Application Research of Intelligent Teaching Assistant System in Civil Engineering Education

[1st] Cuicui Hao[1,a], [2nd] Yingjing Lan[1,b], [3rd]*Kan Zhao[2,c], [4th] Zihua Zhao[1,d]

[a]441843044@qq.com, [b]948581198@qq.com,
* Corresponding author:[c]717642982@qq.com, [d]283302389@qq.com

[1]Haidu College Qingdao Agricultural University, Yantai, China
[2]Yantai International Construction Group Limited, Yantai, China

Abstract—With the continuous development of technology, the application of intelligent teaching assistance systems in civil engineering education is becoming increasingly widespread. This article mainly explores the application of intelligent teaching assistance systems in civil engineering education, including the concept and characteristics of intelligent teaching assistance systems, the current application status, existing problems, solutions, and future development trends in civil engineering education. Through the study of intelligent teaching assistance systems, this paper explores the application effects and impacts of intelligent teaching assistance systems in civil engineering education, in order to provide reference for future educational reforms.

Keywords- Intelligent teaching assistance system;Data security;Artificial intelligence

1. Introduction

Civil engineering education is an important way to cultivate future engineers, but with the increasing number of students and limited teaching resources, traditional teaching methods can no longer meet the needs of modern education. Therefore, developing and applying intelligent teaching assistance systems has become an important means to improve the quality of civil engineering education. Intelligent teaching assistance system refers to a system that utilizes computer technology, network technology[1], artificial intelligence and other technological means to intelligently manage and assist teaching activities, in order to improve teaching efficiency and quality. With the help of intelligent teaching assistance systems, personalized teaching, real-time feedback, virtual experiments, etc. can be achieved, helping students better grasp knowledge, improve practical abilities, and improve teaching quality. This article aims to explore the application effect and impact of intelligent teaching assistance systems in civil engineering education, analyze the problems in application, and propose relevant suggestions, in order to provide reference for future education reform[2].

2.The characteristics of ibtelligent teaching assistance system

1)Intelligent:Intelligent teaching assistance system can automatically adjust teaching content and methods according to students' learning situation and learning needs to achieve personalized teaching.

ITEI 2023, November 24-26, Zhengzhou, People's Republic of China

DOI 10.4108/eai.24-11-2023.2343688

2)Diversification:Intelligent teaching assistance system can provide a variety of forms of teaching resources, such as text, pictures, videos, audio, etc., to meet the different learning needs of students.

3)Interactivity:Intelligent teaching assistance system can realize the interaction between teachers and students and help students better understand and master knowledge.

4) Integration:Intelligent teaching assistance system can integrate various teaching resources to facilitate the use of teachers and students.Maintaining the Integrity of the Specifications

3. The functions of intelligent teaching assistance system

1)Intelligent diagnosis and recommendation:Intelligent teaching assistance system can provide teachers with personalized teaching suggestions and auxiliary tools by analyzing and understanding students' learning status and needs. It can make intelligent diagnosis and recommendation according to students' learning situation, so as to better meet students' learning needs.

2)Automatic test group function:According to the preset question bank system[3], the intelligent teaching assistance system can realize the teacher's random test group function, so that teachers can better arrange and organize teaching activities.

3)Dynamic test entries:The intelligent teaching assistance system can temporarily add questions according to the requirements of teachers, and can automatically complete the classification of the question bank or send questions to registered students immediately, making teaching activities more flexible and diversified.

4)Permission management:The intelligent teaching assistance system can assign corresponding permissions according to the login user type (student, teacher, administrator), so that different users can complete the operation within their limited functional scope, to ensure the security and stability of the system[4].

4.The application status of intelligent teaching assistance system in civil engineering education

In civil engineering education, intelligent teaching assistant system has a wide application prospect in civil engineering education. It can provide teachers and students with more intelligent, personalized and efficient learning and management tools[5], improve teaching efficiency and student learning effect. At the same time, the application of intelligent teaching assistance system can also promote the development of education information and promote the progress and development of civil engineering education. Specifically, its application mainly includes the following aspects:

1)Online learning platform:Through the smooth network operation, the intelligent teaching assistance system can realize the system expansion of local area network and wide area network, providing students with an online learning platform, so that teachers and students can carry out

online learning or management at any time and any place, improving learning efficiency and independent learning ability.

2)Personalized teaching:Intelligent teaching assistance system can provide teachers with personalized teaching suggestions and auxiliary tools by analyzing and understanding students' learning status and needs[6]. It can make intelligent diagnosis and recommendation according to students' learning situation, so as to better meet students' learning needs.

3)Virtual experiment simulation:Intelligent teaching assistance system can help students to carry out practical operation and improve practical ability through virtual experiment simulation. It can be connected with laboratory equipment to realize intelligent management of laboratory equipment. Through the system, students can book laboratory equipment online and perform experimental operations within the specified time. At the same time, the system can also monitor and manage the use of laboratory equipment in real time to ensure the safety and normal use of equipment. Help students timely understand their own learning situation and shortcomings, timely adjustment of learning strategies.

