# A Study on the Relationship between AI Teaching Application Effectiveness and Teaching Leadership among Instructors at Zhengzhou C College in Henan Province, China

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***Abstract***: This study aimed to investigate the relationship between AI teaching application effectiveness and teaching leadership among instructors at Zhengzhou C College in Henan Province, China. Based on the Technology Acceptance Model and Teaching Leadership Theory, a questionnaire survey was conducted with 260 valid responses. Results indicated that the overall AI teaching application effectiveness among instructors was high, while teaching leadership among instructors was at a moderate level. There were significant differences in AI teaching application effectiveness among instructors in terms of educational background, teaching experience, professional title, and subject. There were significant differences in instructors' teaching leadership in terms of gender, teaching experience, professional title, and administrative position. There was a significant positive correlation between AI teaching application effectiveness and teaching leadership among instructors at Zhengzhou C College in Henan Province, China. The recommendation provided a theoretical basis for instructor development in application-oriented universities in the AI teaching application era.

***Keywords***: Zhengzhou C College in Henan Province, AI Teaching Application Effectiveness, Teaching Leadership.

## 1. Introduction

The international perspective, Generative AI (GenAI), epitomized by ChatGPT, has witnessed rapid proliferation in international higher education, precipitating unprecedented innovations in instructional design, learning support, and assessment feedback. Empirical studies indicated that, under conditions of structured instructional design and appropriate guardrails, GenAI could significantly enhance students' academic performance, learning perceptions, and higher-order thinking skills (Chen et al., 2020). These findings empower instructors to implement data-driven pedagogical applications, thereby establishing a novel technical foundation for the exercise of teaching leadership.

Conversely, recent randomized controlled trials in educational management caution that, absent clear pedagogical objectives, procedural scaffolds, and defined usage boundaries, over-reliance on generic large-scale models may attenuate the acquisition and transfer of authentic skills (Holmes et al., 2022). Consequently, instructors must not only determine the rationale for AI adoption but also proactively define the parameters of its use—specifically how, when, and to what extent it is deployed. This requires continuous leadership in orchestrating prompt engineering, monitoring learning processes, and verifying outcomes to ensure a learning experience that is both pedagogically robust and transferable. Thus, rather than diminishing the instructor's role, AI integration repositions teaching leadership at the epicenter of classroom practice.

Simultaneously, ethical and governance frameworks governing GenAI remain nascent within higher education. Systematic analyses of institutional policy texts reveal that responsibility, transparency, explainability, and human oversight constitute the core principles currently emphasized across universities (Sun & Chen, 2023). The interpretation and implementation of these principles at the classroom level serve as critical

dimensions for evaluating teaching leadership. From a macro perspective of educational technology leadership, AI not only restructures instructional delivery but also redefines roles in organizational strategy, decision-making, quality assurance, and compliance (Sposato, 2025). This suggests that “teaching leadership” should be understood within the broader spectrum of “educational technology leadership,” linking micro-level instructional design to meso-level policy coordination and institutional governance.

Regarding professional development, GenAI presents a dual challenge. While it equipped instructors with tools for precision intervention, immediate feedback, and personalized support, it simultaneously imposes complex demands on their competency structures. Instructors are required to discern the heterogeneous effects of AI tools across diverse subjects, curricula, and pedagogical models (e.g., PBL and inquiry-based learning), and to design curriculum-level guardrails and procedural scaffolds (Sun & Chen, 2023). Furthermore, these efforts must align with institutional AI governance structures to foster a support system balancing learning efficacy, ethical compliance, and instructor agency (Sposato, 2025). Empirical evidence from varied cultural contexts confirms that stakeholders maintain a positive yet ambivalent stance toward AI, emphasizing the necessity of training, ethical guidelines, data privacy, and fairness (Kasneci et al., 2023). This underscores the imperative to redefine teaching leadership within the tripartite logic of “technology adoption—pedagogical transformation—ethical governance.”

At present, artificial intelligence technology is spreading throughout the higher education ecosystem at a breakthrough speed. Internationally, the OECD (2021) report indicated that over 70% of higher education institutions worldwide have begun to explore the application of artificial intelligence in teaching, but 28% of instructors could effectively integrate technology into teaching practice, forming true teaching innovation. Zhengzhou College, as a typical applied undergraduate institution in Henan Province, is confronted with unique challenges in the process of promoting the digital transformation of education. The teaching assessment data within the school showed that although the school has invested in building smart classrooms and introducing various artificial intelligence teaching platforms, the usage rate of instructors presents a "two-pole" phenomenon: about 35% of instructors could use AI tools for personalized teaching design, while over 40% of instructors only use them for basic operations, such as automatic homework correction. The most crucial pointed that few instructors could recognize the leading relationship between the AI teaching application effectiveness and teaching leadership, resulting in a situation where they "can use technology but cannot lead". This situation seriously restricts the overall improvement and cutting-edge development of the school's teaching quality application.

