn and how that learning will be assessed. A well-designed lesson plan ensures alignment among objectives, content, activities, and assessment, which is referred to as constructive alignment.

Furthermore, lesson planning supports teachers in anticipating potential learning difficulties and planning appropriate instructional interventions. According to Harmer (2015), effective lesson planning allows teachers to maintain instructional flexibility while ensuring that learning objectives remain central to classroom activities. For future teachers, structured lesson planning fosters confidence and reduces classroom management issues, particularly during teaching practice. This highlights the importance of developing strong planning skills early in teacher education programs.

For future teachers, lesson planning plays a crucial role in professional development, particularly during teaching practice. Farrell (2015) argues that novice teachers depend heavily on lesson plans to guide classroom instruction due to limited teaching experience. Lesson planning helps them manage classroom activities, maintain lesson flow, and reduce anxiety during teaching.

Research indicates that pre-service teachers often face difficulties in writing measurable objectives, selecting appropriate instructional strategies, and aligning assessments with objectives (Khan, 2018). In the Pakistani context, Mahmood and Iqbal (2019) found that student teachers struggle with time management, sequencing of activities, and effective use of instructional materials. These

deficiencies highlight the need for structured guidance and reflective support systems for improving lesson planning skills.

In addition, lesson planning contributes to the professional identity formation of future teachers. Darling-Hammond (2017) suggests that when student teachers consistently plan lessons using structured frameworks, they develop a deeper understanding of pedagogical reasoning. Lesson planning also encourages accountability, as teachers become more aware of instructional goals and expected learning outcomes. Thus, improving lesson planning skills is critical for enhancing teaching competence and instructional confidence.

Lesson planning is widely recognized as a foundational teaching competency that directly influences classroom effectiveness. According to John (2006), lesson planning supports instructional clarity, classroom organization, and learner engagement. Killen (2015) argues that effective lesson planning ensures alignment between objectives, teaching strategies, and assessment procedures. Similarly, Cruickshank, Jenkins, and Metcalf (2009) assert that well-structured lesson plans enhance teacher confidence and instructional flow during teaching practice.

Richards (2017) emphasizes that lesson planning is not a static task but a reflective and adaptive process. Future teachers often struggle with lesson sequencing and time allocation during teaching practice, particularly when feedback is limited (Brown, 2007). These challenges highlight the need for structured feedback mechanisms that support lesson planning development.

Teaching practice is a compulsory component of teacher education programs and serves as a bridge between theoretical knowledge and practical classroom application. According to Darling-Hammond (2017), teaching practice provides future teachers with opportunities to apply pedagogical theories, classroom management techniques, and assessment strategies in real school settings.

However, several studies have identified challenges associated with teaching practice. Ali and Akhter (2020) reported that student teachers often receive limited feedback from supervisors due to large class sizes and time constraints. As a result, future teachers may not fully understand their instructional weaknesses, particularly in lesson planning.

Moreover, teaching practice serves as a formative period where future teachers experiment with various instructional strategies. Zeichner (2010) emphasizes that meaningful teaching practice should include opportunities for reflection and feedback to promote continuous improvement. However, without systematic feedback mechanisms, student teachers may rely on trial-and-error approaches, which may not effectively enhance lesson planning quality. This further emphasizes the need for structured self-assessment tools during teaching practice.

Reflective practice is widely recognized as a key element of professional teacher development. Schon (1983) introduced the concept of reflective practice, emphasizing that professionals learn by reflecting on their actions and experiences. Reflection allows teachers to evaluate their instructional decisions and identify areas for improvement.

Farrell (2015) notes that reflective teachers are more effective in adapting their lesson plans to meet students' needs. Reflection during teaching practice enhances awareness of instructional alignment, classroom interaction, and assessment strategies. Self-assessment is considered a structured form of reflection that promotes continuous professional growth.

Reflective practice also supports the development of critical thinking and pedagogical decision-making. According to Brookfield (2017), reflective teachers are better equipped to question their assumptions and improve instructional practices. Reflection on lesson planning helps future teachers understand why certain strategies work and others do not. As a result, reflective practice strengthens professional judgment and instructional effectiveness.

