Innovative Applications and Practical Research of Artificial Intelligence Technology in Basic Computer Course Teaching

Hongliang Li*

College of Information Technology and Communication, HeXi University, Zhangye 734000,China
**Corresponding author:jsjahz@163.com*

Abstract: *With the rapid development of artificial intelligence technology, the education sector is undergoing profound changes. As a core component of information technology education, computer foundation courses urgently require innovative applications of artificial intelligence to enhance teaching quality and learning outcomes. This article explores the application of artificial intelligence in computer foundation courses, including the development of intelligent teaching assistance tools, adaptive learning systems, and virtual experimental environments. It also analyzes challenges faced in teaching practices, such as improving teachers' information literacy, difficulties in resource integration, and matching students' personalized needs. Based on these challenges, corresponding practical strategies are proposed to promote the innovation and optimization of computer foundation course teaching. The research shows that the effective application of artificial intelligence technology not only helps to enhance the learning experience but also fosters students' autonomous learning and innovation capabilities.*

Keywords: *artificial intelligence; computer foundation courses; innovative applications; teaching practice; personalized learning*

Introduction

In the context of the information age, educational models are undergoing unprecedented transformations, with artificial intelligence technology serving as a significant driving force that offers new opportunities and challenges for education. Computer foundation courses represent the starting point for students' learning in computer science and technology, and the quality of their teaching directly impacts students' future learning and career development. Therefore, exploring the application of artificial intelligence in the teaching of computer foundation courses holds significant research importance and necessity.

1. Innovative Applications of Artificial Intelligence Technology in Computer Foundation Courses

1.1 Intelligent Teaching Assistance Tools

The rapid development of artificial intelligence technology has made the intelligence of teaching assistance tools possible. These tools utilize natural language processing, machine learning, and data analysis techniques to provide personalized support for teachers and students. For instance, intelligent teaching assistance systems can automatically push relevant learning resources and practice questions based on students' learning histories and performances, catering to diverse student needs. Such intelligent tools not only enhance classroom efficiency but also enable teachers to monitor students' learning progress more effectively and adjust teaching strategies in a timely manner[1].

By integrating voice recognition and interactive feedback features, these tools can provide immediate guidance to students, enhancing their autonomous learning abilities and sense of engagement. For example, in a programming course, intelligent assistance tools can identify errors in students' coding in real-time and offer specific correction suggestions, helping to prevent frustration during the learning process. Additionally, through big data analysis, teachers can gain insights into students' learning trends and potential issues, allowing for targeted adjustments to course content and teaching methods.

Moreover, these intelligent tools can analyze students' learning habits and provide customized learning plans, helping them set reasonable learning goals. By continuously tracking students' learning

progress, the system can automatically adjust the recommended learning content to ensure that students engage with material at an appropriate difficulty level, avoiding boredom from content that is too easy or too difficult. Furthermore, teachers can use these tools to generate detailed learning reports, visually displaying each student's achievements and growth trajectories, thus providing data support for subsequent teaching decisions. Through such intelligent support, students benefit from personalized learning while continuously refining their learning strategies through dynamic feedback, ultimately improving learning outcomes and academic performance.

1.2 Design and Application of Adaptive Learning Systems

Adaptive learning systems represent another significant application of artificial intelligence in the teaching of computer foundation courses. These systems analyze students' learning behavior data to automatically adjust teaching content and learning paths, ensuring that each student can learn at their optimal pace. Such systems typically combine knowledge graphs and learning analytics technologies to provide real-time feedback on students' knowledge mastery and recommend learning resources accordingly. For instance, the system can identify weak areas in students' understanding of specific programming concepts and push relevant instructional videos and exercises to achieve a personalized learning experience.

Additionally, adaptive learning systems can continuously optimize learning paths based on students' progress and feedback. This dynamic adjustment capability allows students to receive help promptly when encountering difficulties, rather than waiting until the next class to resolve issues. This timely intervention not only reduces students' feelings of frustration but also boosts their confidence in learning. By providing personalized feedback, the system encourages students to actively reflect on their learning strategies, helping them more effectively develop subsequent learning plans.