Therefore, this study focused on the Instructors at Zhengzhou C College in Henan Province, China, systematically examining the relationship between the AI teaching application effectiveness and teaching leadership. By revealing the intrinsic connection and mechanism of action between the two, it could not only provide the school with scientific instructor development strategies but also help the school transform technological investment into actual improvement of teaching leadership. It could better fill the gap of application-oriented universities in the field of artificial intelligence education and research and provide a traceable practical path for the digital transformation of similar institutions in Henan Province.

**Research Objectives**

To reveal the correlation between the AI teaching application effectiveness and teaching leadership among instructors. Based on the research questions, the research objectives of this study mainly included:

1) To understand the current situation of AI teaching application effectiveness among instructors at Zhengzhou C College in Henan Province, China.

2) To understand the current situation of teaching leadership among instructors at Zhengzhou C College in Henan Province, China.

3) To identify the differences in the AI

teaching application effectiveness among instructors at Zhengzhou C College in Henan Province, China, under different demographic background variables.

4) To identify the differences in the teaching leadership among instructors at Zhengzhou C College in Henan Province, China, under different demographic background variables.

5) To analyze the correlation between AI teaching application effectiveness and teaching leadership among instructors at Zhengzhou C College in Henan Province, China.

## Literature Review

### *Research on the Current Status of AI Teaching Application Effectiveness among Instructors*

In recent years, the application of artificial intelligence technology in higher education has shown a rapid development trend, gradually evolving from an auxiliary tool to a core driving force for the transformation of teaching models. At present, the application of AI in education and teaching has covered multiple dimensions such as intelligent teaching systems, learning analysis, personalized recommendations, automatic assessment, and virtual teaching assistants, and has widely permeated various links, including course design, teaching implementation, learning support, and teaching management.

In terms of teaching support, Intelligent Tutoring Systems (ITS) and adaptive learning platforms have become mainstream applications. Chen et al. (2020) pointed out that the adaptive system based on machine learning algorithms could dynamically adjust the learning content and path according to students' learning progress, cognitive level and behavioral data, achieving "teaching students in accordance with their aptitude". For instance, platforms such as Knewton and Smart Sparrow have been adopted in mathematics, engineering and language courses in international universities, significantly enhancing students' learning engagement and academic performance. Some domestic universities have also introduced similar systems, such as the "Xuetang" intelligent recommendation module of Tsinghua University, which pushes personalized learning resources to students by analyzing learning trajectories.

In the management of the teaching process, learning analytics technology was widely used for monitoring students' learning conditions and teaching interventions. Yu et al. (2025) proposed that learning analytics could transform students' online learning behavior data into actionable teaching insights. In recent years, this technology has been widely applied in MOOCs and blended courses in colleges. Holmes et al. (2022) systematically reviewed and found that AI-driven learning analytics systems could effectively identify students with learning difficulties, issue early warnings in advance, and provide precise teaching adjustment suggestions for instructors. For instance, Arizona State University in the United States has utilized an AI system to conduct real-time monitoring of online courses, which has increased the pass rate of courses by more than 15%.

In the evaluation and feedback stage, natural language processing (NLP) technology has driven the development of automatic scoring and intelligent feedback. Especially, the rise of generative artificial intelligence has enabled AI to perform semantic understanding and quality assessment on open-ended answers, thesis writing, and even programming assignments. Kasneci et al. (2023) pointed out that the GPT series models have been piloted in some universities for automatic composition correction, generating personalized comments, and assisting instructors in teaching reflection. In addition, speech recognition and sentiment computing technologies were also employed in classroom behavior analysis to help instructors understand students' attention concentration and emotional states.

In terms of teaching resource development, AI technology has significantly enhanced the generation efficiency and diversity of teaching content. Instructors could use AI tools to quickly generate lesson plans, PPTS, test question banks and even virtual experimental scenarios. Trust and Whalen (2022) found that an increasing number of instructors were beginning to use large language models such as ChatGPT to assist in lesson preparation, saving a significant amount of repetitive work time and thus allowing them to devote more energy to teaching design and student interaction.

