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Research on the Intelligence-Oriented Teaching of the Artificial Intelligence-Driven Operating System Course

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ABSTRACT
This paper takes the operating system course as the research object. Aiming at the problems such as fragmented knowledge and single learning path existing in the traditional teaching mode, an intelligent teaching scheme based on the Chaoxing Learning Pass platform to construct the course knowledge graph is proposed. By structuring course resources through the Chaoxing platform, a multi-dimensional knowledge graph system covering core concepts such as process management, memory allocation, file systems, and device control, key algorithms, and typical application scenarios is established. Relying on the learning situation analysis function of the Learning Pass platform, students' learning behaviors and mastery situations are dynamically tracked. This model enhances students' understanding of the intrinsic connections of the system mechanism through a visual knowledge network, dynamically diagnoses weak links in knowledge, and precisely supports teaching intervention. At the same time, integrate online resources, introduce practical cases related to operating systems, expand the engineering perspective, stimulate students' interest, promote independent exploration, and effectively improve teaching efficiency and learning outcomes.

KEYWORDS
Artificial intelligence; Operating system; Intelligent teaching

1 Introduction

With the advancement of digital transformation in education, artificial intelligence technology has also been widely applied in teaching. The Ministry of Education has particularly emphasized the need to use intelligence to assist in education, teaching, management, and research. It is imperative to strengthen research on artificial intelligence and digital ethics and empower teaching with AI [1]. As a core and fundamental course in the field of computer science, the knowledge system of the operating system combines theoretical complexity with practical relevance. Constrained by the traditional teaching mode, the operating system course has long been confronted with problems such as fragmented knowledge modules and a single cognitive path. Students generally encounter learning difficulties such as difficulty in understanding the system mechanism, weak connection between algorithms and implementation, and insufficient support for personalized learning. At present, although some online education platforms (such as MOOC) have initially achieved the digital integration of teaching resources, the static resource accumulation model still makes it difficult to achieve the structured integration of knowledge and adaptive learning guidance. It is urgent to leverage intelligent technologies to deepen the teaching system from "resource presentation" to "cognitive construction", and break through the deep-seated bottlenecks of teaching reform [2].

Knowledge graph technology has powerful semantic association and cognitive modeling capabilities, providing new ideas for the structured reorganization of knowledge [3]. This research focuses on the operating system course, taking the Chaoxing Learning Pass platform and the dynamic Algorithm as the core carriers, to explore the reconstruction path of the intelligent teaching system driven by artificial intelligence: through natural language processing technology, semantic analysis and structured parsing are conducted on the course materials, experimental cases and teaching resources, and core concept entities such as process management, memory allocation and file system are extracted; Utilize graph neural networks to mine the explicit logic and implicit associations among various knowledge points (such as the cognitive dependency relationship between process synchronization and deadlock avoidance); Ultimately, a dynamically evolving course knowledge graph is constructed and deeply integrated with the intelligent teaching engine of the Chaoxing Learning Pass platform to achieve personalized learning path push and precise intervention for weak links.

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2 Artificial intelligence empowers teaching

2.1 Knowledge graph-driven intelligent teaching

The operating system course mainly studies the coordination and management of computer system resources, which involves a large number of abstract core mechanisms and complex concurrent control algorithms. Students generally reflect that it is difficult to establish a systematic understanding and they lack a clear understanding of the overall knowledge framework of the course. Meanwhile, there are significant differences in students' foundations, and traditional teaching is difficult to meet the individualized learning needs. In response to the above issues, this study intends to build a knowledge graph based on the Chaoxing Learning Pass platform, structurally sort out the core contents such as process management, memory allocation, and file system in the operating system course, form a clearly hierarchical knowledge system, and associate related knowledge points with typical exercise resources. In this way, students can intuitively grasp the connections among various knowledge modules during the learning process, construct a complete framework diagram of the course content, and deepen their understanding and mastery of key mechanisms and algorithms with the help of the accompanying question bank.

The core content of the operating system course can be developed around two main lines: one is resource management, and the other is process control. Resource management mainly includes the allocation and scheduling of memory, peripherals and file systems. Process control involves aspects such as process synchronization, communication, and deadlock handling. These two main lines run through the entire curriculum system and can serve as the primary dimensions for integrating knowledge graphs. By means of comparison and association, they can be organically organized and bound to corresponding experimental cases, exercises, and learning resources to help students systematically master the design and implementation principles of operating systems.

