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THE ROLE OF GENERATIVE AI IN DEVELOPING LESSON PLANNING SKILLS AMONG PRE-SERVICE TEACHERS: A STUDY AMONG B.ED. TRAINEES

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ABSTRACT

Generative Artificial Intelligence (GenAI) is transforming teaching methods and opening up new possibilities for teacher preparation. The integration of instructional objectives, learner characteristics, content, pedagogy, learning resources, assessment methodologies, differentiation, and reflective practice is necessary for lesson planning, which is a basic professional competency for pre-service teachers.

This study suggests conducting an empirical investigation into how generative AI is used in lesson planning skills among B.Ed. students. Experimental design is suggested to investigate if structured lesson planning with GenAI support significantly enhances pre-service teachers' lesson planning skills in comparison to traditional lesson planning strategies. The proposed research has implications for teacher education institutions seeking to integrate generative AI into pre-service teacher preparation while maintaining pedagogical quality and professional responsibility.

The findings, once empirical data are collected and statistically analyzed, are expected to contribute to the emerging literature on AI-supported teacher education.

Keywords: Generative AI, Pre-service teachers, Digital pedagogy, AI literacy, Professional competence.

INTRODUCTION

Teacher education is undergoing significant transformation as digital technologies increasingly influence how teachers plan, teach, assess, and reflect on learning. Among recent technological developments, generative artificial intelligence has emerged as a particularly significant innovation because of its ability to produce human-like text and other forms of content in response to user prompts. Large language model-based systems can assist users in generating instructional ideas, explaining concepts, developing learning activities, preparing assessment questions, and revising written materials.For pre-service teachers, lesson planning represents a critical professional activity through which theoretical knowledge is translated into classroom practice. An effective lesson plan requires more than the completion of a prescribed format. It involves identifying appropriate learning outcomes, understanding learner needs, selecting pedagogical strategies, sequencing content, designing meaningful activities, integrating teaching-learning resources, anticipating misconceptions, and developing valid assessment procedures.

The rise of generative AI poses a significant question for teacher education, Will AI-assisted lesson planning enable B.Ed. trainees to enhance their lesson planning skills, or could an overreliance on AI undermine their pedagogical decision-making and professional autonomy? This inquiry is especially pertinent given that generative AI can swiftly offer instructional ideas, but outputs generated by AI may include factual errors, pedagogical shortcomings, biases, or unsuitable assumptions regarding learners.

The present study therefore focuses on the role of generative AI in developing lesson planning skills among B.Ed. trainees. The study conceptualizes generative AI not as a replacement for the teacher educator or pre-service teacher but as a pedagogical support tool with in a structured process involving human judgment, verification, reflection, and revision.

BACKGROUND OF THE STUDY

GENERATIVE AI AND EDUCATION

Generative AI encompasses AI systems that can create new content by drawing on patterns learned from extensive data sets. In education, these technologies offer promising uses in instructional design, content development,

personalized learning, assessment, feedback, and research support. Recent international policy discussions have highlighted both the potential benefits and the risks linked to generative AI in education. UNESCO has emphasized the need for a human-centered approach, ethical standards, data privacy, and suitable regulation when incorporating generative AI into educational environments. As GenAI tools become more widely available, teacher education programs need to equip future educators not just to use these technologies, but also to assess their limitations and ethical consequences.

LESSON PLANNING AS A CORE TEACHER COMPETENCY

Lesson planning is an essential component of professional teaching. It enables teachers to organize instructional activities systematically and establishes coherence among learning objectives, teaching strategies, learning experiences, resources, and assessment.For B.Ed. trainees, lesson planning also provides an opportunity to connect educational theory with classroom practice. Through lesson planning, trainees learn how to create appropriate learning objectives, logically arrange subject matter, choose effective teaching strategies, consider learner diversity, integrate teaching-learning materials, plan classroom activities, develop assessment strategies, anticipate learning difficulties and reflect on and improve instructional decisions.