Self-assessment refers to the process through which learners evaluate their own performance based on predefined criteria. According to Boud and Falchikov (2007), self-assessment encourages learners to take responsibility for their learning and promotes self-regulated learning skills.

In teacher education, self-assessment enables future teachers to critically analyze their lesson plans, teaching strategies, and classroom performance (Panadero & Alonso-Tapia, 2013). Through self-assessment, future teachers develop the ability to identify instructional gaps and improve their professional competencies.

Additionally, self-assessment encourages metacognitive awareness among future teachers. Zimmerman (2002) argues that learners who engage in self-assessment develop better self-monitoring and goal-setting skills. In lesson planning, self-assessment allows future teachers to evaluate whether instructional components are logically connected and aligned with learning objectives. This process enhances independent professional learning.

Self-assessment plays a significant role in enhancing professional skills of future teachers. Studies indicate that self-assessment improves clarity of instructional objectives, alignment of teaching strategies, and reflective thinking (Andrade, 2010).

Nicol and Macfarlane-Dick (2006) emphasize that self-assessment supports self-regulated learning by helping learners monitor their progress and adjust learning strategies accordingly. In lesson planning, self-assessment allows future teachers to evaluate whether their objectives, activities, and assessments are constructively aligned.

Self-assessment also fosters a sense of ownership over professional growth. According to Taras (2010), when learners assess their own work, they become more engaged in the learning process and demonstrate improved performance. In teacher education, self-assessment helps future teachers internalize professional standards and continuously improve their lesson planning skills during teaching practice.

Self-assessment is considered a core component of self-regulated learning and professional growth in teacher education. Zimmerman (2002) explains that self-regulated learners actively monitor, evaluate, and improve their performance through reflection and feedback. In teacher education, self-assessment enables future teachers to identify gaps in their instructional planning and refine their professional skills (Panadero, 2017). Black & Wiliam (2009) further emphasize that formative self-assessment improves instructional decision-making when learners are actively engaged in evaluating their own work.

Sadler (1989) highlights that effective self-assessment requires clear performance criteria and opportunities for revision. When lesson planning rubrics are used alongside self-assessment, future teachers gain a clearer understanding of instructional expectations (Brookhart, 2013). Research indicates that rubric-guided self-assessment enhances planning accuracy, coherence, and reflective depth (Reddy & Andrade, 2010; Moskal, 2000).

Despite its advantages, traditional self-assessment has several limitations. Boud and Falchikov (2007) argue that self-assessment may be influenced by personal bias, lack of confidence, or overestimation of performance. Without structured feedback, future teachers may fail to accurately evaluate their lesson plans.

Additionally, traditional self-assessment often lacks immediacy and consistency, particularly during teaching practice where supervisors cannot provide continuous guidance. These limitations highlight the need for technology-enhanced self-assessment approaches.

Furthermore, traditional self-assessment often lacks consistency due to the absence of standardized evaluation criteria. Panadero et al. (2016) note that without clear rubrics, self-assessment

may result in inaccurate judgments. Future teachers may either underestimate or overestimate their lesson planning abilities, which limits the effectiveness of reflection. These challenges justify the integration of AI-based, rubric-guided self-assessment systems.

Artificial Intelligence (AI) refers to computer systems capable of performing tasks that require human intelligence, such as analysis, decision-making, and feedback generation. In education, AI is used to support personalized learning, automated assessment, and adaptive feedback systems.

According to Luckin et al. (2016), AI has the potential to transform education by offering data-driven insights and individualized support. AI-based systems can analyze instructional data and provide real-time feedback to learners and teachers.

AI-based educational systems also support data-driven decision-making in teaching and learning. Holmes et al. (2019) argue that AI can analyze large volumes of educational data to provide insights that are not easily identified by humans. In teacher education, such analysis can support lesson planning by identifying patterns of instructional strengths and weaknesses, thereby enhancing professional learning outcomes.

AI has increasingly been integrated into teacher education to support instructional design and professional learning. Holmes, Bialik, and Fadel (2019) state that AI tools assist teachers in planning lessons, analyzing instructional alignment, and improving teaching effectiveness.