***Research on the Current Status of Instructors' Teaching Leadership***

Instructors' teaching leadership, as a core element for improving teaching quality and promoting school transformation, has long received extensive attention from educational researchers. In recent years, with the transformation of the educational governance model and the deepening of instructors' professional development, the research focus of teaching Leadership has gradually shifted from the traditional "principal-centered" leadership to the "distributed leadership" and "instructor Leadership" that emphasize instructors as professional subjects. Harris & Jones (2022) pointed out that in the field of higher education, teaching leadership was no longer confined to administrative management functions but was reflected in the influence and leading role of instructors in curriculum construction, teaching innovation, peer guidance, and the construction of professional communities. This transformation has enabled instructors to evolve from the role of "teaching implementers" to that of "promoters of teaching change", becoming a key force for the continuous improvement of teaching quality in colleges (Yu et al., 2025).

Research on instructors' teaching leadership mainly focused on its structural dimensions, influencing factors and mechanisms of action. In terms of structural dimensions, early studies were mostly based on the three-dimensional model proposed by Hallinger (2005), namely "setting a vision", "managing the teaching process" and "creating a supportive culture". However, this model was more suitable for administrators of basic education. In the context of higher education institutions, Meyer et al. (2021) conducted empirical research to extract a framework for instructors' teaching leadership applicable to higher education, which included four core dimensions: "Curriculum and teaching innovation", "academic peer collaboration", "student learning promotion", and "professional development guidance", which better aligns with the academic and professional autonomy characteristics of instructors.

In terms of the research on influencing factors, scholars generally focus on the roles of organizational support, professional development opportunities and individual initiative. Kraft et al. (2022) found that teaching development programs provided by universities, interdisciplinary teaching and research teams, and incentive mechanisms significantly and positively predict the occurrence frequency and influence of instructors' teaching leadership behaviors. Meanwhile, instructors' sense of teaching efficacy, professional identity and willingness to change have also been confirmed to be key internal driving forces (Sun & Chen, 2023). It was worth noting that with the integration of artificial intelligence technology, research has begun to focus on the moderating effect of digital literacy and technology integration ability on teaching leadership. Trust & Whalen (2022) pointed out that instructors who were proficient in using AI tools for student situation analysis, teaching design, and feedback optimization were more likely to play a leading and exemplary role in their teams and become "pioneers of intelligent teaching".

In terms of the mechanism of action, a large number of studies have shown that instructors' teaching leadership not only directly affects students' learning experience and academic achievements, but also enhances the overall teaching level by promoting a collaborative culture and professional dialogue among instructors. Harris & Jones (2022) pointed out that instructors with strong teaching leadership could drive their peers to conduct teaching reflection and practice innovative, creating a "ripple effect" and promoting teaching improvement at the departmental level. In the context of artificial intelligence, this leading role has further expanded to the fields of technology adoption and ethical discussion. For instance, Kasneci et al. (2023) found that teaching leaders play an irreplaceable role in guiding teams to use generative AI rationally, formulating usage norms, and preventing academic misconduct.

***The Correlation between the AI Teaching Application Effectiveness and Teaching Leadership among Instructors***

Existing research generally holds that the AI teaching application effectiveness was an

important leading variable for enhancing instructors' teaching leadership. Chai et al. (2020) pointed out that after instructors successfully integrated AI tools for personalized teaching, student situation analysis and intelligent feedback, their sense of teaching effectiveness was significantly enhanced. As a result, they were more willing to share experiences and guide colleagues in teaching and research activities, demonstrating a stronger willingness to lead teaching. This process embodies the inherent logic of "technical success experience - enhancement of professional confidence - stimulation of leadership behavior". The empirical research by Kraft et al. (2022) further verified that instructors who have achieved remarkable results in AI teaching practices (such as increased student engagement and improved academic performance) were more likely to be regarded by their peers as "technological pioneers" or "teaching innovators", forming an informal influence network within the department and playing a distributed leadership role.

In terms of the mechanism of action, many scholars emphasize the mediating role between "data literacy" and "instructional design ability". Holmes et al. (2022) proposed that in an AI-supported educational environment, instructors could grasp students' learning patterns by using learning analysis systems and make teaching decisions based on evidence. This kind of "Data-Informed Instructional Leadership" has become the core feature of teaching leadership in the new era. Instructors not only optimize their own teaching but also guide their teams to carry out data-based teaching and research activities, promoting the improvement of collective teaching. Trust & Whalen (2022) found that instructors who were proficient in using generative AI for lesson plan generation, feedback writing, and curriculum design were more frequently invited to share their technology application strategies in teaching and research meetings, and their professional discourse power has significantly increased, reflecting a trend of transformation from technical capabilities to leadership.