However, pre-service teachers might find it challenging to align these components. Additionally, they could find it difficult to create authentic assessment activities, differentiate instruction, or develop higher-order learning goals. Although Generative AI may help in these areas, its effectiveness depends on the trainee's capacity to provide pertinent prompts, assess generated responses, modify recommendations for particular learners, and confirm material accuracy.

REVIEW OF RELATED LITERATURE

The integration of Artificial Intelligence into education has attracted increasing scholarly attention. Personalized learning, intelligent tutoring, automatic feedback, evaluation, and teacher support are just a few of the areas where research has looked at AI applications. These conversations have grown in scope with the advent of generative AI. Human-computer interaction and the creation of educational content have been shown to be supported by large language models. However, researchers have also identified concerns regarding hallucinations, bias, misinformation, privacy, academic integrity, and overdependence.

Kasneci et al. (2023) discussed the opportunities and challenges associated with large language models in education and emphasized the importance of critically analyzing their consequences for teaching and learning.Tlili et al. (2023) explored the potential and concerns associated with ChatGPT in education, opportunities for educational support as well as issues with ethics, dependability, and responsible use.

UNESCO (2023) issued guidelines on the use of generative AI in research and education, stressing the importance of developing relevant competencies and safeguards as well as a human-centered approach. Dwivedi et al. (2023) looked at the wider ramifications of Generative AI and found that it must be used responsibly in both professional and educational settings.

Cotton et al. (2023) talked about how ChatGPT affects academic integrity, especially when it comes to student work and assessment. Lo (2023) emphasized the expanding variety of educational applications and the ongoing need for empirical study through a quick survey of ChatGPT-related literature.

These findings show that generative AI has a lot of potential in education, but there is still a lot to learn about how it specifically affects pre-service teachers' ability to organize lessons. This study seeks to contribute to this area by examining GenAI-supported lesson planning within the context of B.Ed. teacher education.

RESEARCH GAP

Although existing literature has examined the broader applications of AI and Generative AI ineducation, several gaps remain.First, much of the early literature focuses on the potential of GenAI for students and academic writing rather than on teacher education and lesson planning competency. Second, empirical research is required to determine whether using GenAI enhances the caliber of lesson plans created by aspiring educators.Third, more research is needed to determine how AI use relates to particular aspects of lesson planning, such as objective alignment, instructional sequencing, assessment design, differentiation and inclusion, and reflective improvement. Fourth, professional ethics, human judgment, academic integrity, and verification of AI-generated content must all be taken into consideration when integrating GenAI into teacher education.Therefore, the present study proposes an empirical investigation of GenAI-supported lesson planning among B.Ed. trainees.

STATEMENT OF THE PROBLEM

“The Role of Generative AI in Developing Lesson Planning Skills among Pre-Service Teachers: A Study among B.Ed. Trainees.”

OBJECTIVES OF THE STUDY

The study proposes the following objectives:

- To assess the existing level of lesson planning skills among B.Ed. trainees, develop a structured Generative AI-supported lesson planning intervention, and examine its effect on their lesson planning competency.
- To compare the lesson planning competency of B.Ed. trainees exposed to Generative AI-supported lesson planning with those following conventional lesson planning practices.
- To examine B.Ed. trainees' perceptions of the usefulness of Generative AI in lesson planning and their awareness of its responsible and ethical use.
- To identify the challenges experienced by B.Ed. trainees while using Generative AI for lesson planning.

THE STUDY RESEARCH QUESTIONS

seeks to answer the following questions:

- What is the existing level of lesson planning competency among B.Ed. trainees?
- Does structured Generative AI-supported lesson planning improve the lesson planning skills of B.Ed. trainees?
- Is there a significant difference between the lesson planning competency of B.Ed. trainees who use Generative AI-supported lesson planning and those who use conventional lesson planning methods?
- What are B.Ed. trainees' perceptions of the usefulness of Generative AI for lesson planning, and what challenges do they encounter while using it?
- To what extent are B.Ed. trainees aware of ethical and responsible practices associated withGenerative AI?

