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Leveraging large language models for educator feedback: A ChatGPT-assisted approach to improving teaching practices in higher education

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Abstract
In the era of artificial intelligence (AI), higher education is undergoing profound pedagogical transformation. This study investigates the feasibility and effectiveness of employing large language models (LLMs), represented by ChatGPT, as an auxiliary tool to enhance teaching practices and improve student learning experiences. A ChatGPT-based feedback framework was developed to enable educators to promptly optimize instructional strategies, enhance classroom interaction, and refine knowledge delivery. The framework provides actionable improvement suggestions, adaptive teaching recommendations, and reflective guidance. A semester-long controlled experiment was conducted to compare the outcomes of educators utilizing ChatGPT-assisted feedback with those employing traditional instructional methods. Results demonstrate that ChatGPT feedback significantly improved teaching adaptability. During the initial intervention phase, the mean score of the experimental group was 74.00, surpassing the control group's 71.35 with high statistical significance ($p < 0.001$). In the final phase, the experimental group maintained a significant advantage with a mean score of 86.50 compared to 84.63 ($p = 0.015$). Student satisfaction scores exhibited a consistent upward trend, while the technology acceptance model survey revealed mean ratings above 4.0 across perceived usefulness, perceived ease of use, and behavioral intention dimensions. These findings indicate that ChatGPT-assisted feedback substantially enhances teaching adaptability and student learning experiences, while also achieving strong acceptance among educators.

Keywords: AI-assisted teaching, large language models, teaching adaptability, student feedback analysis, higher education

1. Introduction
With the rapid development of AI technologies, higher education is experiencing a profound shift in its teaching methodologies. Traditional classroom models, which predominantly focus on one-way knowledge transmission, are increasingly inadequate to meet the evolving demands of contemporary education. These demands include the need for greater personalization, enhanced interactivity, and the continuous improvement of instructional practices. In particular, within classroom teaching practices, educators are now expected to do more than simply impart knowledge. They must actively monitor and respond to students' learning statuses and feedback in real time. This requires frequent adjustments to teaching strategies to ensure deeper and more meaningful learning outcomes (Wong *et al*., 2017) [8]. However, the diverse and demanding nature of modern teaching often poses significant challenges for teachers. The extensive workload involved in preparing and delivering lessons, managing classroom dynamics, and grading assignments frequently limits teachers' ability to comprehensively analyze student feedback in a timely manner. As a result, critical instructional details, such as the appropriateness of course content difficulty, the design and alignment of assignments, and the effectiveness of classroom interactions, may be overlooked (Wood, 2000) [9]. These issues ultimately undermine the overall quality of teaching and the learning experience for students.
In recent years, large language models, such as ChatGPT, have emerged as powerful tools in education, demonstrating considerable potential to address these challenges(Hu *et al*., 2025; Peng *et al*., 2025) [2, 3]. Thanks to their robust natural language processing capabilities and contextual understanding, LLMs can generate personalized learning experiences, provide

immediate feedback, and support teaching practices through intelligent automation. Research has shown that AI technologies can effectively support personalized learning, such as intelligent tutoring systems (Stamper *et al*., 2024) [6], automate assessments (Gao *et al*., 2024) [1], and generate educational resources (Tan *et al*., 2025) [7]. Despite these advancements, there remains a significant gap in the academic and practical exploration of tools that provide post-class, student feedback-based improvements for educators. As the central figures in the educational process, teachers play a pivotal role in shaping students' learning outcomes. The quality of teaching directly influences how well students engage with and retain new knowledge (Zacharias, 2007) [11]. Therefore, finding ways to leverage generative AI technologies such as ChatGPT and converting student feedback into actionable teaching improvements is a critical area of research (Ruwe & Mayweg-Paus, 2024) [4]. By offering teachers targeted, data-driven insights, AI technologies have the potential to enhance teaching practices and, consequently, improve student learning experiences in real time. In this context, this study proposes a ChatGPT-based framework designed to support teaching practices. This framework, which is centered on instructional goals, addresses multiple domains of learning, including cognitive, psychomotor, affective, and metacognitive aspects. The framework systematically collects and organizes classroom teaching records, student assignments, and feedback. These data are processed by ChatGPT, which generates personalized recommendations for teaching improvements. The generated suggestions include optimizing content, modifying teaching methods, and enhancing teaching resources. Teachers can evaluate these suggestions and selectively implement them in subsequent lessons. Meanwhile, students, learning under the updated teaching strategies, provide further feedback, thereby creating an iterative cycle of continuous improvement.