Sun & Chen (2023) pointed out that if universities establish effective incentive mechanisms, provide continuous technical training and collaboration platforms, they could amplify the positive correlation between the AI teaching application effectiveness and teaching leadership. For instance, establishing "Smart Teaching Demonstration Posts" or "Intelligent teaching ability Teams" to provide formal leadership roles for highly effective instructors could help transform their individual experiences into organizational knowledge and institutionalize leadership. Conversely, in an environment lacking support, even if instructors have high AI application capabilities, they may still find it difficult to play a leading role due to their isolation and lack of assistance.

It was worth noting that some studies have also warned of the risk of leadership alienation that may be brought about by the application of technology. Trust & Whalen (2022) warns that excessive reliance on algorithmic decision-making may lead to a weakening of instructors' professional judgment, which in turn undermines their authority as educational leaders. Kasneci et al. (2023) emphasized that teaching leadership should not merely be reflected in the ability to promote technology, but also include critical reflection on AI ethics, fairness, and the essence of education, to avoid falling into the trap of "technicity".

**Research Conceptual Framework**

This study aimed to understand how the instructors' AI teaching application effectiveness affected teaching leadership and to analyze the correlation between the AI teaching application effectiveness and teaching leadership. The research conceptual framework for this study is shown in Figure 1:

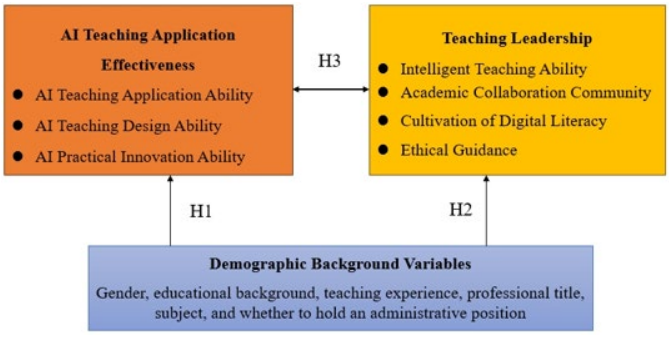


Figure 1 Research Conceptual Framework

I. Background variables The gender,

educational background, teaching experience, professional title, subject, and whether they concurrently hold administrative positions of instructors were included in the analysis. It is used to analyze whether the AI teaching application effectiveness and teaching leadership among instructors vary due to different demographic background variables.

II. Independent variable: AI Teaching Application Effectiveness The AI teaching application effectiveness included three dimensions: AI teaching application ability, AI teaching design ability, and AI practical innovation ability.

III. Dependent variable: Teaching Leadership The instructors' teaching leadership included four dimensions: Intelligent teaching ability, academic collaboration community, cultivation of digital literacy, and ethical guidance.

## 2. Research Methodology

This study adopted the method of convenient sampling and selected 265 instructors from Zhengzhou C College in Henan Province, China as the research subjects. Zhengzhou C College currently has a total of 851 full-time instructors, covering subjects such as Liberal Arts, Science, Engineering and Art. According to the Morgan Table research sample size standard of Krejcie & Morgan (1970), it is reasonable to draw 265 samples. Therefore, in this study, through the management of the college, questionnaires were distributed to 265 instructors of the college. After sorting out and eliminating invalid questionnaires, it is ultimately estimated that 260 valid data points would be recovered, the effective return rate reached 98.11%.

This study adopted a quantitative research method. The questionnaire design strictly adhered to the requirements of reliability and validity and was divided into three parts: the basic information questionnaire, the questionnaire on AI teaching application effectiveness, and the questionnaire on instructors' teaching leadership. The development of the scale is based on a highly mature theoretical framework and the application of measurement tools and has been localized and revised in combination with the specific situation of AI teaching practice in Zhengzhou C College, a local and application-oriented undergraduate institution, to ensure the accuracy and applicability of the measurement.

The basic information questionnaire aimed to quickly investigate the demographic indicators of instructors. These indicators would serve as moderating variables in this study to analyze whether there are significant differences in the AI teaching application effectiveness and teaching leadership among instructors with different background characteristics. This section is filled in by instructors from Zhengzhou C College in Henan Province, China. The content included variables such as gender, educational background, teaching experience, professional title, subject, and whether they concurrently hold administrative positions. This study is based on the "AI-TPACK Scale" revised by Chai et al. (2020) and the "HE-AIASE Scale" developed by Zhou & Zhang (2021) and combined the AI teaching practice of instructors in Zhengzhou C College to carry out localized development of the measurement. This study is based on the "HE-TILS Scale" (HE-TILS) proposed by Meyer (2021) and the "Intelligent Educational Leadership Framework" proposed by Chai et al. (2020) on the basis of the TPACK theory. Combined with the real picture of teaching leadership of instructors at Zhengzhou C College in Henan Province, China, in the AI era, the scale is localized and developed.

