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Research on Scenarios and Practical Practice of Artificial Intelligence Technology Empowering Computer Teaching in Universities

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Abstract: In the digital intelligent era, the integration of artificial intelligence (AI) technology and higher education has become a core direction for the teaching reform of computer majors in universities. Traditional teaching modes for university computer majors are plagued by outdated curriculum content, rigid teaching frameworks, insufficient practical training scenarios, inadequate personalized education, and single evaluation mechanisms, which fail to meet the demands of cultivating high-quality computer talents in the digital age. Based on the current teaching status of computer majors in higher education institutions, this paper explores diversified application scenarios where AI technologies facilitate theoretical instruction, practical training, personalized tutoring, and teaching research innovation. Combined with frontline teaching practices, it analyzes the strengths and existing dilemmas of AI-assisted teaching, and proposes systematic practical strategies covering scenario optimization, technical specification formulation, and faculty competency improvement. This study constructs an "AI + Computer Major" intelligent teaching paradigm, reshapes talent cultivation paths, elevates teaching quality and educational outcomes, and delivers practical references for the digital teaching reform of computer majors in universities.

Keywords: Artificial Intelligence; Universities; Computer teaching; Application scenarios; Teaching practice

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1. Introduction

The Action Plan for Artificial Intelligence Innovation in Institutions of Higher Education explicitly proposes promoting in-depth integration between artificial intelligence and teaching practice, leveraging intelligent technologies to facilitate teaching reform, optimize education models, and upgrade talent cultivation quality. At present, conventional computer teaching modes reveal prominent drawbacks. Uniform teaching arrangements cannot accommodate students with divergent academic foundations; static textbooks lag behind the rapid iteration of industrial technologies; limited physical laboratory resources cannot satisfy students' all-time practical training demands; and unitary evaluation systems cannot comprehensively assess students' comprehensive professional competencies.

Relying on core capabilities including intelligent data analysis, virtual scene simulation, real-time human-computer interaction, data-driven auxiliary teaching, and adaptive personalized matching, artificial intelligence reconstructs multi-dimensional teaching scenarios for computer majors and addresses bottlenecks inherent to traditional teaching models.

This paper categorizes and expounds four core teaching scenarios empowered by AI, sorts out prominent practical obstacles encountered in real teaching operations, and puts forward targeted optimization schemes to realize high-quality intelligent education for computer majors [1].

2. Core application scenarios of AI empowering computer teaching in universities

2.1. Theoretical teaching scenarios: Intelligent auxiliary tools to break through difficult teaching points

AI technologies innovate conventional classroom theoretical teaching and resolve typical challenges such as obscure abstract knowledge, insufficient classroom interaction, and lack of targeted teaching design. Computer majors involve numerous highly abstract core knowledge points, such as recursive algorithms, operating system process scheduling, computer network topology, and database indexing principles. AI transforms static, intangible theoretical knowledge into visualized dynamic scenes via dynamic animation, process decomposition, virtual demonstration, and 3D modeling, effectively lowering students' cognitive barriers.

Intelligent AI teaching platforms enable precise classroom interaction. The system can push in-class exercises and knowledge quizzes in real time, automatically collect and analyze students' answer data, and accurately identify universal difficult knowledge points for the whole class and individual learning weaknesses of each student. Teachers can adjust teaching schedules dynamically according to AI-generated learning condition data, conduct targeted intensive explanations on difficult knowledge, and abandon the outdated cramming teaching mode. In this way, theoretical teaching becomes more precise, efficient, and consistent with students' cognitive rules [2].

2.2. Practical training scenarios: Virtual simulation to expand the boundary of practical education

Practical training constitutes a pivotal segment of AI-assisted computer teaching. Supported by artificial intelligence, virtual reality (VR), augmented reality (AR), and virtual simulation technologies, all-weather, full-scenario, and risk-free intelligent virtual training platforms are constructed to compensate for deficiencies of physical laboratories. AI virtual training environments can simulate a full spectrum of computer practical projects, including programming development, network deployment, network attack and defense, system operation and maintenance, big data analysis, and AI model training. Complex practical operations can be completed without physical hardware equipment, eliminating risks brought by equipment loss or improper operation, and breaking the constraints of time and space to support students' anytime, anywhere training [3].