The primary contributions of this study are as follows: (1) the proposal of a ChatGPT-based post-class teaching optimization framework, which effectively integrates student feedback with AI-generated improvement suggestions; (2) the demonstration of the framework's significant impact on enhancing teaching adaptability and improving student learning experiences, as evidenced by a crossover-controlled experiment; and (3) the evaluation of the feasibility and potential application of ChatGPT-assisted teaching from the perspective of teacher technology acceptance, providing empirical support for its deep integration in higher education.

2. Methods

This study developed a ChatGPT-assisted large language model teaching framework (as shown in Fig. 1) and employed a quasi-experimental, crossover design with pre-test, mid-test, and post-test stages. A quantitative approach was used to systematically explore the impact of AI on enhancing teaching practices and student learning experiences (Yang *et al*., 2024). [10] Specifically, the study investigated how artificial intelligence can improve both teaching practices and student learning outcomes.

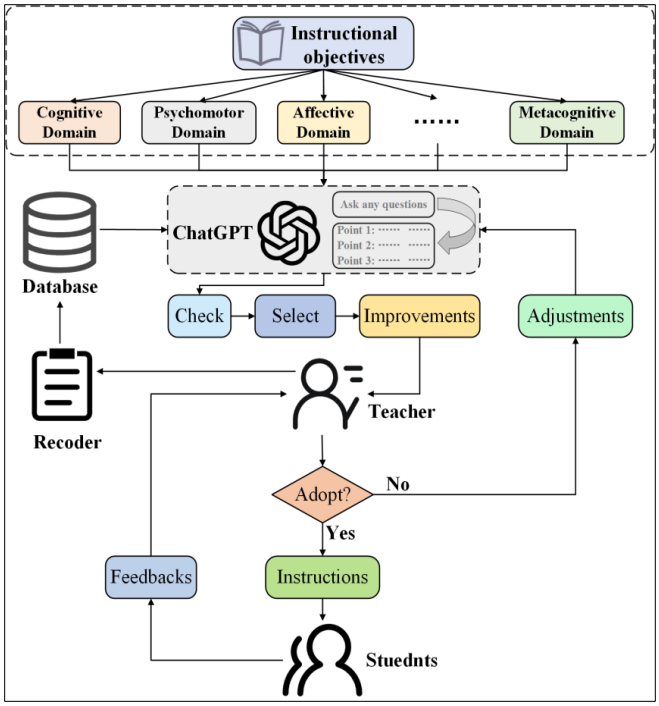

Fig 1: Workflow of the ChatGPT-assisted teaching enhancement process

The participants were 100 students from a Marxism course at a university in Shantou, Guangdong, China. The students were divided into two parallel classes of 60 each, with two instructors of similar teaching experience and ability. The entire experiment spanned 12 weeks and was divided into four stages, as outlined in Table 1.

Table 1: Experimental process and data acquisition arrangement

Stage	Time	EG	CG
Pre-test	Week 1	CT	CT
Intervention	Week 2-5	CAT	CT
Cross	Weeks 6-9	CT	CAT
Post-test	Week 10-12	CT	CT

Note: CT = Conventional teaching, CAT = ChatGPT-assisted teaching, EG = Experimental group, CG = Control group

To control for potential teacher-related factors, especially proficiency in using ChatGPT, both instructors underwent unified pre-training before the formal experiment commenced. This ensured that both instructors had a consistent understanding of the functionality and limitations of the AI-assisted teaching tool. The experiment process is illustrated in Fig. 2. The first stage was the pre-test phase, during which both groups received traditional instruction. Baseline data was collected, including student performance on assessments and an initial teaching satisfaction survey. The performance test comprised 30% objective questions and 70% subjective questions, with the scores averaged across both instructors. Teaching satisfaction was measured using a validated 5-point Likert scale (Table 2), covering dimensions such as lesson structure, explanation of difficult concepts, classroom interaction, time management, assignment relevance, and overall satisfaction.