In teacher education programs, AI-based tools support reflective practice by identifying weaknesses in lesson plans and suggesting pedagogical improvements (Zawacki-Richter et al., 2019).

Moreover, AI tools promote personalized professional development for future teachers. Zawacki-Richter et al. (2019) highlight that AI-based systems can adapt feedback based on individual performance levels. This personalized support is particularly beneficial during teaching practice, where future teachers have diverse instructional needs. AI-based feedback helps bridge gaps that traditional supervision may not fully address.

The integration of artificial intelligence in education has gained global attention due to its potential to enhance feedback, personalization, and reflective learning (UNESCO, 2021). Luckin et al. (2016) argue that AI can support learning by providing intelligent guidance rather than replacing human instruction. Holmes, Bialik, and Fadel (2019) further note that AI tools are particularly effective when used to support formative assessment and instructional design.

Recent studies indicate that AI-based feedback systems improve learners' ability to revise and refine instructional materials (Yang, Ding, & Pan, 2020). Chen et al. (2020) and Zawacki-Richter et al. (2019) report that AI applications in education enhance instructional coherence and learner autonomy when ethically and pedagogically integrated. These findings support the use of AI-based self-assessment in teacher education contexts.

AI-based self-assessment combines automated analysis with rubric-based evaluation to provide immediate, objective, and criterion-referenced feedback. According to Khosravi et al. (2022), AI-supported feedback enhances learning by offering timely and personalized guidance.

AI-based self-assessment systems analyze lesson plans based on predefined rubrics and highlight areas needing improvement, such as objective clarity, assessment alignment, and lesson sequencing.

AI-based self-assessment enhances objectivity in evaluation by reducing human bias. According to Khosravi et al. (2022), automated feedback systems provide consistent evaluation aligned with predefined rubrics. This consistency improves reliability and fairness in assessment, enabling future teachers to trust the feedback and apply suggested improvements to their lesson plans.

Research demonstrates that AI-based self-assessment positively affects lesson planning skills. Yang et al. (2020) found that AI-supported feedback improved coherence, sequencing, and instructional alignment in lesson plans.

Similarly, Umar and Hassan (2021) reported that future teachers who used AI-based self-assessment tools showed significant improvement in lesson planning quality, particularly in writing objectives and aligning activities with learning outcomes.

Furthermore, AI-based self-assessment encourages iterative improvement in lesson planning. Yang et al. (2020) emphasizes that repeated cycles of feedback and revision lead to higher-quality instructional designs. Future teachers who engage in AI-supported reflection demonstrate improved coherence, sequencing, and pedagogical alignment in lesson plans over time.

Rubrics provide clear performance criteria and enhance transparency in assessment. Andrade (2010) states that rubrics guide learners in understanding expectations and evaluating their performance.

When integrated with AI, rubrics enable automated yet structured feedback, reducing subjectivity and improving reliability in evaluation (Redecker & Punie, 2017).

Rubrics also function as instructional tools that guide learning. Brookhart (2013) states that rubrics clarify expectations and support formative learning. When integrated with AI, rubrics help future teachers understand performance standards and apply feedback effectively, leading to improved lesson planning quality.

Several empirical studies support the effectiveness of AI in education. A systematic review by Zawacki-Richter et al. (2019) concluded that AI-based tools enhance instructional design, assessment accuracy, and teaching effectiveness.

However, most studies have been conducted in developed countries, indicating a lack of empirical research in developing contexts such as Pakistan.

Empirical evidence suggests that AI-based tools improve both teaching and learning outcomes. Chen et al. (2020) found that AI-supported instructional systems enhanced teachers' planning efficiency and instructional alignment. However, contextual differences highlight the need for localized research in developing countries such as Pakistan.

In Pakistan, teaching practice remains a critical component of teacher preparation; however, several studies have reported persistent challenges. Haider & Hussain (2014) identified limited supervision and feedback as major issues faced by future teachers. Hussain & Mahmood (2019) further reported that pre-service teachers often lack opportunities for reflective lesson planning during practicum.

