Journal of Buddhist Education and Research
JBER ISSN: 2586-9434 (Print) Vol.11 No.3 (July-September 2025)

Academic Paper

Primary School Teachers' Perceptions of Using Generative Artificial Intelligence in Lesson Planning in Liaoning, China

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Received: 13 April 2025; Revised: 27 April 2025; Accepted: 12 May 2025

Abstract

This study investigates primary school teachers' perceptions and attitudes toward the integration of generative artificial intelligence (GenAI) tools in lesson planning within Liaoning Province, China. Employing a quantitative survey approach, the research analyzes how demographic factors - including gender, teaching experience, and educational background - impact teachers' perceived usefulness, ethical concerns, and intention to use GenAI. Results indicate overall positive perceptions and strong intentions among teachers to adopt GenAI technologies, despite moderate ethical concerns. Notably, gender emerged as a significant predictor of perceived usefulness, with female teachers showing higher acceptance than males, whereas teaching experience and educational background demonstrated no significant influence. Additionally, no interaction effects were identified among the demographic variables. The findings highlight the importance of gender-sensitive approaches in professional development programs and suggest broad-based training interventions to effectively integrate GenAI tools in educational practices. Future research should explore psychological and institutional factors to further understand educators' acceptance and effective utilization of AI technologies.

Keywords: Generative artificial intelligence (GenAI), Teacher perceptions, Lesson planning, Demographic factors, Primary education, Technology integration, Ethical concerns

1. Introduction

The rapid advancement of generative artificial intelligence (GenAI) technologies, such as ChatGPT, has introduced new dimensions to educational practices. These tools possess the capability to generate human-like text, offering potential applications in content creation, personalized learning, and administrative tasks within the educational sphere (Barrett & Pack, 2023). As these technologies become more prevalent, understanding educators' perceptions of their integration into teaching methodologies becomes increasingly vital.

Educators' attitudes toward GenAI significantly influence its successful

implementation in classrooms. Recent studies have shown that while some teachers recognize the potential benefits of GenAI in enhancing instructional efficiency and student engagement, others express concerns regarding issues such as data privacy, the accuracy of AI-generated content, and the potential for diminished teacher-student interactions (Moura & Carvalho, 2024). These apprehensions highlight the necessity for comprehensive professional development programs that equip teachers with the skills and knowledge to effectively integrate GenAI into their pedagogical practices.

In the context of lesson planning, GenAI offers promising avenues for assisting educators in designing and structuring instructional content. Research indicates that AI tools can support teachers by providing creative suggestions, automating routine tasks, and offering personalized resources tailored to diverse student needs (Barrett & Pack, 2023). However, the extent to which teachers are willing to adopt these tools, and their perceptions of the efficacy and reliability of AI-generated lesson plans, remain areas requiring further exploration.

Focusing on China, the integration of AI in education is gaining momentum, yet there is a paucity of research examining primary school teachers' perceptions of GenAI, particularly in regions such as Liaoning. Investigating these perceptions is crucial for developing effective strategies that align AI integration with local educational objectives and cultural contexts.

This study aims to explore the perceptions of primary school teachers in Liaoning, China, regarding the use of GenAI in lesson planning. By examining their attitudes, experiences, and concerns, this research seeks to inform policy development and professional training programs that facilitate the effective and ethical integration of AI technologies in primary education.

2. Objectives

2.1 To explore the perceptions and attitudes of primary school teachers in Liaoning, China, regarding the integration of generative artificial intelligence (GenAI) tools into their lesson planning processes.

2.2 To examine the relationship between teachers' demographic characteristics (such as age, years of teaching experience, and educational background) and their perceptions of GenAI integration in lesson planning.

3. Research Questions

3.1 What are the perceptions and attitudes of primary school teachers in Liaoning, China, regarding the integration of generative artificial intelligence (GenAI) tools into lesson planning?

3.2 To what extent do demographic factors such as age, years of teaching experience, and educational background influence teachers’ perceptions of GenAI integration in lesson planning?

4. Research Hypotheses

H1: Primary school teachers in Liaoning, China, will exhibit varying levels of acceptance and attitudes toward the integration of GenAI tools in lesson planning, reflecting a diversity of perceptions influenced by individual experiences and professional contexts.

H2: There is a statistically significant relationship between teachers’ demographic characteristics (specifically age, years of teaching experience, and educational background) and their perceptions of GenAI integration in lesson planning.