Adaptive learning can also enhance student engagement through gamification elements, such as setting learning tasks and achievement badges to motivate students to maintain enthusiasm during the learning process. Through these elements, students can experience enjoyment while learning, thereby increasing their motivation. Moreover, the real-time data analysis features provided by such systems assist teachers in gaining a comprehensive understanding of the overall learning status of the class and individual differences, thus informing teaching decisions. Teachers can use this data to adjust teaching strategies and content to meet the needs of different students.

Ultimately, through adaptive learning systems, students can not only gain a more efficient learning experience but also achieve significant progress in knowledge acquisition, enhancing their programming skills and problem-solving abilities. This personalized approach to learning not only better accommodates various learning styles but also lays a solid foundation for future learning and development.

1.3 Construction of Virtual Experiment and Simulation Environments

The construction of virtual experiment and simulation environments represents another innovative application of artificial intelligence technology in computer foundation courses. These environments provide students with safe, risk-free spaces to engage in programming practice and problem-solving. For example, through virtual laboratories, students can execute code in a simulated computer environment, observe the results, and debug, thereby deepening their understanding of programming principles and logic. Utilizing augmented reality (AR) and virtual reality (VR) technologies, these simulation environments can also provide immersive learning experiences that promote active exploration and collaborative learning[2].

Moreover, virtual laboratories allow students to conduct repeated experiments in various scenarios, providing the flexibility needed to explore complex concepts in a pressure-free environment, helping them establish a deeper understanding. For instance, students can experiment with different algorithms or debug various pieces of code, observing results in real time and reflecting on and adjusting their thought processes. This hands-on practice not only deepens understanding of abstract concepts but also cultivates students' problem-solving skills and creative thinking.

Virtual experiment platforms also feature the ability to record students' operational processes, providing teachers with rich instructional data for subsequent analysis and feedback. Teachers can use students' experiment records to identify common errors and knowledge gaps, allowing for adjustments to teaching strategies and personalized tutoring. Additionally, this data can be used to assess students' learning

progress, helping teachers gain a more precise understanding of the overall learning situation in the class.

Through the construction of virtual experiment and simulation environments, computer foundation courses can offer students more flexible and personalized learning approaches, significantly enhancing their practical abilities and learning motivation, and promoting their overall development in the field of information technology.

2. Challenges of Artificial Intelligence Technology in the Teaching Practice of Computer Foundation Courses

2.1 Teachers' Information Literacy and Technological Adaptability

Teachers' information literacy and technological adaptability are crucial factors affecting the effective application of artificial intelligence technology in computer foundation course teaching. Although many educators possess solid subject knowledge, there may be deficiencies in their application of information technology. Some teachers lack a comprehensive understanding of the functions and potential of artificial intelligence tools, leading to underutilization of these technologies to enhance teaching effectiveness. Moreover, differences in adaptability to continuously evolving technologies can result in uneven teaching quality. Research indicates that teachers' information literacy not only affects their ability to use technology but also directly influences students' learning experiences and outcomes[3].

Thus, enhancing teachers' technological adaptability and information literacy has become an urgent priority in educational reform. Universities need to design systematic training programs to familiarize teachers with various artificial intelligence tools and provide practical opportunities to improve their information technology application skills. This approach can not only enhance teaching effectiveness but also boost teachers' confidence, enabling them to better tackle future technological challenges.

2.2 Integration of Teaching Resources and Insufficient Technical Support

The integration of teaching resources and insufficient technical support represent another significant challenge in the application of artificial intelligence technology. Although many universities have introduced advanced teaching tools and platforms, they often face issues such as resource fragmentation, platform incompatibility, and lack of unified standards. This situation complicates teachers' efforts to integrate diverse educational resources, resulting in cumbersome operations and information silos, which in turn affect the optimization of teaching effectiveness and the coherence of student learning. Additionally, the professionalism and availability of technical support teams directly influence teachers' and students' experiences with artificial intelligence technology. In the absence of effective technical support, teachers may struggle to quickly resolve technical issues, thereby disrupting the smooth progress of lessons. For instance, if teachers encounter technical failures during class without timely technical assistance, the classroom rhythm will be disrupted, negatively impacting students' learning experiences.

Therefore, universities should establish efficient technical support mechanisms, equip professional technical teams, and provide ongoing technical training and support to ensure that teachers and students can fully leverage artificial intelligence technology for optimal teaching and learning outcomes. Simultaneously, encouraging resource sharing and integration across disciplines will promote the establishment of unified educational technology standards, reducing operational complexity and fundamentally enhancing the efficiency of teaching resource integration.