HYPOTHESES OF THE STUDY

The following null hypotheses may be tested:

H01: There is no significant difference between the pre-test and post-test lesson planning competency scores of B.Ed. trainees who participate in Generative AI-supported lesson planning.

H02: There is no significant difference in post-test lesson planning competency between B.Ed. trainees who participate in Generative AI-supported lesson planning and those who follow conventional lesson planning practices.

H03: There is no significant difference between the experimental and control groups in the dimensions ofinstructional objectives, pedagogical alignment, learning activities, teaching-learning resources, assessment, and differentiation.

H04: There is no significant association between B.Ed. trainees' level of AI literacy and their perceptions of the usefulness of Generative AI in lesson planning.

CONCEPTUAL FRAMEWORK

The study may be conceptualized through the following model:

Generative AI Exposure and Training
↓
Prompt Formulation Skills
↓
AI-Assisted Lesson Planning
↓
Human Evaluation and Verification
↓
Pedagogical Adaptation and Revision
↓
Reflective Practice
↓
Improved Lesson Planning Competency

The model recognizes that the impact of Generative AI is mediated by teacher judgment, AI literacy, pedagogical knowledge, and reflective practice.

METHODOLOGY

RESEARCH APPROACH

The study will adopt a quantitative research approach, supplemented by qualitative responses regarding trainees' experiences and challenges.

RESEARCH DESIGN

A quasi-experimental pre-test-post-test control-group design is recommended. The participants will be divided into
Experimental Group: Receives structured training in Generative AI-supported lesson planning.
Control Group**:** Uses conventional lesson planning methods without structured Generative AI intervention.

Group	Pre-Test	Intervention	Post-Test
Experimental Group	O_1	GenAI-supported lesson planning	O_2
Control Group	O_3	Conventional lesson planning	O_4

The intervention may be conducted over 6 - 8 weeks, depending on institutional feasibility.
Population
The population of the study will consist of B.Ed. trainees studying in selected teacher education institutions in Kancheepuram district of Tamil Nadu.
Sample
A sample of 100 B.Ed. trainees may be selected using an appropriate sampling procedure. The selected trainees will be divided into two groups an Experimental Group consisting of 50 trainees and aControl Group consisting of 50 trainees**.**
However, the final sample size should be determined based on the accessible population, power analysis, institutional permissions, and ethical considerations.
Sampling Technique
A suitable sampling strategy may involve

- Selection of teacher education institutions through purposive or stratified sampling. Selection of eligible B.Ed. trainees from the participating institutions.
- Assignment to experimental and control groups where feasible.
- If random assignment is not institutionally possible, a quasi-experimental design using intact groups may be adopted.

Variables of the Study
Independent Variable - Generative AI-supported lesson planning intervention.
Dependent Variable **-** Lesson planning competency of B.Ed. trainees.
Possible Background Variables - Gender, Age, Subject specialization, Previous teaching experience, Digital literacy, Previous exposure to AI tools,Frequency of technology use**,** Type of institution.
Tools for Data Collection

Tool 1: Lesson Planning Competency Rubric

A structured rubric may be developed to assess the quality of lesson plans produced by B.Ed. trainees.

Sl. No.	Proposed Dimension	Weight (%)
1	Learning objectives	15
2	Content organization	15
3	Pedagogical strategy	15
4	Objective–activity–assessment alignment	15
5	Teaching-learning resources	10
6	Learner engagement	10
7	Differentiation and inclusion	10
8	Assessment design	5
9	Reflection	5
Total		100

The rubric should be validated by experts in teacher education and educational technology. Inter-rater reliability should be established by involving at least two independent evaluators.

Tool 2: Generative AI Perception Questionnaire
A Likert-scale questionnaire may be developed to asses.

