

Innovation and Practice of New Engineering Teaching Mode with Artificial Intelligence

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Abstract: Guided by the goal of the new era, the construction of new engineering is very important for cultivating high-quality engineering talents. This paper focuses on the new engineering teaching model of artificial intelligence, and deeply discusses its innovation in concept, structure optimization and model innovation. By analyzing the application advantages of artificial intelligence technology in teaching and combining with the actual work, study and research situation, this paper explores the construction of a teaching mode that meets the needs of modern teaching in order to improve the training quality of new engineering talents and provide beneficial reference for the development of engineering education.

Keywords: Artificial Intelligence; Teaching Mode Innovation; Optimization of Teaching Structure; Personalized Learning; Virtual Simulation Practice.

1. Introduction

With the rapid development of science and technology, artificial intelligence has become the key force to promote education reform. It is urgent to realize the innovation and upgrading of teaching mode with the help of artificial intelligence technology. The research of "Innovation and Practice of the New Engineering Teaching Mode with Human and Artificial Intelligence" aims to meet the needs of the educational strategy of the new era, explore how to integrate artificial intelligence into the teaching process deeply, and cultivate the educational engineering talents with advanced scientific and technological accomplishment and teaching ability.[1]

2. Integration of New Engineering Construction Concept and Artificial Intelligence

2.1. Connotation of New Engineering Construction Concept

With the aim of serving the country and the modernization of education and teaching in colleges and universities, the new engineering course emphasizes the interdisciplinary integration, the cultivation of innovative ability and the orientation of practical application. Its core lies in breaking through the traditional disciplinary barriers and cultivating compound talents who can cope with the complicated educational engineering problems and adapt to the future educational form. [2]

The cultivation of innovation ability is the key to new engineering disciplines. Encourage students to break through conventional thinking and explore new technologies and methods in engineering practice. From simple engineering design to complex system innovation, guide students to apply knowledge from multiple disciplines and explore key points. Let students gain experience in real engineering scenarios. Through enterprise internships and project practices, they can master the skills of applying knowledge and shorten the adaptation period from campus to the workplace.

2.2. Significance of the Integration of Artificial Intelligence and New Engineering Concepts

The introduction of artificial intelligence provides technical support for the implementation of new engineering concepts. Through the artificial intelligence technology, can realize the intelligent renewal of the teaching content, make it keep up with the education science and technology frontier; At the same time, it can accurately customize the learning path according to the individual differences of the students, improve the personalized training level, and better practice the people-oriented education concept.

In response to individual differences among students, artificial intelligence enables precise customization of learning paths.[3] By leveraging the intelligent learning analysis system, students' learning data is collected, including their mastery of knowledge, learning progress, and learning habits, etc. For students with weak foundations, push personalized basic knowledge consolidation modules. For students who have spare capacity for learning, we provide extended engineering cases and research-based learning content, practice the people-oriented educational concept, enhance the level of personalized cultivation, and enable students with different characteristics to fully develop in the study of new engineering.

3. Optimization of New Engineering Teaching Structure Based on Artificial Intelligence

3.1. Reconstruction of Curriculum System

There are some problems in the traditional teaching and engineering curriculum system, such as the division of subjects is too detailed and the practice links are weak. With the help of artificial intelligence technology, curriculum content can be integrated and optimized. For example, using the knowledge atlas technology to sort out the knowledge vein in the field of teaching engineering, breaking the discipline boundary and constructing the interdisciplinary curriculum group.[4] The courses such as artificial

intelligence algorithm and big data analysis are integrated into the traditional engineering courses such as communication and equipment engineering, so that the students have a multi-disciplinary knowledge structure.

Integrating courses such as artificial algorithms and big data analysis into traditional engineering courses is a trend.[5]The reconstruction of practical links is an important part of the optimization of the curriculum system.By leveraging artificial intelligence-related technologies such as virtual simulation and digital twins, a virtual engineering practice platform is built.Students design and debug complex equipment in a virtual environment, simulate real production fault detection, make up for the insufficiency of physical practical resources, improve the efficiency and effectiveness of practical teaching, and accumulate practical experience in a safe and repeatable environment.

3.2. Integration of Teaching Resources

Artificial intelligence assists the intelligent integration of teaching resources. On the one hand, through the intelligent search engine, a large amount of engineering teaching resources can be gathered, including online courses, academic papers, teaching cases, etc. On the other hand, the content recommendation algorithm of artificial intelligence is used to accurately push the appropriate teaching resources according to the learning progress and interest preference of students, so as to improve the resource utilization efficiency.

Teaching resources can also be updated dynamically. By leveraging artificial intelligence technology to track technological innovations and changes in industrial demands in the engineering field, the course resource library can be updated in a timely manner. Ensure that teaching content is in step with industrial development, so that the knowledge students learn is always in line with actual needs.