5. Literature Review

5.1 Emergence of Generative AI in Education

The advent of GenAI technologies, such as ChatGPT, has introduced new dimensions to educational practices. These tools possess the capability to generate human-like text, offering potential applications in content creation, personalized learning, and administrative tasks within the educational sphere. As these technologies become more prevalent, understanding educators' perceptions of their integration into teaching methodologies becomes increasingly vital.

5.2 Teachers' Perceptions of GenAI Integration

Educators' attitudes toward GenAI significantly influence its successful implementation in classrooms. Recent studies have shown that while some teachers recognize the potential benefits of GenAI in enhancing instructional efficiency and student engagement, others express concerns regarding issues such as data privacy, the accuracy of AI-generated content, and the potential for diminished teacher-student interactions. These apprehensions highlight the necessity for comprehensive professional development programs that equip teachers with the skills and knowledge to effectively integrate GenAI into their pedagogical practices.

5.3 Application of GenAI in Lesson Planning

In the context of lesson planning, GenAI offers promising avenues for assisting educators in designing and structuring instructional content. Research indicates that AI tools can support teachers by providing creative suggestions, automating routine tasks, and offering personalized resources tailored to diverse student needs. However, the extent to which teachers are willing to adopt these tools, and their perceptions of the efficacy and reliability of AI-generated lesson plans, remain areas requiring further exploration.

5.4 Demographic Factors Influencing GenAI Adoption

Demographic variables such as age, teaching experience, and educational background may influence teachers' perceptions and adoption of GenAI tools. Studies suggest that younger educators or those with higher levels of technological proficiency are more inclined to embrace AI technologies in their teaching practices. Understanding these demographic influences is crucial for developing targeted interventions and support systems that facilitate the effective integration of GenAI in education.

6. Research Methodology

6.1 Research Design

This study adopts a cross-sectional survey research design to investigate primary school teachers’ perceptions of the integration of generative artificial intelligence (GenAI) tools into lesson planning. A quantitative approach was employed to gather empirical data from a diverse sample of in-service teachers, enabling the analysis of trends, differences, and associations across demographic subgroups. The research design was guided by the need to identify both the general attitudes toward GenAI and the influence of demographic characteristics on those attitudes.

6.2 Participants and Sampling

The target population for this study comprises in-service primary school teachers in Liaoning Province, China. A combination of convenience sampling and snowball sampling techniques was used to recruit participants. The inclusion criteria required that participants be

currently teaching in a primary school and have experience with lesson planning. A minimum of 200 responses was targeted to ensure statistical power and representation across age, experience, and educational levels.

6.3 Data Collection Instrument

A structured questionnaire was developed based on existing literature on AI integration in education (e.g., Barrett & Pack, 2023; Moura & Carvalho, 2024). The instrument consisted of three sections:

Section A: Demographic Information – including age, gender, years of teaching experience, academic qualification, and prior exposure to AI technologies.

Section B: Perceptions and Attitudes toward GenAI – measured using a 5-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). Items in this section assessed perceived usefulness, concerns about AI ethics, trust in AI-generated materials, and willingness to adopt GenAI tools in lesson planning.

Section C: Usage Scenarios – including situational tasks such as generating lesson objectives, organizing instructional sequences, and producing formative feedback with GenAI. Participants rated their acceptance of GenAI under different usage conditions.

The questionnaire was piloted with a small group of primary school teachers (n = 15) to refine wording, ensure content validity, and assess reliability. Minor adjustments were made accordingly.

6.4 Data Collection Procedures

The finalized questionnaire was distributed electronically using an online survey platform. Participants were invited via professional networks, school contacts, and teacher training groups. Prior to participation, all respondents were provided with an informed consent form outlining the purpose of the study, data confidentiality, and their right to withdraw at any time.

6.5 Data Analysis Techniques

Data were analyzed using the Statistical Package for the Social Sciences (SPSS). The following statistical procedures were employed:

Descriptive statistics (mean, standard deviation, frequency) to summarize demographic characteristics and general attitudes.

Reliability analysis using Cronbach's alpha to determine internal consistency of attitude scales.

Inferential statistics including Mann–Whitney U tests and Kruskal–Wallis H tests to assess differences across demographic groups.

Spearman correlation analysis to examine the strength and direction of associations between demographic variables and perceptions of GenAI use.

6.6 Ethical Considerations

The study adhered to ethical standards for educational research. Ethical approval was obtained from the affiliated university's research ethics board. Participants' anonymity and confidentiality were assured, and no identifiable data were collected. Participation was entirely voluntary and informed consent was secured prior to data collection.