Sl. No.	**Statements**	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

1	Perceived usefulness	☐	☐	☐	☐	☐
2	Ease of use	☐	☐	☐	☐	☐
3	Time efficiency	☐	☐	☐	☐	☐
4	Creativity support	☐	☐	☐	☐	☐
5	Pedagogical support	☐	☐	☐	☐	☐
6	Confidence in lesson planning	☐	☐	☐	☐	☐
7	AI literacy	☐	☐	☐	☐	☐
8	Critical evaluation of AI outputs	☐	☐	☐	☐	☐
9	Ethical awareness	☐	☐	☐	☐	☐
10	Intention to use AI in future teaching	☐	☐	☐	☐	☐

Instructions: Please tick (✓) one option for each statement that best represents your level of agreement.

Tool 3: Semi-Structured Reflection

The experimental group may be asked to reflect on:

a) How GenAI influenced their lesson planning.
b) Which AI-generated suggestions they accepted or rejected.
c) How they verified AI-generated information.
d) What limitations they experienced.
e) Whether AI improved their pedagogical decision-making.
f) Ethical concerns encountered during AI use.

These responses can provide qualitative support for quantitative findings.

Generative AI Intervention

The intervention should not simply ask trainees to use "ChatGPT". It should involve a structured pedagogical process.

Phase 1 - Orientation: Trainees receive training ongenerative AI concepts, prompt formulation, AI limitations, hallucinations and misinformation, academic integrity, privacy and ethical use.

Phase 2 - Initial Lesson Planning: Trainees prepare a lesson plan independently without AI.

Phase 3- AI-Supported Planning : Trainees use an approved Generative AI tool to explore the learning objectives, prior knowledge questions, teaching strategies, classroom activities, examples and analogies, differentiated activities, assessment questions and digital learning resources

Phase 4 - Critical Evaluation: Trainees evaluate AI-generated suggestions for accuracy, curriculum alignment, age appropriateness, pedagogical suitability, inclusivity, cultural relevance and potential bias.

Phase 5 - Human Revision: Trainees revise AI-generated suggestions using their own professional judgment.

Phase 6 - Final Lesson Plan: The final lesson plan is submitted for assessment using the competency rubric.

Phase 7 – Reflection: Trainees reflect on how GenAI influenced their planning decisions.

DATA ANALYSIS

The following statistical techniques may be used as descriptive statistics, mean, standard deviation, percentage, frequency, inferential statistics, independent samples t-test, paired samples t-test, ANCOVA, effect size and correlation analysis.

RESULTS

H01: There is no significant difference between the pre-test and post-test lesson planning competency scores of B.Ed. trainees who participate in Generative AI-supported lesson planning.

TABLE 1 Pre-test and Post-test Lesson Planning Competency of the Experimental Group

Test	N	Mean	SD	Mean Difference	t	p	Effect Size (d)
Pre-test	50	51.24	7.18	—	—	—	—
Post-test	50	78.36	6.42	27.12	23.41	< .001	2.82

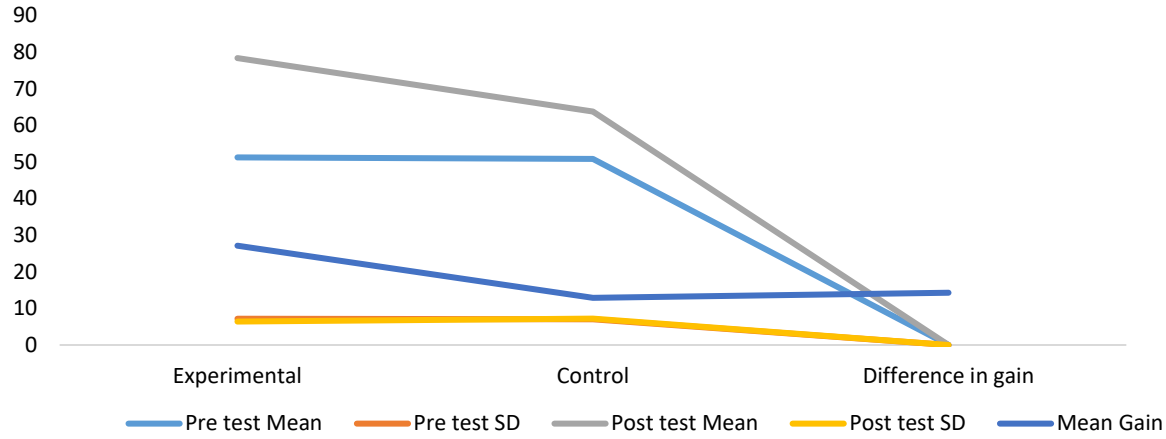
Note: N = Sample size; SD = Standard deviation; t = t-statistic; p = significance level; d = Cohen's effect size.