This study conducted reliability and validity tests on the AI teaching application effectiveness scale for instructors. The overall Cronbach's α coefficient of the instructor AI teaching application effectiveness questionnaire in this study was 0.920, and the Cronbach's α coefficients of each dimension ranged from 0.827 to 0.899, all higher than 0.7, indicating that the reliability of the instructor AI teaching application effectiveness scale was relatively good. This study adopted exploratory factor analysis (EFA) to test the structural validity of the scale. The results of KMO and Bartlett's sphericity test calculated via SPSS demonstrated a KMO value of 0.937 and a significant Bartlett's sphericity test result ($p < 0.001$), which met the criteria for factor analysis. The three common factors explained 76.479% of the total variance in cumulative terms, verifying

the good validity of the scale.

This study conducted reliability and validity tests on the instructors' teaching leadership scale. The overall Cronbach's α coefficient of the instructors' teaching leadership questionnaire was 0.880, and the Cronbach's α coefficients of each dimension ranged from 0.754 to 0.915, all higher than 0.7, indicating that the reliability of the instructors' teaching leadership scale was relatively good. The results of the "KMO and Bartlett's sphericity Test" obtained after exploratory factor analysis of this scale in SPSS showed that the KMO value is 0.925, and the Bartlett's sphericity test result indicated $p<0.001$, reaching a significant level and being suitable for factor analysis. The extraction of three common factors cumulatively explained 70.753% of the total variance, indicating that the scale has good validity.

## 3. Results

A total of 260 valid questionnaires were collected in this study, with a recovery rate of 98.11%.

Table 1: Demographic Backgrounds Analysis for Samples ($N$=260)

| Demographic Backgrounds | Group | *N* | % |
|---|---|---|---|
| **Gender** | Male | 115 | 44.2 |
| | Female | 145 | 55.8 |
| **Educational Background** | Bachelor's Degree | 59 | 22.7 |
| | Master's Degree | 142 | 54.6 |
| | Doctoral Degree | 59 | 22.7 |
| **Teaching Experience** | 1-3 Years | 73 | 28.1 |
| | 4-6 Years | 64 | 24.6 |
| | 7-10 Years | 63 | 24.2 |
| | More than 10 Years | 60 | 23.1 |
| **Professional Title** | Teaching Assistant | 41 | 15.8 |
| | Lecturer | 133 | 51.2 |
| | Associate Professor | 79 | 30.4 |
| | Professor | 7 | 2.6 |
| **Subject** | Liberal Arts | 60 | 23.1 |
| | Science | 30 | 11.5 |
| | Engineering | 90 | 34.6 |
| | Arts | 80 | 30.8 |
| **Whether to Hold an Administrative Position** | Yes | 80 | 30.8 |
| | No | 180 | 69.2 |
| **Total** | | 260 | 100 |

The specific sample size of the research subjects under different demographic background variables was as follows: In terms of gender, there were 145 female instructors, accounting for 55.8% of the total sample size. There were 142 instructors with a master's degree as the highest educational background, accounting for 54.6% of the total sample size. There were 73 instructors with 1 to 3 years of teaching experience, accounting for 28.1% of the total sample. In terms of professional titles, there were 133 lecturers, accounting for 51.2% of the total sample size. In terms of subject distribution, there were 90 Engineering instructors, accounting for 34.6% of the total sample size. Among the research subjects, 180 instructors did not hold administrative positions, accounting for 69.2% of the total sample size.

1) This study used descriptive statistical methods to conduct a statistical analysis on the current status and level of the AI teaching application effectiveness among instructors at Zhengzhou C College in Henan Province, China. As shown in Table 2, the overall mean of the AI teaching application effectiveness among instructors at Zhengzhou C College was 3.52, and the means of each dimension ranged from 3.21 to 3.65. According to the five-point scale evaluation standard, it indicated that the AI teaching application ability and AI teaching design ability of instructors were in the high-level range.