2.3 Matching Student Learning Differences with Personalized Needs

In an information-based teaching environment, student learning differences and personalized needs emerge as important factors influencing the effectiveness of artificial intelligence technology applications. Each student has varying learning abilities, interests, backgrounds, and learning styles, rendering the traditional "one-size-fits-all" teaching model inadequate for meeting diverse learning demands. Although adaptive learning systems aim to provide personalized learning experiences through data analysis, effectively identifying and matching students' personalized needs remains a challenge in practice. Many systems may lack sufficient data support, leading to imprecise judgments regarding student needs and an inability to provide truly personalized recommendations[4].

Additionally, students' self-awareness and learning strategies can also impact the degree to which personalized needs are met. Some students may not be clear about their learning weaknesses or needs, making it difficult for the system to deliver optimal resource recommendations. To address these issues,

educators need to establish comprehensive learning assessment systems to collect data on students' learning behaviors and feedback, gaining a more holistic understanding of their needs. Furthermore, teachers can guide students in self-assessment and reflection during class, helping them clarify learning goals, thereby enabling adaptive learning systems to recommend relevant resources more accurately.

3. Practical Strategies for Applying Artificial Intelligence Technology in Computer Foundation Course Teaching

3.1 Innovation in Course Design and Teaching Methods

With the advancement of artificial intelligence technology, the design and teaching methods of computer foundation courses require innovation. Firstly, course design should be learner-centered, integrating artificial intelligence tools with traditional teaching content to construct flexible learning pathways. For example, modular design can enable course content to be dynamically adjusted based on students' learning progress and comprehension, ensuring that each student can learn at their own pace. Additionally, online learning platforms can be introduced to provide abundant learning resources and practical opportunities, promoting students' autonomous learning and enhancing their engagement with the course.

Secondly, diverse teaching methods, such as flipped classrooms, project-based learning, and inquiry-based learning, can be adopted to increase students' active participation and practical skills. In class, teachers can leverage artificial intelligence technology for real-time feedback, helping students promptly correct errors and optimize learning strategies. Furthermore, through collaborative group projects, students can work together to solve real-world problems, fostering their communication skills and teamwork spirit. This collaboration not only enhances learning outcomes but also provides students with a platform to showcase their individual talents[5].

Lastly, by incorporating virtual laboratories and simulation environments, students can conduct experiments and explorations in a risk-free setting, enhancing their understanding and application of theoretical knowledge. Through virtual environments, students can repeatedly practice and explore different solutions, deepening their grasp of computer concepts. This innovative course design and teaching methodology can more effectively meet students' personalized learning needs, improve overall learning outcomes, and lay a solid foundation for their future learning and development. By continuously adjusting and optimizing course content and teaching strategies, educators will be able to cultivate more competitive computer professionals.

3.2 Continuous Training and Support Mechanisms

To ensure the effective application of artificial intelligence technology in computer foundation course teaching, establishing continuous training and support mechanisms is crucial. Universities should regularly organize teacher training to help them become familiar with the latest artificial intelligence tools and educational technologies while providing practical opportunities to enhance their technical application skills. Training content can cover specific applications of artificial intelligence in teaching, data analysis techniques, and classroom management strategies, enabling teachers to respond flexibly to different teaching scenarios. Additionally, customized training programs can be developed to address the specific needs of various teaching fields, helping teachers enhance their skills accordingly.

Establishing a technical support team is also an important measure to enhance teachers' technical capabilities. This team should be responsible for providing real-time technical support to teachers, ensuring that they receive timely assistance when using artificial intelligence tools to address various issues encountered in the teaching process. This support should encompass not only the resolution of technical malfunctions but also guidance on effectively utilizing these tools to maximize their potential. Moreover, the technical support team can facilitate regular workshops and online consultations, helping teachers gain a deeper understanding of technology applications and best practices.

Furthermore, universities can create online communities or forums to encourage experience sharing and communication among teachers. On these platforms, teachers can share success stories, discuss teaching strategies, and seek advice and support from their peers. By establishing a rich resource library and Q&A platform, teachers can receive continuous inspiration and guidance in their daily teaching. Additionally, regularly organized interactive workshops and demonstration classes can help teachers further solidify and enhance their skills through practical experience. Through continuous training and

support mechanisms, not only can teachers' information literacy be improved, but their confidence can also be strengthened, thereby promoting the effective application of artificial intelligence technology and ultimately enhancing teaching quality and student learning experiences. This supportive environment not only fosters teachers' professional growth but also creates a richer learning experience for students.