For teachers, they can use knowledge graphs to view in real time the average learning progress and mastery of students in a certain main line content in their class, such as the completion rate of knowledge related to process synchronization and the understanding level of common algorithms (such as the Banker's algorithm), so as to adjust teaching strategies in a timely manner and implement targeted tutoring.

The knowledge graph function of the Chaoxing Learning Pass platform can clearly present the logical relationships among various knowledge modules in the operating system course, build a complete cognitive framework from core concepts to specific technologies, and assist students in establishing a structured understanding.

2.2 AI course management

Chaoxing Learning Pass offers a virtual teaching assistant function. These virtual teaching assistants can provide 24-hour Q&A services for students, effectively enhancing their problem-solving efficiency. Teachers can manage knowledge through AI teaching assistants. Students can set different questions and answers based on the different ementations of various knowledge points by themselves, which is convenient for them to look up. In addition, teachers can also view visitor statistics and Q&A statistics based on the data statistics provided by the AI teaching assistant. With this information, they can grasp students' learning progress and mastery level [4].

In addition, Chaoxing Learning Pass comes with a built-in statistics function. It can not only record students' classroom performance at any time, dynamically monitor their learning situation, automatically generate students' grades based on the set proportion, but also conduct learning monitoring. Teachers can have a clear understanding of students' learning situations at a glance and make appropriate adjustments based on the current circumstances.

2.3 Intelligent resource sharing

As different institutions have their own strengths in discipline construction, teaching staff and experimental equipment, they can avoid redundant construction by sharing high-quality course resources among themselves. In addition, cooperation between educational institutions in developed and underdeveloped regions can promote high-quality educational resources to resource-scarce areas, thereby advancing educational equity [5]. With the help of the Chaoxing Learning Pass platform, different institutions of higher learning can achieve cross-platform interaction. Through Chaoxing Shangjianke, one can build online courses, high-quality teaching materials, high-quality case libraries, etc., to achieve the sharing of high-quality resources and avoid repetitive construction. Cross-institutional course collaboration not only promotes disciplinary complementarity and resource sharing, but also alleviates the imbalance of educational resources. As in Reference 1, a detailed analysis was conducted on the collaborative design cases of STEM courses in 12 schools.

The professional knowledge of different disciplines is often presented to students in a scattered form, making it difficult for them to integrate and connect the scattered disciplinary knowledge. In real life, it is even more challenging for them to link different knowledge together. By jointly developing courses and conducting research projects, teaching teams from different majors can stimulate interdisciplinary thinking, organically integrate the disciplinary knowledge of different fields, and promote academic integration. At the same time, it can also build a learning system that deeply integrates theory with practice for students. For instance, when chemistry teachers collaborate with mathematics teachers, they can utilize big data analysis to accelerate material research and development and produce higher-level scientific research achievements. When computer science teachers collaborate with mathematics teachers, they can cultivate compound talents with logical thinking, algorithmic ability and mathematical modeling literacy. For instance, by integrating statistics (hypothesis testing, regression analysis, etc.) with artificial intelligence to achieve better analysis algorithms, the scientificity, interpretability and robustness of AI systems can be significantly enhanced. It also provides new ideas for addressing the shortcomings of traditional AI models in aspects such as uncertainty quantification, causal inference, and decision reliability.

2.4 Analysis of students' learning situation

The operating system is a core course that combines the underlying logic of the system with the core technologies of engineering practice. The analysis of students' learning situations plays a key role in systematic teaching. Student situation analysis, by continuously tracking students' programming foundation, systems thinking, practical ability and phased practical effects, can help teachers accurately identify teaching bottlenecks and core issues. For instance, in the process management section, students often encounter difficulties in understanding due to the complexity of abstract concepts such as process synchronization and deadlock mechanisms. In the memory management stage, the practical application capabilities of core mechanisms such as virtual memory and page replacement algorithms often become weak links. Through classroom practice, project reports, and phased experiments and other learning situation data, teachers can identify common system design obstacles or practical application misunderstandings among students, and then adjust teaching strategies - such as introducing Linux kernel cases to deepen system understanding, or using simulation tools to assist in understanding scheduling algorithms. Meanwhile, the analysis of students' learning conditions can also promote the implementation of stratified teaching. By designing flexible experimental tasks based on the differences in students' programming abilities and system foundations, it not only avoids the knowledge disconnection caused by the "one-size-fits-all" teaching approach but also stimulates the engineering practice potential of students at different levels. It is worth noting that student situation analysis is not a one-way diagnosis. The closed-loop feedback mechanism it forms (teaching implementation → student situation assessment → strategy optimization) can significantly enhance the achievement degree of course objectives, especially in cultivating core abilities such as systems thinking and solving complex engineering problems, which is of strategic significance.