Table 2: Teaching satisfaction Likert scale

Number	Item content	SA	A	N	DA	SDA
Q1	The instructor presented well-structured content with clear emphasis on key concepts.	N/A	N/A	N/A	N/A	N/A
Q2	The instructor explained complex or abstract ideas in a clear and understandable manner.	N/A	N/A	N/A	N/A	N/A
Q3	The instructor encouraged interaction and responded patiently to student questions.	N/A	N/A	N/A	N/A	N/A
Q4	The instructor was well-prepared, managed class time effectively, and maintained good pacing.	N/A	N/A	N/A	N/A	N/A
Q5	The assignments are meaningful and contributed to deeper understanding.	N/A	N/A	N/A	N/A	N/A
Q6	I am satisfied with the instructor's teaching in this course.	N/A	N/A	N/A	N/A	N/A

Note: SA = Strongly agree (5 points), A = Agree (4 points), N = Neutral (3 points), DA = Disagree (2 points) and SDA = Strongly Disagree (1 point). "N/A" indicates that no individual response data is displayed in this table.

In the second phase, the intervention began, with the experimental group using ChatGPT-assisted teaching while the control group continued with traditional methods. The third phase implemented a crossover intervention, where the experimental group ceased using ChatGPT, and the control group began using it, to mitigate the potential bias introduced by fixed teacher assignments. The fourth phase involved a no-intervention period, with both groups returning to regular teaching, and final assessments were conducted along with the final satisfaction survey and the teacher's TAM questionnaire.

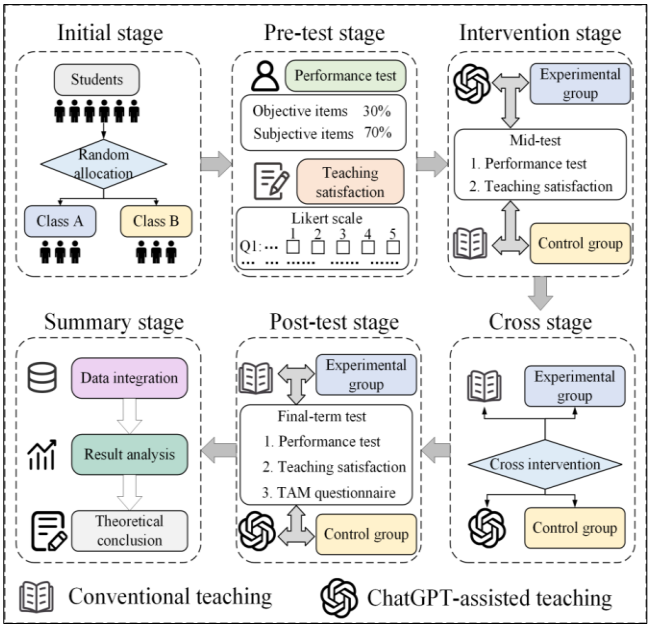

Fig 2: The experimental process frame diagram

To enhance reliability and validity, several control measures were incorporated into the study design. For instance, pre-test scores were included as covariates in subsequent analyses, and both instructors adhered to a standardized syllabus, textbook, and schedule. Student performance was evaluated using standardized test papers, and satisfaction was measured with a validated Likert scale (Spooren *et al*., 2007) [5]. Data analysis involved independent samples t-tests, repeated measures ANOVA, and, when parametric assumptions were not met, Mann-Whitney U tests.