Raza (2020) found that lesson planning competencies of future teachers in Pakistan remain underdeveloped due to traditional supervisory practices. Similarly, Ali & Khatoon (2018) emphasized the need for innovative approaches to support professional growth during teaching practice. Khan et al. (2021) concluded that educational technology can significantly enhance instructional planning and reflective practice in Pakistani teacher education programs.

In addition to geographical gaps, limited research has examined AI-based self-assessment at the school-teaching level during teaching practice. Most existing studies focus on higher education or student learning outcomes rather than teacher planning skills. This gap reinforces the relevance of the present study in contributing original insights to teacher education research.

Methodology of the Study

The present study, as quantitative research rooted in positivism, employed a one-group pre-test and post-test experimental design**,** widely used in educational settings for practical classroom-based

interventions (Creswell & Creswell, 2018). This design was appropriate because the purpose of the research was to determine the effect of an AI-based self-assessment tool on the lesson planning quality of future teachers, rather than to compare two independent groups.

The one-group pre-test and post-test design allows the researcher to measure the same participants before and after an intervention. In this study, the pre-test represented the lesson plans developed by students without AI support, while the post-test represented the revised plans created after engaging with an AI-based self-assessment tool. The difference in scores between the two stages indicated the impact of the intervention. The study is action research in nature and aims to explore whether integrating artificial intelligence (AI) tools for self-assessment can significantly improve the lesson planning skills of future teachers during their teaching practice. As lesson planning is a fundamental component of professional teacher preparation, it is cruc ial to determine how technological support mechanisms such as AI-based assessment can influence teacher performance, reflection, and instructional design.

This design is particularly suitable for action research, as it focuses on improving practice within a specific context (Mertler, 2020). Since the participants were future teachers currently undergoing teaching practice, the design allowed for a realistic, reflective, and developmental process rather than a purely controlled laboratory experiment.

Table 1: Research Process

Stages	Activity Description
Pre-test	Students submit initial lesson plans prepared independently, without any AI support. These are assessed using a standard rubric.
Intervention	Students are introduced to an AI-based self-assessment tool (such as ChatGPT and Edcafe AI platform). They use it to receive automated feedback, reflections, and suggestions for improvement.
Post-test	Students revise and resubmit their lesson plans after using AI-based feedback. The revised plans are re-evaluated using the same rubric.
Analysis	Comparison between pre-test and post-test scores determines whether AI self-assessment produced significant improvement through scores comparison in form of averages,

Participants of the Study

The population for this study consisted of future teachers enrolled in the Bachelor of Education (B.Ed.) 1.5-year program at the University of Education, Lahore, and engaged in their teaching practice in various public and private schools affiliated with the university. These participants represented the target group for which the research problem was most relevant, as they were actively developing professional teaching competencies, including lesson planning. A purposive-convenient sampling technique was used to select the sample. According to Fraenkel & Wallen (2019), purposive sampling allows researchers to choose participants who possess specific characteristics relevant to the study's objectives. In this case, the key criterion was that participants had to be student-teachers currently involved in teaching practice and required to prepare lesson plans regularly. A total of 20 participants were selected from different schools where University of Education Lahore students were assigned for

teaching practice. The sample size was considered adequate for an action research project and manageable for individualized data collection and analysis.

Research Instrument

Lesson Planning Rubrics

The main instrument used for data collection was lesson planning assessment rubrics were developed by the researcher in consultation with expert teacher educators. The rubric evaluated the quality of lesson plans based on five core dimensions as criteria:

- **Learning Objectives**: clarity, alignment with curriculum standards, and measurability.
- **Instructional Strategies**: appropriateness, variety, and learner engagement.
- **Content Organization**: logical sequencing, relevance, and accuracy.
- **Assessment Techniques**: coherence with objectives and feasibility in classroom context.
- **Reflection and Adaptation**: teacher's ability to anticipate learner needs and make improvements.

Each component was rated on a 5-point scale (5 = Poor, 10 = Fair, 15 = Good, 20 = Excellent).

Validity

The content validity is ensured by experts. Content validity testing involves reviewing the instrument such as observation checklist (JhonSon, 2014).