Artificial intelligence delivers real-time intelligent error correction, procedural guidance, and problem-solving inspiration during students' practical operations. The system monitors operational steps, coding logic, and parameter configuration synchronously, promptly detects grammatical errors, logical defects, and configuration mistakes, and guides students to troubleshoot problems step by step instead of directly providing standard answers. Moreover, AI dynamically adjusts training difficulty and generates customized practical tasks according to students' training progress, effectively improving students' hands-on capabilities and problem-solving skills and realizing quality improvement and efficiency enhancement of practical teaching.

2.3. Personalized tutoring scenarios: Student-centered differentiated teaching to realize individualized education

Big data analysis and adaptive learning capabilities of artificial intelligence provide solid technical support for stratified teaching and personalized education of computer majors. AI platforms record comprehensive learning data covering students' preview performance, classroom engagement, exercise accuracy, practical achievements, and error types throughout the whole learning process, establish exclusive learning archives for each student, and intelligently analyze their knowledge mastery status, learning deficiencies, competency levels, and study habits.

Based on learning condition analysis results, AI designs differentiated learning plans for students at various levels. For beginners and students with weak foundations, the platform prioritizes pushing basic knowledge explanations, simple practical cases, and fundamental exercises to consolidate their professional foundations. For intermediate-level students, variant training and comprehensive practical projects are recommended to strengthen their knowledge application capabilities. For outstanding students, cutting-edge technical cases, complex development projects, and advanced algorithm tasks are provided to cultivate their innovative research and development abilities. Meanwhile, the AI tutoring system supports 7 × 24-hour instant Q&A to respond to personalized questions accurately, achieving individualized education and solving the "one-size-fits-all" defect of traditional teaching [4].

2.4. Teaching research innovation scenarios: AI assists teachers' professional development

While facilitating students' learning, artificial intelligence also promotes teachers' teaching research quality and career growth. Tracking industrial technical updates and hot topics of teaching reform, AI intelligently updates teaching materials, frontier cases, and practical training projects, helping teachers realize rapid curriculum content iteration and tackle the problem of outdated textbooks. Additionally, AI assists teachers in repetitive work, including teaching design, courseware optimization, exercise compilation, learning data analysis, and homework grading, greatly reducing routine teaching workload and allowing teachers to concentrate on core work such as teaching design, difficult knowledge breakthrough, and students' competency cultivation. AI also integrates high-quality teaching research resources, pushing forward advanced teaching concepts, innovative modes and teaching reform cases, offering robust support for teachers' teaching innovation and research projects and boosting the sustainable improvement of teachers' professional capacities.

3. Practical dilemmas of AI empowering computer teaching in universities

3.1. Severe student dependence on AI leading to weakened core computational thinking

The convenient auxiliary functions of AI simplify computer learning, yet trigger excessive reliance among some students. In programming development, project practice, and problem-solving sessions, numerous students directly utilize AI tools to generate code, complete training tasks, and obtain answers, skipping independent thinking, manual coding, logical sorting, and trial-and-error exploration. Long-term over-reliance on AI tools gradually weakens students' core competencies, including computational thinking, logical reasoning, code debugging, and project architecture design. Although superficial learning efficiency improves, solid professional core abilities cannot be formed, exerting adverse impacts on students' long-term career development.

3.2. Superficial technical application with insufficient in-depth integration of teaching scenarios

At present, most universities only adopt AI in superficial auxiliary links rather than realizing deep integration between technologies and teaching scenarios. Some teachers merely regard AI as an auxiliary tool for Q&A, homework grading, and courseware production, without reconstructing teaching frameworks, optimizing practical training modes, or innovating educational scenarios based on the disciplinary characteristics of computer majors. AI technologies are mostly applied to after-class auxiliary links, while core scenarios including pre-class guided learning, in-class interactive teaching, project development, and teaching research innovation lack sufficient integration depth. The advantages of intelligent auxiliary teaching fail to be fully exerted, and intelligent teaching reform remains a superficial formality.