3.3 Diversification and Dynamic Adjustment of the Assessment System

In the context of artificial intelligence technology, the diversification and dynamic adjustment of the assessment system serve as important strategies for optimizing teaching effectiveness. Traditional assessment methods often focus on memorization and comprehension of knowledge, making it difficult to comprehensively reflect students' learning processes and capability development. Therefore, a multidimensional assessment system should be designed, including formative assessments, ongoing assessments, and summative assessments, to comprehensively evaluate students' performance throughout the learning process. This type of assessment system not only emphasizes students' final learning outcomes but also values the accumulation and development of skills during the learning process[6].

By leveraging artificial intelligence technology, real-time collection and analysis of students' learning data can provide a scientific basis for assessments. For instance, by analyzing students' interaction frequency in class, completion of online assignments, and quiz scores, teachers can obtain a comprehensive view of students' learning states. Additionally, using machine learning algorithms, the assessment system can identify key factors influencing learning outcomes, thus providing data-driven decision support for teachers. This allows for assessments to extend beyond quantitative indicators to include qualitative feedback, forming a more holistic assessment system.

The assessment system should possess the ability to dynamically adjust based on students' learning progress and feedback, timely updating assessment standards and content. This flexible assessment mechanism can more accurately reflect students' learning states while motivating them to make continuous progress during the learning process. Moreover, to ensure the fairness and effectiveness of assessments, peer assessment and self-assessment mechanisms can be introduced, allowing students to participate in the evaluation process. This approach not only enhances students' awareness of autonomous learning but also cultivates their critical thinking abilities.

By establishing a comprehensive, diverse, and dynamic assessment system, educators will be able to more effectively support students' personalized learning journeys, fostering their holistic development. Furthermore, regular assessment feedback will provide teachers and students with the basis for improving teaching and learning, further enhancing the adaptability and flexibility of teaching. Ultimately, this assessment mechanism will contribute to creating a student-centered learning environment, enhancing the overall quality and effectiveness of education.

Conclusion

The application of artificial intelligence technology in computer foundation course teaching holds great promise, yet its promotion and implementation face numerous challenges. The previous discussion explored the innovative applications of intelligent teaching tools, the design of adaptive learning systems, and the construction of virtual experimental environments, emphasizing how these technologies enhance learning efficiency and teaching effectiveness. However, insufficient information literacy and technical adaptability among teachers, the difficulties of integrating teaching resources, and the challenges of matching students' personalized needs remain core issues that urgently require resolution. Future research should further explore the effective integration of intelligent teaching tools to enhance teachers' technical skills, focusing on dynamic mechanisms for matching personalized learning needs to ensure that students from diverse backgrounds receive appropriate learning support.

References

[1] Zhu Li. Exploration of Integration Paths for Artificial Intelligence Technology and University Computer Foundation Course Teaching. University Education, 2024, (16): 60-63.
[2] Yang Wen, Yan Dengwei, Zhang Wenfeng. Analysis of the Teaching Evaluation System of Artificial Intelligence and Computer Courses. Electronic Technology, 2024, 53(07): 150-151.
[3] Zheng Xiaodong, Li Xuejiao, Song Jianping. Research and Exploration of Teaching Reform Measures for Pilot Courses in Computer Majors under the Background of Artificial Intelligence and New

Technologies. Science and Technology Vision, 2024, 14(13): 15-18.
[4] Li Jin. Application of Artificial Intelligence in Vocational Education Computer Courses. Integrated Circuit Applications, 2023, 40(12): 92-93.
[5] Ye Jing, Zheng Mengze, Huang Chunfang. Exploration of Curriculum Standards Construction for Computer Majors in the Age of Artificial Intelligence. Research on Printing and Digital Media Technology, 2023, (04): 88-95 + 187.
[6] Chen Long, Huang Xin, Zhang Zhe, et al. Teaching Exploration of Introducing Artificial Intelligence Content into University Computer Courses. Computer Education, 2023, (03): 203-207.