Intervention

The intervention employed an AI-based self-assessment mechanism**.** Participants used an AI text-based platform (ChatGPT) to evaluate their draft lesson plans. The tool provided feedback on structure, coherence, alignment with learning objectives, and pedagogical appropriateness. Students were instructed to input their lesson plans and request targeted feedback in areas such as clarity, learning outcomes, and instructional strategies. This step aimed to allow future teachers to reflect on and refine their planning independently.

Science Contents and Lesson Plans

Table 2

Distribution of Grade 8 Science Lesson Plans

Topic	Area of science	No. of Lesson Plans (pre-test)	No. of Lesson Plans (post-test)	Purpose of Lesson Plans
Introduction to Science	General science	5	5	To ask questions, test ideas and find answers about the universe and how it works.
States of Matter	Chemi,stry	5	5	To examine the solid, liquid and gas
Hydraulic Elevator	Physics	5	5	To assess application of scientific principles
Galaxies	Astronomy	5	5	To evaluate conceptual clarity and instructional alignment

Table presents the distribution of Grade 8 Science lesson plans prepared by twenty future teachers during teaching practice. Each participant developed one pre-test and one post-test lesson plan on the same topic. The post-test lesson plans were revised using AI-based self-assessment feedback. This distribution ensured equal representation of topics and allowed systematic comparison of lesson planning performance before and after the intervention.

Rubric Criteria (see table 3)

Overall Constructive Alignment

Overall, pre-test lesson plans demonstrated partial alignment among objectives, activities, assessment, and materials. The findings indicate that future teachers required structured guidance to improve coherence and effectiveness in lesson planning.

The pre-test results indicate that lesson planning skills were generally at a fair level. Objectives were often partially clear, activities showed limited alignment with learning outcomes, and assessment strategies lacked coherence. These findings highlight the need for structured self-assessment support.

Table 3

Plan of Action Research

Week	Activity	Details
Week 1 – Orientation & Pre-Test	Pre-test lesson plan submission	• Each student submits 1 lesson plan without AI support. • Lesson plan scored using the 10-criteria rubric to establish baseline. • Rubric scores recorded for pre-test.
Week 2 – AI Introduction & Training	AI-based self-assessment training	• Train students on using AI (e.g., ChatGPT & Edcafe AI) for lesson plan evaluation. • Show examples of prompts to evaluate alignment between objectives, activities, and assessment.
Weeks 3– AI-Assisted Revision	AI-based self-assessment	• Students input their lesson plans into AI for feedback. • Students revise lesson plans according to AI suggestions. • Instructor monitors progress and clarifies doubts, if needed.
Week 4 – Post-Test Lesson Plan Submission	Submit revised lesson plans	• Each student submits 1 post-test lesson plan after AI-based self-assessment. • Lesson plan scored using the same 10-criteria rubric.

Data Analysis

Data analysis was conducted by comparing pre-test and post-test lesson plan scores. Mean values were calculated to summarize overall performance before and after the use of AI-based self-assessment. Improvement was determined by comparing the pre-test and post-test mean scores. Each of the 20 future teachers prepared two Grade 8 Science lesson plans: one before the use of AI-based self-assessment (pre-test) and one after receiving AI-generated feedback (post-test). Both lesson plans were evaluated using the Lesson Plan Alignment Rubric consisting of ten criteria.

Each criterion was scored using weighted values to enhance quantitative clarity: Poor = 5, Fair = 10, Good = 15, and Excellent = 20. Therefore, the maximum possible score for a lesson plan was 20. Mean scores were calculated for each criterion to evaluate overall trends and improvements.