3.3. Insufficient faculty adaptability restricting teaching research innovation

The integration of artificial intelligence and professional teaching raises higher standards for teachers' digital literacy and technical application capabilities. Many computer teachers retain rigid traditional teaching mindsets, lack proficiency in operating AI teaching tools and virtual training platforms, and fall short in abilities in intelligent teaching design, personalized tutoring, and data-driven evaluation. Furthermore, universities lack systematic and regular special training

programs for AI teaching application, making it difficult for teachers to master cutting-edge intelligent teaching modes and conduct in-depth teaching reform and research innovation supported by AI technologies, which hinders the advancement of intelligent teaching construction.

4. Optimized practical strategies for AI-empowered computer teaching in universities

4.1. Formulate standardized AI usage rules to consolidate students' core professional competencies

Universities shall formulate standardized AI tool usage specifications for computer teaching, clarify applicable scenarios and usage boundaries, and guide students to utilize AI rationally and appropriately. Strict regulations should be implemented to prohibit students from copying AI-generated codes, reports, and project deliverables as completed assignments, and define that AI can only serve as auxiliary tools for thinking inspiration, problem troubleshooting, error inspection, and content optimization. During teaching processes, teachers should prioritize cultivating students' computational, logical, and innovative thinking by increasing in-class live coding, real-time programming, logical defense, and project review sessions, driving students to think independently and practice manually to eliminate excessive AI dependence and consolidate core professional capabilities. Regular academic integrity education should also be carried out to foster students' autonomous learning awareness and academic ethics.

4.2. Deepen scenario integration to build a full-process intelligent teaching system

Centered on the curriculum characteristics of computer majors, universities shall promote in-depth integration between AI technologies and full-process teaching links to break the limitation of superficial technical application. Before class, the AI intelligent tutoring platform pushes personalized preview tasks to sort out students' learning doubts accurately. During class, AI virtual simulation, dynamic knowledge demonstration, and real-time interaction optimize theoretical teaching and in-class practical training. After class, layered practical projects and extended learning resources are delivered via AI for personalized after-school tutoring. In assessment stages, AI big data realizes multi-dimensional and precise learning evaluation. Targeted AI-assisted characteristic teaching scenarios shall be constructed according to different course types: intelligent error correction and project auxiliary functions for programming courses, virtual simulation training for network courses, and model training and frontier case research for artificial intelligence courses. Precise matching between technologies and curriculum characteristics can comprehensively elevate the intelligence level of teaching activities.

4.3. Strengthen faculty construction to improve teachers' digital teaching literacy

Universities need to establish systematic faculty training mechanisms and organize regular special training covering AI teaching application, intelligent teaching design, virtual training platform operation, and data-based learning condition analysis, helping teachers update educational concepts and upgrade digital teaching capabilities. Teaching research exchange platforms shall be built to organize thematic seminars on AI-assisted teaching cases, intelligent teaching innovation competitions, and academic research activities, encouraging teachers to develop innovative intelligent teaching modes and high-quality intelligent teaching resources based on disciplinary characteristics. Industrial technical experts can be invited to deliver special lectures to help teachers grasp cutting-edge industrial technologies, align curriculum content with industrial employment demands, and cultivate a compound teaching team with high digital literacy and intelligent teaching capabilities.

5. Conclusion

In the practice of intelligent teaching, universities and teachers must objectively address prominent challenges brought by AI application, including students' over-reliance on intelligent tools, superficial integration between technologies and teaching, insufficient faculty digital capabilities, and incomplete supervision mechanisms. Universities can maximize

the strengths and mitigate the drawbacks of AI technologies through standardized AI usage regulations, deepened cross-scenario integration, upgraded faculty digital literacy, and improved teaching supervision systems to deliver precise auxiliary support for computer teaching. In the future, continuous deepening of integration between artificial intelligence and computer professional teaching shall be pursued, adhering to the educational principle of teacher guidance and student subjectivity. Intelligent technologies should be positioned as effective auxiliary teaching tools to continuously optimize intelligent teaching paradigms and fuel the high-quality development of computer higher education.

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