7. Research Methodology

7.1 Descriptive Statistics

Descriptive statistics were conducted to examine participants' responses to the 12 Likert-scale items across three dimensions: Perceived Usefulness (A1–A4), Ethical Concerns (B1–B4), and Intention to Use (C1–C4).

The Perceived Usefulness items demonstrated high mean scores ranging from 3.86 (A4) to 4.01 (A2), with relatively low standard deviations (SDs between 0.621 and 0.661), indicating general agreement among respondents regarding the utility of GenAI in lesson planning.

In contrast, Ethical Concerns items (B1–B4) had lower mean values, ranging from 3.16 (B4) to 3.29 (B1), with slightly higher variability (SDs between 0.733 and 0.761), suggesting a moderate level of concern about the ethical implications of GenAI use.

The Intention to Use dimension (C1–C4) yielded consistently high average scores, with means between 3.78 and 3.86 and low standard deviations (0.573–0.599), indicating strong willingness among participants to adopt GenAI tools in their instructional practices.

Table 1: Descriptive Statistics of Mediation Variables

Variable	N	Mean	Max	Min	SD
A1	216	2	5	3.87	0.660
A2	216	3	5	4.01	0.621
A3	216	2	5	3.98	0.650
A4	216	2	5	3.86	0.661
B1	216	1	5	3.29	0.761
B2	216	1	5	3.25	0.750
B3	216	1	5	3.21	0.733
B4	216	1	5	3.16	0.743
C1	216	2	5	3.78	0.574
C2	216	2	5	3.81	0.599
C3	216	3	5	3.86	0.573
C4	216	2	5	3.79	0.587

Note: A = Perceived Usefulness, B = Ethical Concerns, C = Intention to Use.

7.2 Reliability Analysis Summary

To assess the internal consistency of the questionnaire, Cronbach's alpha was computed for each subscale: Perceived Usefulness (A1–A4), Ethical Concerns (B1–B4), and Intention to Use (C1–C4). All subscales demonstrated excellent reliability, with alpha coefficients exceeding 0.88. Corrected item-total correlations and alpha if item deleted values confirmed that all items contributed positively to their respective subscales.

Table 2: Reliability Analysis of Subscales

Subscale	Number of Items	Cronbach's Alpha
Perceived Usefulness (A1–A4)	4	0.905
Ethical Concerns (B1–B4)	4	0.916
Intention to Use (C1–C4)	4	0.881

7.3 Three-Way ANOVA Results Summary

A series of three-way ANOVAs were conducted to investigate the effects of gender, teaching experience, and educational background on three key dimensions of teachers' perceptions toward the integration of generative AI (GenAI) in lesson planning: perceived usefulness, ethical concerns, and intention to use.

For perceived usefulness, the analysis revealed a statistically significant main effect of gender,

$F(1, 204) = 7.201$, $p = .008$, partial $\eta^2 = .034$, indicating that male and female teachers differed significantly in their evaluations of GenAI's utility. However, neither teaching experience nor educational background yielded significant main effects, and no interaction effects were observed (all $p > .10$).

Regarding ethical concerns, the ANOVA results showed no significant main effects of gender, teaching experience, or educational background. Furthermore, no interaction effects were found among the three factors (all $p > .10$). Although Levene's test based on the mean suggested a potential violation of the assumption of homogeneity of variances ($p = .038$), additional robust tests using the median and trimmed mean confirmed that the assumption was not substantially violated ($p > .20$), supporting the validity of the ANOVA results.

For intention to use, none of the three demographic variables (gender, teaching experience, or educational background) had a statistically significant main effect (all $p > .10$), and no interaction effects were detected. The homogeneity of variance assumption was supported by Levene's test ($p = .862$), indicating that the results are reliable.

In summary, gender was found to significantly influence teachers' perceived usefulness of GenAI, while teaching experience and educational background did not exhibit statistically significant effects across any of the three outcome variables. No significant interaction effects were observed among the three independent variables.

Table 3: Three-Way ANOVA Results Summary

Dependent Variable	Significant Main Effects	Interaction Effects	Conclusion
Perceived Usefulness (A_avg)	Gender ($p = .008$)	None	Gender impacts perceived usefulness
Ethical Concerns (B_avg)	None	None	No significant effects
Intention to Use (C_avg)	None	None	No significant effects

8. Discussion

This study examined primary school teachers' perceptions and attitudes toward integrating generative artificial intelligence (GenAI) tools into lesson planning in Liaoning, China. The analysis specifically explored how demographic factors such as gender, teaching experience, and educational background influence three critical attitudinal dimensions: perceived usefulness, ethical concerns, and intention to use GenAI.