Through Learning Pass's student situation analysis, teachers can receive assistance in multiple aspects such as teaching decision-making, teaching methods, learning guidance, and communication between teachers and students. They can understand the overall learning situation of students, optimize teaching methods and strategies, carry out personalized learning guidance, and improve teaching content through Learning Pass, etc. In conclusion, the learning situation analysis of Chaoxing Learning Pass provides teachers with a data-driven tool, which can help them understand students' learning conditions more comprehensively and accurately, thereby achieving individualized teaching, optimizing teaching design and improving teaching quality.

2.5 Dancing algorithm

For the operating system course, there are a large number of abstract algorithm principles that rely on dynamic execution. Take the process scheduling algorithm as an example. As one of the core mechanisms for resource allocation in an operating system, it determines how multiple processes share a limited CPU time slice, thereby affecting the overall efficiency and response performance of the system. Take the time slice round-robin scheduling as an example. In a multi-tasking environment, each process is allocated a time slice to execute in rotation. Macroscopically, it seems parallel, but in fact, it switches quickly. Although teachers can explain its principle in class through pseudo-code or flowcharts, students often find it difficult to intuitively perceive its dynamic execution process and performance differences.

However, with the development of AI and simulation technology, we can use visualization tools and algorithm simulation platforms, such as Doubao, deepseek, and Yuanbao, to transform static scheduling strategies into dynamic and visual algorithms. Students can observe in real time the changes in process queues, fluctuations in CPU utilization, and system behavior under different scheduling strategies (such as FCFS, SJF, priority scheduling, etc.). This immersive interactive experience not only reproduces the "dynamic logic" behind the algorithm, but also helps students build an intuitive understanding and profound comprehension of the operating system's kernel mechanism.

3 Conclusions and prospects

To assess the learning effect of intelligent teaching on students, we adopt a comprehensive evaluation method to measure students' overall grades, which includes formative assessment and summative assessment. Among them, formative assessment and summative assessment each account for 50% of the final total grade. Formative assessment includes students' regular attendance (accounting for 5%), classroom performance (accounting for 5%), homework (accounting for 10%), and experiments (accounting for 30%), etc. We selected students from the two academic years of 2023 to 2025 for comparison. As shown in Table 1：

Table 1 Comprehensive evaluation

Semester	Number of people	Average score	Standard deviation	Failure rate
2023-2024(2)	95	55.205	13.015	45.26%
2024-2025(2)	87	60.455	12.72	19.54%

By comparison, it was found that the overall average score has increased, while the standard deviation and the failure rate have decreased. This indicates that the overall performance of students in the second semester of the 2024-2025 academic year is better. At the same time, it reflects to a certain extent the significant improvement in teaching effectiveness after integrating artificial intelligence technology into the classroom.

The development of artificial intelligence technology has brought about tremendous changes to teaching. Through the dynamic reconstruction of classroom teaching and the precise adaptation of personalized learning, the efficiency of teaching and the quality of learning can be enhanced. Through the collaborative use of various intelligent technologies (such as Chaoxing Learning Pass, Deepseek, KiMi, etc.), comprehensive innovation from knowledge imparting to ability cultivation can be achieved, promoting teachers to shift from "experience-driven" to "data-driven" and "visualization-driven". This transformation not only addresses the pain points in traditional teaching such as the difficulty in understanding abstract concepts and insufficient personalized support, but also builds an integrated intelligent education model of "teaching, assessment and management".

Although artificial intelligence technology has provided many conveniences for learning, such as personalization and efficiency. However, the rapid development of artificial intelligence technology has also brought about drawbacks that cannot be ignored. For instance, the convenience of artificial intelligence technology may cause students to become overly dependent, leading to a decline in their autonomous learning ability, limited critical thinking and innovation capabilities, and weakened social skills. Therefore, this further demands that teachers focus on cultivating students' abilities and guide them to use artificial intelligence technology scientifically, making AI a powerful tool in their hands rather than a slave to it.

For the future, AI can be utilized to build a complete educational and teaching system, providing real-time auxiliary tools such as intelligent lesson plan optimization and classroom interaction design for all teachers. Additionally, it is expected that a digital literacy certification system for university teachers can be established with the help of AI technology, and the application of AI tools can be incorporated into the teaching ability assessment standards. The future intelligence of education should adhere to the core concept of "human-oriented intelligence" : AI technology needs to serve the essential demands of teaching. It should not only enhance educational efficiency through algorithm optimization but also retain the educational warmth of interaction between teachers and students.

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