3. Results

In the pre-test phase, both the experimental group (EG) and the control group (CG) showed comparable baseline academic performance and teaching satisfaction, as shown in Fig. 3:

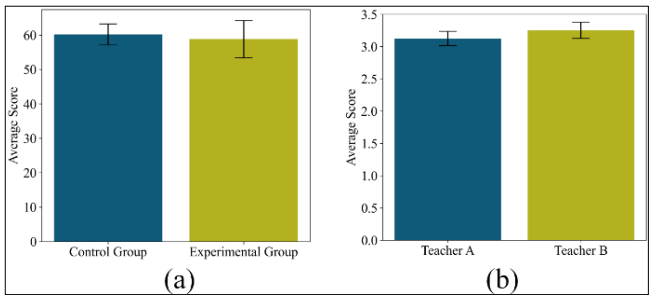

Fig 3: Students performance on pre-test stage

Specifically, the mean score for the EG was 58.78, while the CG's mean score was 60.15, indicating no significant differences between the two groups at baseline. This ensures that any observed differences in outcomes after the intervention can be attributed to the teaching method used, rather than pre-existing differences in student performance. Similarly, teaching satisfaction ratings (Fig. 3b) revealed minimal differences between the two instructors, with Teacher A scoring an average of 3.10 and Teacher B scoring 3.20. The small differences and overlapping error bars suggest that both instructors had similar classroom performance and were equally accepted by students at the outset. This consistency in baseline conditions was particularly important given the crossover experimental design, as it helped control for teacher-related variability and provided a solid foundation for comparing the effects of ChatGPT-assisted teaching. In the intervention and crossover phases, the academic performance of both groups improved, as shown in Table 3 and Fig. 4:

Table 3: Evaluation of the students' performance

Phase	Group	N	Mean score	Std Dev	U statistic	p-value	Significance
Pre-test	EG	60	58.78	5.36	1467.5	0.08	ns
	CG	60	60.15	3.00	N/A	N/A	N/A
Mid-test	EG	60	74.00	2.35	2526.0	0.0001	**
	CG	60	71.35	4.72	N/A	N/A	N/A
Post-test	EG	60	86.50	3.28	2262.0	0.015	*
	CG	60	84.63	5.07	N/A	N/A	N/A

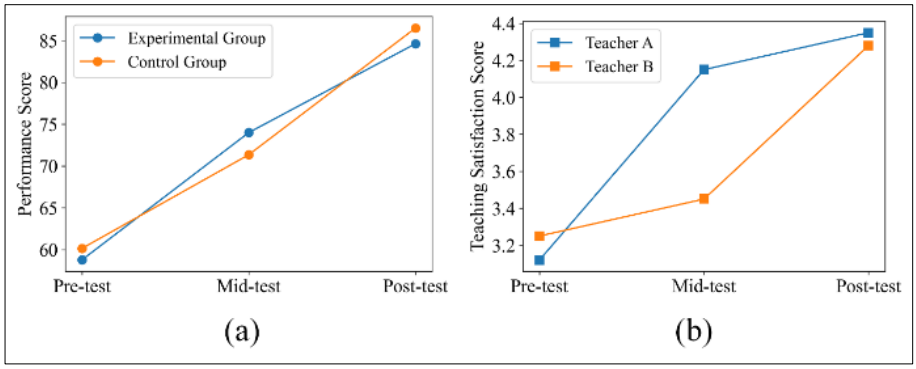

Fig 4: (a) for students' performance and (b) for teaching satisfaction on all stage

After the initial intervention phase, the experimental group, which utilized ChatGPT-assisted teaching, achieved a mean score of 74.00, which was significantly higher than the control group's mean score of 71.35. The difference between the two groups was statistically significant (U = 2526.0, p = 0.0001), demonstrating the positive impact of ChatGPT-assisted teaching on student performance. This result suggests that the integration of AI into teaching can enhance student engagement and comprehension, particularly in subjects that require complex conceptual understanding and active participation. In the crossover phase, when the control group began using ChatGPT and the experimental group returned to traditional teaching, the gap between the two groups narrowed. The post-test results showed that the experimental group's mean score increased to 86.50, compared to 84.63 for the control group, with a statistically significant difference (U = 2262.0, p = 0.015). While both groups showed improvement, the experimental group still outperformed the control group, indicating that ChatGPT-assisted teaching had a lasting impact on student performance even after the initial intervention period. The sustained improvement in academic achievement suggests that the AI-assisted methods may have been internalized by students, contributing to their long-term learning habits. This highlights the potential for ChatGPT to create lasting changes in students' academic approaches and enhance their ability to retain and apply knowledge. To further validate the acceptance and sustainable application potential of ChatGPT-assisted teaching from the teachers' perspective, a technology acceptance model survey was conducted at the end of the study. The results are as shown in Tabel 5:

Table 5: Technology acceptance model questionnaire results

Number	Item content	Dimension	Mean score
Q1	Using ChatGPT improves my teaching effectiveness.	PU	5.0
Q2	ChatGPT helps me prepare lessons more efficiently.	PU	4.5
Q3	ChatGPT allows me to better engage students.	PU	4.0
Q4	Using ChatGPT enhances the quality of teaching materials.	PU	4.0
Q5	Learning to use ChatGPT for teaching was easy for me.	PEOU	3.5
Q6	I find ChatGPT user-friendly and intuitive to operate.	PEOU	4.0
Q7	I can complete teaching-related tasks quickly using ChatGPT.	PEOU	4.0
Q8	I feel confident using ChatGPT for teaching.	PEOU	3.5
Q9	I intend to continue using ChatGPT in future teaching.	BI	4.5
Q10	I will recommend ChatGPT to others for educational use.	BI	4.5
Q11	Using ChatGPT in teaching is a positive experience for me.	ATT	4.5
Q12	I enjoy integrating ChatGPT into my teaching practice.	ATT	4.5

Note: Mean Score represents the average rating by two instructors based on a 5-point Likert scale, where 1 point = Strongly Disagree and 5 points = Strongly Agree. PU = Perceived Usefulness, PEOU = Perceived Ease of Use, ATT = Attitude Toward Use, BI = Behavioral Intention to Use.

The results of the TAM survey revealed that in the "Perceived Usefulness" dimension, teachers rated ChatGPT highly for enhancing teaching effectiveness (Q1 = 5.0). Positive effects were also reported in the areas of lesson preparation efficiency (Q2 = 4.5), classroom interaction (Q3 = 4.0), and the quality of teaching materials (Q4 = 4.0). These findings suggest that teachers view ChatGPT as a valuable tool for streamlining instructional tasks, improving student engagement, and enhancing the quality of teaching resources. In the "Perceived Ease of Use" dimension, teachers gave relatively high ratings for the tool's intuitiveness and user-friendliness (Q6 = 4.0). However, the ratings for learning cost (Q5 = 3.5) and self-confidence in using the tool (Q8 = 3.5) were slightly lower, indicating that while teachers were generally comfortable with the technology, there is still room for improvement in terms of ease of adoption and confidence in utilizing AI tools. This suggests that further training and technical support could help address these areas, making the technology even more accessible and effective for educators. Regarding the "Behavioral Intention" and "Attitude Toward Use" dimensions, the teachers' ratings were above 4.5, indicating strong intentions to continue using ChatGPT in future teaching sessions and to recommend it to their colleagues. This demonstrates a high level of acceptance and enthusiasm for the integration of ChatGPT into teaching practice, further supporting its potential as a valuable tool in educational settings. Overall, the feedback from teachers aligns with the positive improvements observed in student performance and satisfaction. The findings provide compelling evidence for the feasibility and effectiveness of ChatGPT-assisted teaching in enhancing both teaching

practices and student learning experiences. The strong acceptance of the tool by teachers and the sustained improvement in student outcomes suggest that ChatGPT has the potential to play a significant role in the future of higher education, offering a scalable solution to enhance teaching and learning processes.

4. Discussion

This study employed a quasi-experimental crossover design to evaluate the effectiveness of ChatGPT-assisted teaching in enhancing both teaching practices and student learning experiences in higher education. The results demonstrate significant improvements in both academic performance and student satisfaction during the intervention phases. Specifically, the experimental group achieved significantly higher academic performance compared to the control group, both in the initial intervention and the crossover phases. These findings are consistent with existing literature, which suggests that AI-powered tools such as ChatGPT can enhance classroom engagement, provide timely feedback, and contribute to improved student learning outcomes.