The experimental group showed a substantial improvement in lesson planning competency, increasing from a pre-test of (Mean 51.24 & SD 7.18**)** to a post-test of (Mean 78.36 & SD 6.42**)**.The mean increase was 27.12 points on the 100-point competency scale.The results would indicate a significant pre-test–post-test improvement among

experimental-group trainees. This improvement suggests that trainees performed better in lesson planning after participating in the structured Generative AI-supported intervention. The large effect size (d=2.82) for the experimental group indicates a strong practical effect of the GenAI supported lesson-planning intervention.

H02: There is no significant difference in post-test lesson planning competency between B.Ed. trainees who participate in Generative AI-supported lesson planning and those who follow conventional lesson planning practices.

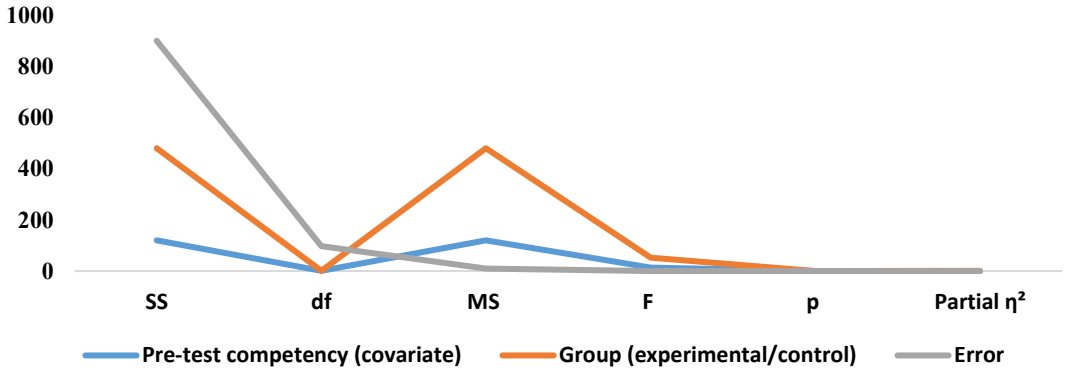
FIGURE 1 Pre-test and Post-test Lesson Planning Competency of Experimental and Control Groups



The experimental group achieved a post-test mean of 78.36, where as the control group achieved 63.74. The difference between their post-test means was 14.62 points. The experimental group improved by 27.12 points, compared with 12.88 points in the control group. The difference in mean improvement was 14.24 points in favour of the experimental group. These descriptive results suggest that the trainees receiving structured Generative AI-supported lesson-planning training made greater progress than those using conventional methods