Table 2: Current Level of AI Teaching Application Effectiveness among Instructors at Zhengzhou C College in Henan Province

| Dimension | *M* | *SD* | Interpretation |
|---|---|---|---|
| AI Teaching Application Ability | 3.65 | .700 | High |
| AI Teaching Design Ability | 3.63 | .683 | High |
| AI Practical Innovation Ability | 3.21 | .802 | Moderate |
| AI Teaching Application Effectiveness | 3.52 | .602 | High |

2) As shown in Table 3, the overall mean teaching leadership of instructors in Zhengzhou C College was $M$=3.47, and the means of each dimension ranged from 3.28 to 3.66. It indicated that the instructors' teaching leadership at Zhengzhou C College in Henan Province, China was generally at a moderate level.

Table 3: Current Level of Teaching Leadership among Instructors at Zhengzhou C College in Henan Province

| Dimension | *M* | *SD* | Interpretation |
|---|---|---|---|
| Intelligent Teaching Ability | 3.32 | .781 | Moderate |
| Academic Collaboration Community | 3.28 | .740 | Moderate |
| Cultivation of Digital Literacy | 3.66 | .690 | High |
| Ethical Guidance | 3.61 | .664 | High |
| Teaching Leadership | 3.47 | .595 | Moderate |

3) In terms of the AI teaching application effectiveness, there were no significant differences in gender or administrative position. However, there were significant differences in the highest educational background, teaching experience, professional title, and subject.

Table 4: Comparison of the Differences in the AI Teaching Application Effectiveness among Instructors at Zhengzhou C College in Henan Province in Different Genders

| Dimension | Gender | *n* | *M* | *SD* | *t* | *p* |
|---|---|---|---|---|---|---|
| AI Teaching Application Ability | Male | 115 | 3.65 | .712 | -0.050 | .960 |
| | Female | 145 | 3.65 | .693 | | |
| AI Teaching Design Ability | Male | 115 | 3.63 | .690 | 0.100 | .920 |
| | Female | 145 | 3.63 | .670 | | |
| AI Practical Innovation Ability | Male | 115 | 3.21 | .814 | 0.120 | .910 |
| | Female | 145 | 3.21 | .795 | | |
| AI Teaching Application Effectiveness | Male | 115 | 3.52 | .610 | 0.080 | .940 |
| | Female | 145 | 3.52 | .594 | | |

To explore whether there were differences in the AI teaching application effectiveness among instructors of different genders, an independent sample t-test was conducted in this study, and the results are shown in Table 4. Data analysis showed that there were no significant differences among instructors of different genders in the total score of AI teaching application effectiveness and its various dimensions ($p > 0.05$).

4) There was no significant difference in instructors' teaching leadership in terms of the highest educational backgrounds and subjects. However, there were significant differences in gender, teaching experience, professional title and administrative position.

Table 5 Comparison of the Differences in Teaching Leadership among Instructors at Zhengzhou C College in Henan Province in Different Genders

| Dimension | Gender | *n* | *M* | *SD* | *t* | *p* |
|---|---|---|---|---|---|---|
| Intelligent Teaching Ability | Male | 115 | 3.20 | .750 | -2.450 | .015* |
| | Female | 145 | 3.42 | .790 | | |
| Academic Collaboration Community | Male | 115 | 3.16 | .721 | -2.380 | .018* |
| | Female | 145 | 3.38 | .744 | | |
| Cultivation of Digital Literacy | Male | 115 | 3.58 | .685 | -2.121 | .035* |
| | Female | 145 | 3.73 | .702 | | |
| Ethical Guidance | Male | 115 | 3.52 | .645 | -2.301 | .022* |
| | Female | 145 | 3.68 | .676 | | |
| Teaching Leadership | Male | 115 | 3.36 | .557 | -2.530 | .012* |
| | Female | 145 | 3.56 | .601 | | |

To investigate the differences in the level of teaching leadership among instructors of different genders, an independent sample t-test was conducted in this study. The specific results are shown in Table 5. The result analysis indicated that there were significant differences among instructors of different genders in the total score of teaching leadership and its various dimensions ($p < 0.05$). Overall, there was a significant difference in the total score of teaching leadership between male instructors ($M = 3.36$, $SD = 0.557$) and female instructors ($M = 3.56$, $SD = 0.601$) ($t = -2.530$, $p = 0.012$).

5) There was a significant positive correlation between the AI teaching application effectiveness and teaching leadership among instructors at Zhengzhou C College in Henan Province, China.