Table 3

Comparison of pre-test and post-test lesson plan

Lesson Planning Criteria	Pre-test Mean Score	Post test Mean Score	Improved score
Clarity of Learning Objectives	10.2	16.8	6.6
Measurability of Objectives	9.8	16.4	6.6
Relevance of Activities to Objectives	10.5	17.2	6.7
Cognitive Level Alignment	9.9	16.6	6.7
Variety of Activities	9.4	16.1	6.7
Assessment Alignment	9.7	16.5	6.8
Time Management / Sequencing	10.1	16.9	6.8
Integration of Skills	9.6	16.3	6.7
Instructional Materials Alignment	10.0	17.0	7
Overall Constructive Alignment	10.3	17.4	7.1
Grand Mean	9.95	16.72	6.77

Comparative Analysis of Pre-test and Post-test

A comparison of pre-test and post-test lesson plan scores indicates a clear improvement in lesson planning performance after the use of AI-based self-assessment. The pre-test scores reflect the baseline planning skills of future teachers, which were generally moderate and revealed weaknesses in objective clarity, assessment alignment, and lesson sequencing.

Findings of the study

- The clarity of learning objectives showed clear improvement, as the pre-test score of 10.2 increased to 16.8 in the post-test, resulting in an improvement of 6.6 points. This indicates that learning objectives became more clearly stated after the intervention.
- The measurability of objectives improved from a pre-test score of 9.8 to a post-test score of 16.4, showing an increase of 6.6 points. This suggests that objectives were written in a more measurable and observable manner in the post-test.
- The relevance of activities to learning objectives increased from 10.5 in the pre-test to 17.2 in the post-test, reflecting an improvement of 6.7 points. This indicates better alignment between planned activities and stated objectives.
- The cognitive level alignment score rose from 9.9 to 16.6, showing an improvement of 6.7 points. This suggests that learning activities and objectives were better matched to appropriate cognitive levels.
- The variety of activities improved from 9.4 in the pre-test to 16.1 in the post-test, with an increase of 6.7 points, indicating the inclusion of more diverse and engaging teaching strategies.
- The assessment alignment score increased from 9.7 to 16.5, showing an improvement of 6.8 points. This reflects stronger alignment between learning objectives, instructional activities, and assessment methods.
- The time management and sequencing criterion improved from 10.1 to 16.9, indicating an increase of 6.8 points. This suggests better organization and logical sequencing of lesson components.

- The integration of skills improved from a pre-test score of 9.6 to a post-test score of 16.3, showing an improvement of 6.7 points, indicating better integration of cognitive, psychomotor, and affective skills.
- The instructional materials alignment showed substantial improvement, increasing from 10.0 to 17.0, with an improvement of 7.0 points, suggesting more appropriate and well-aligned use of teaching materials.
- The overall constructive alignment demonstrated the highest improvement, increasing from 10.3 in the pre-test to 17.4 in the post-test, reflecting an improvement of 7.1 points. This indicates strong overall alignment among objectives, activities, assessments, and materials.
- Overall, the mean pre-test score of 9.95 increased to a post-test mean score of 16.72, showing an overall improvement of 6.77 points, which confirms the positive impact of the intervention on lesson planning quality.

Discussion

The findings of the present study indicate that AI-based self-assessment had a positive effect on the lesson planning skills of future teachers during teaching practice. The improvement observed in post-test lesson plans suggests that structured self-assessment supported by artificial intelligence can enhance clarity of learning objectives, instructional alignment, lesson organization, and assessment planning. These findings support the view that reflective practices play a crucial role in teacher professional development (Farrell, 2015).

The results of the study are consistent with the work of Nicol & Macfarlane-Dick (2006), who emphasized that self-assessment and formative feedback promote self-regulated learning. In the present study, AI-based self-assessment provided immediate, criterion-based feedback, enabling future teachers to critically review their lesson plans and revise them independently. This reflective engagement contributed to improved lesson coherence and instructional quality in post-test lesson plans.

The findings also align with Panadero (2017), who reported that self-assessment enhances learners' metacognitive awareness and ability to regulate their learning processes. In this study, future teachers demonstrated increased awareness of lesson structure, objective formulation, and assessment strategies after using AI-based self-assessment. This suggests that AI tools can effectively support reflective thinking and metacognitive development during teaching practice.

Furthermore, the improvement in lesson planning quality supports existing research on artificial intelligence in educational feedback systems. Yang et al. (2020) found that AI-supported feedback assists learners in refining instructional design by providing timely and structured guidance. Similarly, Khosravi et al. (2022) reported that AI-based assessment tools enhance alignment and coherence in educational planning. The present study extends these findings by demonstrating that AI-based self-assessment can be effectively applied in teacher education, particularly for lesson planning during teaching practice.