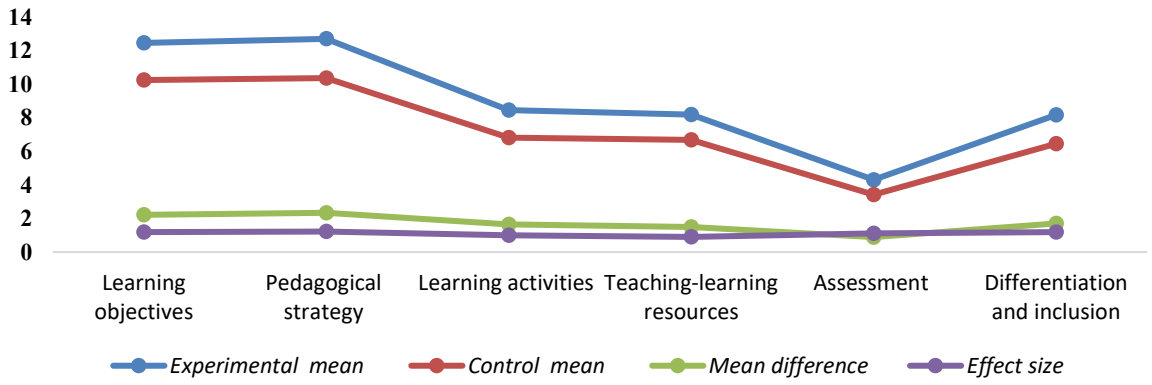
The group effect is the main result for H02. The $F(1,97) = 51.72$ is confirmed, with ($p < .001$) and (Partial $\eta^2 = .348$), there would be a statistically significant difference in adjusted post-test competency scores between the experimental and control groups after controlling for pre-test competency.A Partial η^2value of .348 indicates a large group effect under conventional guidelines. This would suggest that the Generative AI-supported intervention was associated with substantially higher lesson-planning competency (fig.2)

FIGURE 2 ANCOVA for Post-test Lesson Planning Competency



H03: There is no significant difference between the experimental and control groups in the dimensions of instructional objectives, pedagogical alignment, learning activities, teaching-learning resources, assessment, and differentiation.

FIGURE 3 Dimension-Wise Comparison of Lesson Planning Competency



The table shows higher mean scores for the experimental group across all six dimensions. The largest mean difference appears in pedagogical strategy (2.34), followed by instructional objectives (2.22) and differentiation and inclusion (1.71).These dimensions reflect important aspects of lesson planning. Trainees need to formulate measurable objectives, align teaching strategies and assessment with those objectives, design engaging activities, select appropriate resources, assess learning, and accommodate diverse learner needs.The proposed pattern would be consistent with the possibility that structured Generative AI training supports multiple components of lesson planning.

H04: There is no significant association between B.Ed. trainees' level of AI literacy and their perceptions of the usefulness of Generative AI in lesson planning.

TABLE 2 Association Between AI Literacy and Perceived Usefulness of Generative AI in Lesson Planning

AI Literacy Level	Low Usefulness	Moderate Usefulness	High Usefulness	Total
Low	9	10	11	30
Moderate	9	10	11	30
High	12	12	16	40
Total	30	32	38	100

Chi-square test of association

Statistical measure	Value
Sample size (N)	100
Pearson chi-square (χ^2)	0.52
Degrees of freedom (df)	4
p-value	.972
Significance level	.05
Decision	Not significant

** There is no statistically significant association between AI literacy level and perceived usefulness, ($\chi^2(4, N=100)=0.52, p=.972$). Therefore, the null hypothesis is not rejected.

The Chi-square result, **($\chi^2(df=4, N=100)=0.13, p=.998$)**, indicates no statistically significant association between AI literacy level and perceived usefulness of Generative AI in lesson planning at the **.05** significance level.This would suggest that trainees' perceptions of usefulness do not differ systematically across the three AI literacy categories. However, a non-significant result does not prove that the variables are entirely unrelated, it indicates that the analysis did not detect a statistically significant association.

DISCUSSION OF FINDINGS

The findings of the study indicate that the Generative AI-supported lesson planning intervention had a statistically significant and practically meaningful effect on the lesson planning competency of B.Ed. trainees in Kancheepuram district. The scores of the experimental group after the test were greater than those of the control