Table 6: Correlation Matrix of AI Teaching Application Effectiveness and Teaching Leadership among Instructors at Zhengzhou C College

| Dimension | Intelligent Teaching Ability | Academic Collaboration Community | Cultivation of Digital Literacy | Ethical Guidance | Teaching Leadership |
|---|---|---|---|---|---|
| AI Teaching Application Ability | .424** | .302** | .254** | .080 | .359** |
| AI Teaching Design Ability | .250** | .183* | .223** | .051 | .211** |
| AI Practical Innovation Ability | .551** | .484** | .206** | -.030 | .431** |
| AI Teaching Application Effectiveness | .600** | .524** | .320** | .041 | .542** |

To deeply explore the correlation between AI teaching application effectiveness and teaching

leadership, this study conducted a Pearson correlation analysis. As shown in Table 6, there was a significant moderate positive correlation between AI teaching application effectiveness and overall teaching leadership ($r$=0.542, $p$<0.01). From all dimensions, except for the ethics guidance dimension, which showed no significant correlation with the various indicators of the AI teaching application effectiveness, the correlation coefficients among the other dimensions were within the range of.183 to .600, all reaching a significant level. Overall, there was a significant positive correlation between the AI teaching application effectiveness and the teaching leadership of instructors at Zhengzhou C College in Henan Province, China.

## 4. Discussion

In terms of gender, no significant differences are shown among instructors of different genders in the total score of AI teaching application effectiveness and its various dimensions ($p$>0.05). This finding was consistent with the observations of Zhou and Zhang (2021) during the development process of the "Effectiveness Scale of AI Teaching Application in Colleges (HE-AIASE)", that is, when schools provide a relatively unified technical training and support system for all instructors, the differences in technical access or initial interest that may arise due to gender would be significantly reduced. At the same time, this also reflects that in the process of higher education informatization, the operational threshold of technical tools has generally decreased, making gender no longer a key factor affecting the level of technology application (Trust & Whalen, 2022).

In terms of the highest educational background, there were significant differences among instructors of different educational backgrounds in the AI teaching application effectiveness in each dimension and the total score ($p$<0.05). This discovery reveals the dual effects of experience accumulation in the application of AI teaching: on the one hand, as teaching experience increases, instructors' basic operational skills with AI tools and their proficiency in integrating them into teaching design gradually improve, demonstrating the "practice makes perfect" effect of experience accumulation. On the other hand, practical innovation ability depends more on an individual's spirit of exploration and technical sensitivity rather than simply the accumulation of experience and therefore has no significant correlation with teaching years (Chai et al., 2020). Although newly recruited instructors lack experience, they were often more sensitive and enthusiastic about trying out emerging technologies, which to some extent offsets the experience advantage brought by their long teaching years.

In terms of teaching experience, instructors with different lengths of teaching experience exhibit complex phased characteristics in teaching leadership. This discovery conforms to the phased laws of instructors' professional development. Sposato (2025) found that the instructors with 7 to 10 years of teaching experience usually have passed the stage of survival concern and entered the mature development period. They have accumulated sufficient teaching confidence and experience and start to shift more from "teaching" to "nurturing", playing a more active role in teamwork and teaching innovation. Senior instructors with over 10 years of teaching experience have demonstrated the strongest leadership in areas that require profound educational wisdom, such as cultivating students' qualities and guiding ethics.

In terms of professional titles, there were extremely significant differences ($p$<0.001) among instructors with different professional titles in each dimension and the total score of teaching leadership, and a clear gradient effect was presented, with the higher the professional title, the stronger the leadership level. This result indicated that teaching leadership was closely related to an instructor's professional status and academic accumulation. As the academic leaders, the group of professors not only plays a leading and exemplary role in teaching innovation but also demonstrates comprehensive leadership advantages in the construction of academic communities, the cultivation of students' qualities and ethical guidance. Although the group leadership performance of associate professors was slightly lower than that of professors, it was

significantly higher than that of lecturers and teaching assistants. The group of lecturers has accumulated certain teaching experience and begun to play an active role in the team. However, the teaching assistant group, due to their relatively short tenure, was still in the initial stage of influence radiation and leading ability (Harris & Jones, 2022).