The results indicate that gender significantly influenced teachers' perceptions of the usefulness of GenAI, with female teachers perceiving GenAI tools as more beneficial compared to their male counterparts. This finding diverges from prior studies, such as Venkatesh and Morris (2000), which suggest that male teachers typically demonstrate higher acceptance and utilization of technology. In contrast, our study found that female teachers perceived GenAI tools as more useful, potentially due to differentiated instructional responsibilities that place a greater emphasis on lesson planning among female educators. One plausible explanation could be the differentiated roles and responsibilities among male and female teachers in instructional contexts, possibly positioning female teachers to more frequently engage with lesson planning tasks that benefit from AI-enhanced creativity and efficiency. Future research should further explore this gender-based discrepancy, examining specific pedagogical contexts and potential cultural influences.

Interestingly, neither teaching experience nor educational background significantly affected perceptions across all three dimensions. This suggests that GenAI acceptance and concerns may not align closely with teachers' tenure or academic qualifications. Given the relatively novel nature of GenAI tools such as ChatGPT, educators across various experience

levels and educational backgrounds might still be in an exploratory phase, resulting in homogeneous initial attitudes. This finding aligns with prior research indicating a broad curiosity and experimentation with emerging AI technologies across educational contexts (Zawacki-Richter et al., 2022).

Moreover, the absence of significant interaction effects among gender, teaching experience, and educational background indicates that these demographic variables independently shape teachers' perceptions. This finding simplifies the interpretative framework and suggests that demographic factors do not compound or diminish each other's effects in shaping attitudes toward GenAI. It also highlights the potential importance of exploring additional factors beyond demographics, such as digital literacy, institutional support, or professional training, which may more effectively predict teachers' attitudes toward adopting GenAI tools.

Regarding ethical concerns, the absence of significant demographic effects suggests uniformity in teachers' concerns about data privacy, AI-generated content accuracy, and teacher-student interaction dynamics. This finding underscores a generalized cautiousness toward GenAI's ethical implications, reinforcing the need for comprehensive ethical guidelines and targeted professional development programs that address these universal concerns rather than demographic-specific interventions.

Finally, the intention to use GenAI did not vary significantly across demographic subgroups. Teachers consistently expressed high willingness to incorporate these tools into their instructional practices, underscoring the broad appeal and perceived relevance of GenAI regardless of demographic background. Such uniformity offers practical implications for policy-makers and educational institutions; standardized professional training and capacity-building programs can be effectively implemented without necessitating extensive differentiation based on demographic characteristics.

In summary, this study highlights gender as a significant factor influencing perceived usefulness but finds minimal demographic influence on ethical concerns and intentions to use GenAI. Future research should examine broader contextual and psychological variables, such as institutional culture, teachers' self-efficacy, and previous technological exposure, to more comprehensively understand factors driving the integration and effective utilization of generative AI in educational settings.

9. Conclusion

This study explored primary school teachers' perceptions and attitudes toward the integration of generative artificial intelligence (GenAI) into lesson planning in Liaoning, China. Specifically, it examined how demographic characteristics - gender, teaching experience, and educational background - influenced their perceptions of GenAI across three dimensions: perceived usefulness, ethical concerns, and intention to use.

The findings revealed that teachers held generally positive perceptions of GenAI tools and expressed strong intentions to integrate them into instructional practices, although moderate ethical concerns remained, reflecting a cautious optimism toward their adoption.

Importantly, the analysis identified gender as a significant factor affecting perceptions of GenAI's usefulness, with female teachers demonstrating higher levels of positive attitudes compared to their male counterparts. In contrast, teaching experience and educational background did not exhibit significant effects on teachers' perceptions across any measured dimensions. Additionally, no significant interactions were found among these demographic factors, indicating stable perception patterns across diverse subgroups.

These results imply that targeted interventions to promote GenAI integration might

benefit from considering gender differences, particularly emphasizing support strategies and training tailored to male teachers. Given the absence of significant effects from experience and educational background, broad-based training programs appear feasible and practical, potentially simplifying the implementation of professional development initiatives.

Finally, future research should delve deeper into psychological and contextual factors - such as digital self-efficacy, trust in AI, and institutional support - which might offer additional insights into educators' acceptance and effective utilization of emerging AI technologies in education.

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