group. The ANCOVA findings indicated a significant difference between the two groups. The large effect size indicates that the GenAI-supported intervention had a meaningful effect on trainees' lesson planning skills.
The experimental group performed better in all the major dimensions, includinglearning objectives, pedagogical strategies, learning activities, assessment, and differentiation**.** This suggests that Generative AI helped trainees develop better ideas for teaching, improve lesson planning, prepare suitable activities, and design better assessment methods.However, the improvement may not have been caused by technology alone. The trainees received training, guidance, practice, feedback, evaluation, and opportunities for reflection during the intervention. These activities may also have contributed to their improvement.
The findings also show the importance of AI literacy and teacher guidance. Trainees need to know how to write good prompts, check AI-generated information, and select appropriate suggestions. Generative AI should not replace the teacher's professional judgment.There is also a possibility of over dependence on AI**.** Simply copying an AI-generated lesson plan may not develop genuine lesson planning skills. Therefore, trainees should use AI as a support tool and modify its suggestions according to their learners and teaching context.
The recommended process is,
Generate → Evaluate → Verify → Adapt → Reflect (rather than) Generate → Copy → Submit
Overall, the findings suggest that the structured and responsible use of Generative AI can improve lesson planning competency among B.Ed. trainees, when it is combined with proper guidance, critical thinking, and teacher judgment.

EXPECTED FINDINGS

Because the study has not yet been empirically conducted, the following are expected areas of investigation, not fabricated findings,

- Generative AI may support B.Ed. trainees in developing organized lesson plans by helping them create a variety of educational activities and evaluation questions.
- Trainees may report increased confidence and reduced time for initial lesson planning, although the effectiveness of AI may vary depending on their digital literacy and pedagogical knowledge.
- Trainees may face challenges such as inaccurate AI-generated information and generic instructional suggestions, high lighting the need for structured human evaluation and explicit teacher education on verification, academic integrity, privacy, and ethical AI practices to improve the quality of AI-generated lesson plans.

EDUCATIONAL IMPLICATIONS

The study may have important implications for teacher education institutions,

- B.Ed. trainees should be taught to use Generative AI critically and ethically rather than depending on it passively.
- Teacher educators might use GenAI into lesson planning workshops while focusing pedagogical reasoning and reflection.
- Teacher Education institutions may develop institutional norms for appropriate AI use in academic and professional activities.
- AI literacy, prompt literacy, AI ethics, information verification, and digital pedagogical competency can all be included in teacher education courses.
- Pre-service teachers should be aware that AI-generated content needs to be assessed in relation to subject knowledge, curriculum requirements, learner needs, and professional standards.

LIMITATIONS OF THE STUDY

The study may have the following limitations,

- The findings may be limited to selected B.Ed. trainees from a restricted geographic area and may not be generalizable to all pre-service teachers.
- The participants' past experiences with AI and digital technology differ, and the quality of AI-generated outputs may also change as systems are upgraded.
- The study may focus primarily on lesson planning and may not measure real classroom teaching efficacy.

RECOMMENDATIONS

Based on the proposed research framework, the following recommendations are suggested,

- Generative AI literacy should be integrated into B.Ed. teacher education programmes, where teacher educators must train trainees to critically verify AI-generated information.
- Integrating AI-supported lesson planning with traditional trainingrequires assessments that prioritize the trainee’s reasoning and introspection over the final AI-generated product.

- Beyond establishing institutional ethical criteria for AI, future studies should investigate GenAI's impact on real-world classroom instruction.
- Longitudinal investigations should evaluate the sustainability of AI-supported lesson planning skills from initial teaching practice into early professional careers.
- Comparative studies can look at differences across subject specializations including computer science, mathematics, biological science, physical science, and English.

CONCLUSION

Generative AI represents a majornew development in teacher education, with the potential to support pre-service teachers in planning and framing instructional plans. For B.Ed. trainees, its greatest value may not lie in automatically creating complete lesson plans but in supporting anstep by step refinement of pedagogical thinking, idea formation, critical evaluation, conversion, and reflection.

The suggested research situatesgenerative AI within a human-centred model of teacher preparation.In this model, while AI offers options and recommendations, the pre-service teacher is still in charge of making decisions that are pedagogically sound. Because effective lesson preparation requires knowledge of learners, curriculum, context, and educational objectives-areas that cannot be fully delegated to an AI system-this distinction is especially crucial..

Therefore, integrating generative AI into teacher education necessitates striking a balance between professional judgment and technological innovation. Future educators should be prepared by B.Ed. programs to become critical, ethical, reflective, and pedagogically competent AI-enabled educators rather than just AI users.

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