The academic improvements observed in the experimental group highlight the potential of ChatGPT-assisted teaching to offer personalized, adaptive support to students. ChatGPT's ability to analyze student feedback, generate targeted recommendations, and provide real-time guidance allows teachers to adjust course materials, teaching methods, and assignment structures in ways that are tailored to students' needs. This suggests that ChatGPT can help address the diverse learning needs of students, fostering a more inclusive and dynamic classroom environment. Furthermore, by using AI to support instructional practices, teachers can focus on refining their teaching strategies and enhancing the quality of learning experiences. In addition to academic performance, teaching satisfaction scores from students in the experimental group showed significant improvement during the intervention phases. The increased satisfaction scores during the crossover phase, when the control group began using ChatGPT, suggest that the introduction of AI into the teaching process improves not only student outcomes but also their engagement and overall learning experience. These results underscore the importance of interactive, data-driven feedback in creating a more responsive and engaging classroom environment.

Despite these positive outcomes, some limitations were identified. For instance, while ChatGPT significantly improved the academic performance and satisfaction of students, some aspects of teacher usage, such as confidence in using the tool and perceived learning costs, were rated lower in the Technology Acceptance Model (TAM) survey. These lower ratings suggest that while teachers acknowledge the tool's effectiveness, there is a need for additional training and support to help educators feel more confident in using AI in their teaching practices. Furthermore, although the study was conducted over one semester, the short duration of the intervention limits our ability to assess the long-term impact of ChatGPT-assisted teaching. Future research should consider extending the study period to evaluate the sustainability of the improvements in academic performance and teaching satisfaction. Additionally, this study focused on a single course and a single institution, which may limit the external validity of the findings. Future studies should replicate this experiment across multiple disciplines, institutions, and educational contexts to further validate the generalizability of the results. Furthermore, incorporating a broader range of data, such as classroom interaction frequency, online learning behaviors, and qualitative feedback from students and instructors, would provide a more comprehensive understanding of the impact of ChatGPT on the teaching and learning process.

5. Conclusion

This study demonstrated that ChatGPT-assisted teaching significantly enhances both teaching adaptability and student learning experiences in higher education. The integration of ChatGPT into teaching practice provided teachers with valuable, data-driven feedback, enabling them to refine their instructional strategies, optimize course content, and improve student engagement. The study found that ChatGPT was particularly effective in improving academic performance by offering real-time, personalized guidance and creating more dynamic, interactive learning environments. The results of this study suggest that AI-powered tools like ChatGPT have the potential to transform teaching practices by making them more adaptive to individual student needs. By providing immediate feedback and offering targeted improvements to teaching content and methods, ChatGPT can help teachers enhance the quality of their lessons and address the diverse learning needs of students. The positive impact on student performance and satisfaction further emphasizes the importance of AI in fostering a more effective and engaging learning environment. In practical terms, this research encourages higher education institutions to consider incorporating AI-based tools, such as ChatGPT, into their teaching practices. Such tools can support teachers in refining their teaching approaches, improving lesson quality, and fostering a more engaging learning experience.

However, to fully realize the potential of AI in teaching, institutions must invest in teacher training programs and provide ongoing technical support to ensure effective and confident use of these tools in the classroom. Looking ahead, there are several key areas for further research and development. Future studies should explore the long-term effects of ChatGPT-assisted teaching, particularly in terms of its sustained impact on student learning outcomes and teaching practices. Additionally, research should examine the integration of AI tools across different disciplines and educational contexts to assess their broader applicability. Finally, a more comprehensive approach to data collection, including learning behavior data, classroom interactions, and qualitative interviews, will help to provide a fuller picture of how ChatGPT influences the learning process and its potential to drive deeper learning. In conclusion, this study demonstrates that ChatGPT-assisted teaching has substantial potential for improving teaching effectiveness, enhancing student learning experiences, and supporting teacher professional development. By aligning with the ongoing digital transformation in education, ChatGPT offers an innovative approach to fostering a more personalized and adaptive teaching environment.

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