The use of a holistic lesson planning rubric in this study also aligns with Brookhart's (2013) view that rubrics function not only as assessment tools but also as instructional guides. When combined with AI-based self-assessment, the rubric supported future teachers in understanding expectations clearly and focusing on overall lesson quality rather than isolated components. This approach encouraged meaningful revision and professional growth.

The findings of the present study are further supported by research conducted in the Pakistani teacher education context. Hussain & Mahmood (2019) reported that future teachers in Pakistan often face challenges in lesson planning during teaching practice due to limited feedback and reflective support. The improvement observed in post-test lesson plans in this study suggests that AI-based self-

assessment can address these challenges by providing structured guidance and opportunities for independent reflection.

Similarly, Raza (2020) found that many pre-service teachers demonstrate weak lesson planning competencies during practicum, particularly in aligning objectives, activities, and assessment. The current study shows that AI-based self-assessment can help overcome these weaknesses by guiding future teachers to revise and improve lesson plans systematically.

In addition, Khan, Ahmad & Shah (2021) highlighted that the integration of educational technology in teacher education programs in Pakistan enhances instructional planning skills and professional confidence. The present study extends this research by demonstrating that AI-based self-assessment, when used as a supportive and reflective tool, is contextually relevant and beneficial within Pakistani teacher education institutions.

Overall, the discussion of findings suggests that AI-based self-assessment complements traditional supervision practices by providing continuous, structured, and reflective support during teaching practice. The study confirms that integrating AI-supported self-assessment into teacher education programs can strengthen lesson planning skills, promote professional autonomy, and support independent learning among future teachers.

The findings of the present study further support research on feedback and instructional improvement. Hattie & Timperley (2007) explain that effective feedback reduces the gap between current and desired performance. In this study, AI-based self-assessment functioned as a feedback mechanism that enabled future teachers to revise lesson plans more effectively. Andrade (2010) similarly argues that self-assessment encourages learners to take ownership of quality standards and performance improvement.

The observed improvement in post-test lesson planning aligns with studies emphasizing the role of technology in professional learning. Koehler and Mishra's (2009) TPACK framework highlights the importance of integrating technological tools with pedagogical knowledge. Ertmer & Ottenbreit-Leftwich (2010) argue that technology integration supports reflective instructional practices when aligned with learning goals. The present study confirms that AI-based self-assessment supports pedagogical decision-making rather than merely serving as a technical tool.

Additionally, the findings reinforce Selwyn's (2016) assertion that educational technology should be viewed as a supportive aid rather than a replacement for teachers. AI-based self-assessment in this study complemented traditional supervision by offering consistent, criterion-based guidance.

Conclusion

This study concludes that AI-based self-assessment has improved the lesson planning skills of future teachers during teaching practice. The comparative analysis of pre-test and post-test lesson plan scores demonstrated clear improvement across all planning criteria, including clarity and measurability of objectives, alignment of activities and assessments, cognitive level matching, time management, integration of skills, and overall constructive alignment. The findings indicate that structured AI-supported feedback enhanced reflective practice and enabled future teachers to independently identify weaknesses and improve lesson quality. By providing consistent, criterion-based guidance, AI-based self-assessment complemented traditional supervision and promoted professional autonomy among future teachers. Overall, the study confirms that integrating AI-based self-assessment into teacher education programs can strengthen lesson planning competencies and contribute to improved instructional preparation.

References

Abualrob, M. M. A. (2025). Innovative teaching: How pre-service teachers use artificial intelligence to teach science to fourth graders. *Contemporary Educational Technology, 17*(1), Article ep547. https://doi.org/10.30935/cedtech/15686

Ali, T., & Khatoon, S. (2018). Teaching practice and professional development of future teachers in Pakistan. *Pakistan Journal of Teacher Education*, 21(1), 55–70.

Andrade, H. L. (2010). Students as the definitive source of formative assessment: Academic self-assessment and the self-regulation of learning. In *Handbook of formative assessment* (pp. 90-105). Routledge.

Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability (formerly: Journal of personnel evaluation in education)*, *21*(1), 5-31.

Brookhart, S. M. (2013). *How to create and use rubrics for formative assessment and grading*.

Brookhart, S. M. (2018). *Feedback that fits: Teaching strategies for learning. Alexandria.*

Brown, H. D. (2007). Principles of Language Learning and Teaching (Fifth Edit). *San Fransisco State University*.

Chen, X., Xie, H., Zou, D., & Hwang, G. J. (2020). Application and theory gaps during the rise of artificial intelligence in education. *Computers and Education: Artificial Intelligence*, *1*, 100002.

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education*, Routledge.

Creswell, J. W., & Creswell, J. D. (2014). *Research design: Qualitative, quantitative, and mixed methods approach*. Sage publications.

Cruickshank, D. R., Jenkins, D. B., & Metcalf, K. K. (2009). *The act of teaching* (p. 409). New York: McGraw-Hill.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of research on Technology in Education*, *42*(3), 255-284.

Farrell, T. S. (2015). *Promoting teacher reflection in second language education: A framework for TESOL professionals*. Routledge.

Fraenkel, J. R., & Wallen, N. E. (2012). *How to design and evaluate research in education*. Order Department, McGraw Hill Publishing Co., Princeton Rd., Hightstown, NJ 08520.

Gay, L. R., Mills, G. E., & Airasian, P. (2012). Educational research competencies for analysis and applications.

Haider, G., & Hussain, A. (2014). Problems of teaching practicum faced by student teachers. International Journal of Academic Research, 6(3), 1–7.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of educational research*, *77*(1), 81-112.

John, P. D. (2006). Lesson planning and the student teacher: re-thinking the dominant model. *Journal of Curriculum Studies*, *38*(4), 483-498.

Khan, M. A., Ahmad, I., & Shah, S. R. (2021). Integration of educational technology in teacher education programs in Pakistan. *Pakistan Journal of Education*, 38(1), 45–60.

Khosravi, H., Shum, S. B., Chen, G., Conati, C., Tsai, Y. S., Kay, J., ... & Gašević, D. (2022). Explainable artificial intelligence in education. *Computers and education: artificial intelligence*, *3*, 100074.

Killen, R. (2013). Effective Teaching Strategies: Lessons from Research and Practice (6th ed.). Melbourne: Cengage Learning.

Koehler, M., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)? *Contemporary issues in technology and teacher education*, *9*(1), 60-70.

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence unleashed: An argument for AI in education. London, England: Pearson.

Mahmood, N., & Iqbal, Z. (2019). Challenges Faced by Future Teachers during Teaching Practice: Connecting Theory to Practice. *Bulletin of Education and Research*, *40*(2), 113-136.

Miao, F., & Holmes, W. (2021). Artificial intelligence and education. Guidance for policy-makers.

Moon, J. A. (2004). *A handbook of reflective and experiential learning: Theory and practice*. Routledge.

Moskal, Barbara M. (2000). Scoring rubrics: what, when and how? Practical Assessment, Research &Evaluation, 7(3).

Nicol, D. J., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in higher education*, *31*(2), 199-218.

Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in psychology*, *8*, 422.

Raza, M. S. (2020). Lesson planning competencies of pre-service teachers during practicum. *Journal of Educational Research*, 23(2), 89–102.

Reddy, Y. M., & Andrade, H. (2010). A review of rubric use in higher education. *Assessment & evaluation in higher education*, *35*(4), 435-448.

Sadler, D. R. (1989). Formative assessment and the design of instructional systems. *Instructional science*, *18*(2), 119-144.

Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Routledge.

Selwyn, N. (2016). *Education and technology: Key issues and debates*. Bloomsbury Publishing.

Yang, Q., Ding, Z., & Pan, S. J. (2020). Advances in AI-based educational feedback systems. IEEE Transactions on Learning Technologies, 13(4), 686–699.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–where are the educators?. *International journal of educational technology in higher education*, *16*(1), 1-27.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into practice*, *41*(2), 64-70.