4. Innovation of New Engineering Teaching Mode Enabled by Artificial Intelligence

4.1. Intelligent Interactive Teaching Mode

By leveraging artificial intelligence technologies such as natural language processing and computer vision, an intelligent teaching interaction environment is constructed. For instance, virtual teaching instructors can be developed. Students can interact with the virtual instructors in real time through voice or text to obtain services such as knowledge explanations and problem-solving.Meanwhile, by leveraging technologies such as gesture recognition and expression recognition, natural interaction between learners and virtual teaching scenarios is achieved, enhancing the immersion and participation in learning.[6] Artificial intelligence drives the transformation of the new engineering education model from the traditional "teaching-centered" to "learning-centered". Project-based learning combined with artificial intelligence tools has become an important model. Teachers assign interdisciplinary engineering projects, such as the design of intelligent factory systems. Students use artificial intelligence algorithms to optimize production processes and control intelligent equipment. In project practice, they independently apply knowledge from multiple disciplines, cultivating teamwork, problem-solving and innovation abilities.

4.2. Personalized Self-adaptive Learning Mode

The learning data of the students are monitored and analyzed in real time by using the learning analysis technology of artificial intelligence. Through the construction of the learning portrait of the students, accurately grasp the learning style, knowledge mastery degree, learning progress and other information of the students. Based on this, the teaching content and difficulty can be automatically adjusted to provide personalized learning scheme for students. For example, for students who master quickly, push the learning content of extension; Provide targeted coaching and intensive training for students with learning difficulties.

4.3. Virtual Simulation Practice Teaching Mode

The deep fusion of artificial intelligence and virtual simulation technology brings a new breakthrough for the practical teaching of new engineering. Construct a highly lifelike virtual teaching project scene, such as environment simulation, training facility operation drill, etc. Students can practice in a virtual environment, avoiding the risks and costs of doing so. At the same time, the artificial intelligence algorithm is used to evaluate and feedback the operation process of the students in real time, so as to help the students improve in time and improve their practical ability.

5. Practice Strategy of New Engineering Teaching Mode Enabled by Artificial Intelligence

5.1. Construction of Teaching Staff

Cultivating a teaching staff with artificial intelligence literacy is the key to implementing the new teaching model.By organizing teachers to participate in artificial intelligence technology training, academic exchange activities, etc., their understanding and application ability of artificial intelligence technology can be enhanced.Encourage teachers to conduct research and practice on the integration of artificial intelligence and teaching, transform scientific research achievements into teaching resources, and promote the innovation of teaching models.In terms of teaching ability, teachers should learn to apply artificial intelligence teaching tools.Master the intelligent lesson preparation system and utilize its integrated multi-disciplinary resources to design courses;Proficient in using the intelligent classroom interaction platform, carry out mixed online and offline teaching interaction, analyze students' classroom performance data with the help of artificial intelligence, accurately grasp students' learning status, and promptly adjust teaching strategies.At the same time, a "dual-qualified" teaching staff should be built and cooperation between universities and enterprises should be strengthened.Enterprise engineers enter classrooms to impart practical experience in the application of artificial intelligence in industries. University teachers delve into enterprise practices to understand the skill demands of the industry for new engineering talents, integrating practical experience into teaching to enhance the practicality and pertinence of teaching.

5.2. Construction of Teaching Platform

Build an AI-based teaching platform that integrates

functions such as intelligent teaching management, learning analysis, and resource push. By leveraging technologies such as cloud computing and big data, ensure the efficient operation of the teaching platform and the security of data. At the same time, we will cooperate with educational and research institutions as well as enterprises, introduce advanced artificial intelligence technologies and products, and continuously improve the functions of the teaching platform. Deepen the integration of industry and education for collaborative talent cultivation. Promote the in-depth integration of universities with industries, establish long-term and stable industry-education integration alliances, and have enterprises deeply participate in the formulation of new engineering talent cultivation plans, course development, and practical teaching, integrating industrial demands throughout the entire teaching process. Colleges and universities provide talent reserves and technological research and development support for enterprises. Through forms such as jointly building industrial colleges and internship and training bases, they achieve a harmonious resonance between talent cultivation and industrial development, and enhance the compatibility between teaching and industrial demands.

5.3. Reform of Teaching Evaluation

Establish a competency-oriented teaching evaluation system and make full use of artificial intelligence technology to achieve intelligent and diversified teaching evaluation. In addition to traditional examination results, the performance of students in intelligent interactive learning, personalized learning, virtual simulation practice and other links is comprehensively considered. Through learning analysis technology, the learning process and achievements of students are comprehensively evaluated. By leveraging the data analysis capabilities of artificial intelligence, scientific basis can be provided for teaching improvement.

6. Conclusion

The innovation of the new engineering teaching mode enabled by artificial intelligence is an inevitable choice to conform to the development of the times and the educational reform. Through the integration of ideas, the optimization of structure, the innovation of mode and the implementation of practical strategies, it is expected to build up the education engineering talent training system that meets the needs of modern teaching. In the future construction of new engineering courses, it is necessary to continuously deepen the application of artificial intelligence technology, constantly explore the innovative path of teaching model, and contribute to the training of high-quality engineering talents and the promotion of national and educational modernization.

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