The Pearson correlation analysis of this study indicated that there was a significant positive correlation between the AI teaching application effectiveness and teaching leadership among instructors at Zhengzhou C College in Henan Province, China. First, an instructor's proficiency in operating AI tools was a prerequisite for them to play a leading role in teaching. When instructors were proficient in using various AI teaching platforms and generative AI tools, they were more likely to become pioneers of teaching innovation and, on this basis, provide technical guidance and support to colleagues, thereby establishing influence within the professional community (Zhou & Zhang, 2021). Second, whether instructors could deeply integrate AI tools with the characteristics of their subjects and develop innovative teaching cases was the key to their ability to play a leading role in teaching innovation. When instructors were committed to developing AI teaching cases with disciplinary characteristics and guiding students to use AI critically, this practice innovative naturally enhances its exemplary and leading role in the teaching team (Chai et al., 2020). In conclusion, the application of AI technology by instructors provided a practical basis for the exertion of their teaching leadership, and the improvement of teaching leadership in turn creates favorable conditions for further technological application innovation (Harris & Jones, 2022). However, technology could enhance instructors' teaching effectiveness, but it cannot automatically endow them with the awareness of value guidance. The focus of future instructors' professional development should be on the coordinated improvement of technical capabilities and ethical qualities, promoting instructors' comprehensive leap from "technology users" to "leaders in intelligent teaching".

## 5. Conclusions and Recommendations

### Summary of Conclusions

1) The overall AI teaching application effectiveness among instructors at Zhengzhou C College in Henan Province, China was at a high level.

2) Instructors' teaching leadership at Zhengzhou C College in Henan Province, China was generally at a moderate level.

3) In terms of the AI teaching application effectiveness, there were no significant differences in gender or administrative position. However, there were significant differences in the highest educational background, teaching experience, professional title, and subject.

4) There was no significant difference in instructors' teaching leadership in terms of the highest educational backgrounds and subjects. However, there were significant differences in gender, teaching experience, professional title and administrative position.

5) There was a significant positive correlation between the AI teaching application effectiveness and teaching leadership among instructors at Zhengzhou C College in Henan Province, China.

### Limitations

This study mainly has three limitations:

Firstly, the research subjects were only from a single institution. As an applied undergraduate college in Henan Province, Zhengzhou C College had its unique instructors' structure, school support policies and digital construction environment. This made it necessary to be cautious when promoting the conclusions of this study to other types of universities (such as research universities and vocational colleges) or universities in other regions. The external validity of this study needs to be further verified in a broader population.

Secondly, at the level of research methods, this study mainly relied on the questionnaire survey method to collect data. Although the reliability and validity of the scale were well tested, the large number of questions on the scale might cause fatigue among the subjects, thereby affecting the quality of their responses.

Finally, at the level of research variables, this study mainly focused on the relationship between two core variables: the AI teaching application effectiveness and teaching leadership. However, in the actual teaching environment, instructors' application of technology and leadership development may also be influenced by multiple factors such as school training support, incentive mechanisms, research pressure, and team culture. These variables not included in the investigation may cause certain interference with the research results.

**Recommendations**

***Build a Differentiated Development System to Enhance the Shortcomings of AI Practical Innovation Ability***

First, in response to the shortcomings in practical innovation ability, establish an "Intelligent teaching ability Incubation Program".

Second, give full play to the technical vanguard role of the associate professor group, establish an "AI Teaching Backbone instructor" studio, and encourage them to develop distinctive cases and share experiences.

Third, in response to the differences in educational qualifications and teaching experience, a mechanism of "complementary advantages and collaborative progress" should be valid.

***Innovate the Mechanism for Building a Community and Systematically Enhance Teaching Leadership***

First, give full play to the exemplary and leading role of female instructors and those with high professional titles, and build a "leadership inheritance team".

Second, for instructors with six years or less of teaching experience, actively form mutual assistance teams.

Third, use administrative positions as incubators for leadership. It is suggested that the school establish an "administrative management position rotation system", encouraging outstanding instructors to hold positions such as teaching secretaries of departments and directors of teaching and research sections within a certain period of time, and accumulate experience in overall coordination and resource integration in administrative practice.

***Establish a Two-Way Promotion Mechanism for Technological Empowerment and Leadership Development***

First, it is suggested that schools establish an "Intelligent teaching ability Laboratory" to provide instructors with an integrated platform for technological practice and teaching innovation.

Second, it is suggested that schools incorporate ethics education into the compulsory module for instructor development and launch a special training program on "ethics and Teaching", covering core topics such as algorithmic bias identification, data privacy protection, academic integrity norms, and the boundaries of human-machine collaboration.

Third, establish a mechanism for the transformation and promotion of achievements, set up an "Outstanding Case Library of AI Teaching", and sort out and promote the innovative practices of instructors in the application of AI teaching and leadership.

Through the above measures, Zhengzhou C College could establish a virtuous cycle mechanism where the AI teaching application effectiveness and teaching leadership promote each other, drive the professional development of instructors in the era of artificial intelligence, achieve a comprehensive leap from "technology users" to "leaders in smart teaching", and provide solid talent support for the school's digital transformation and high-quality connotative development.

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