4)Online assessment system:Intelligent teaching assistance system can provide students with online assessment system, feedback and analysis of students' test results, help teachers better understand students' learning situation and adjust teaching strategies. At the same time, the system can also control the data of the huge question bank, complete the automatic or semi-automatic test paper composition function according to the various requirements of the teacher users, and can feedback and analyze the test results of the students efficiently and quickly improve the learning quality of the students and the teaching effect of the teachers.

5)Resource sharing and collaboration:Intelligent teaching assistance system can provide resource sharing and collaboration functions for students and teachers[7]. Students and teachers can share learning materials, teaching resources and experimental data through the system, and carry out online collaboration and communication. This can improve the teaching efficiency and students' learning effect, but also can cultivate students' collaborative ability and team spirit.

5.The application status of intelligent teaching assistance Advantages and challenges of intelligent teaching assistance system in civil engineering education

A.Advantages

1)Improve teaching quality: Intelligent teaching assistance system can provide personalized teaching recommendations according to students' learning conditions, helping students better master knowledge and skills. At the same time, the system can also feedback and analyze the teaching effect, help teachers better adjust the teaching strategy and improve the teaching quality.

2) Enhance students' independent learning ability: Intelligent teaching assistance system can provide students with online learning and tutoring functions to help students conduct independent learning and self-management. In this way, students can cultivate their independent learning ability and self-management ability, and improve their learning effect.

3) Improve teaching efficiency: Intelligent teaching assistance system can realize automatic test, online examination, resource sharing and other functions to improve teachers' teaching efficiency and management efficiency. At the same time, the system can also monitor and feedback the students' learning situation in real time, help teachers better understand the students' learning situation and timely adjust the teaching strategy.

4) Promote educational equity: Intelligent teaching assistance systems can realize network expansion, so that teachers and students can learn and communicate online at any time and anywhere. This can break the geographical and time constraints and promote education equity and universal access.

B.Challenges

1) High Technical Difficulty: the development and application of intelligent teaching assistant system need higher technical level and support, including artificial intelligence technology, big data analysis technology and so on. The technical problems of the intelligent teaching assistant system may also lead to errors or deviations in the system algorithm or data analysis, which may have a negative impact on students' learning.

2) Lack of interaction and emotional communication: although the AI system is convenient and fast, some educators believe that AI system can not give students enough interactive experience, they can not be sensitive to students' needs and emotions, and can not adjust accordingly; intelligent teaching AIDS can not communicate and interact with students in the same way as human teachers. This lack of emotional communication may affect students' emotional development and social skills.

3) Unable to adapt to the needs of each student: although intelligent teaching aids can be based on student learning and feedback personalized recommendations and teaching, but it still can not fully adapt to each student's unique needs and interests. Some students may lose their motivation to learn because they can not find what they are interested in or suitable for in the system.

4) Evaluation and feedback mechanism problem: Intelligent teaching aid system usually has the function of evaluating student's learning achievement, but this kind of evaluation may have one-sidedness and inaccuracy. In addition, the system can not provide students with timely and comprehensive feedback like human teachers to help them better understand and master knowledge.

5) Adaptability: the application of intelligent teaching assistant system needs teachers and students to adapt to the new teaching and learning methods, which requires a certain amount of time and effort. The application of intelligent teaching assistant system needs teachers to change the traditional teaching ideas and methods, adapt to new teaching models and technical means. Some teachers may not be willing or able to adapt to this change, which will also affect the application of intelligent teaching assistance system.

6)Data security issues: Intelligent Teaching AIDS system involves a lot of student and teacher information, including personal information, learning progress, achievements, etc. , need to carry out data protection and security management. If data is compromised or obtained illegally, there may be adverse effects and security risks.

7)Cost problem: the construction and maintenance of intelligent teaching assistant system need a lot of capital investment, including hardware equipment, software system, data security and so on. For some schools, the cost may be too high to bear.

6. Recommendations and measures

In view of the above problems, I think we can further develop and improve the intelligent teaching assistant system from the following aspects.

1)Strengthen technology research and development to meet the stable operation requirements of the system and improve data security. By constantly improving the technical level of intelligent auxiliary teaching, the teaching quality and efficiency are improved[8]. For example, artificial intelligence technology can be used to develop more intelligent and efficient teaching AIDS and resources to provide students with a more convenient and efficient learning experience. Educational institutions and related enterprises should strengthen technical input and personnel training, establish a perfect management mechanism, standardize and supervise the use and management of intelligent teaching assistant system, and ensure the stability and safety of the system.

2) Strengthen the interaction between teachers and students and pay attention to students' mental health. Through intelligent auxiliary teaching, the interaction between teachers and students is strengthened and the learning effect of students is improved. For example, the online discussion and real-time question answering functions in the intelligent teaching system can be used to facilitate the communication and interaction between students and teachers. At the same time, we should pay attention to students' mental health and emotional needs. Emotional support and psychological counseling can be provided through intelligent teaching system to help students reduce their learning pressure and anxiety.

3)Adjust the content and form of intelligent auxiliary teaching, and enhance the personalized support of intelligent auxiliary teaching. According to students' needs and learning styles, adjust the content and form of intelligent assistant teaching[9]. For example, we can develop more vivid and interesting multimedia teaching resources and more interactive and practical teaching forms. According to different students' needs and learning styles, provide more personalized intelligent auxiliary teaching support. For example, by analyzing students' learning data and behavior habits, we can provide them with customized learning resources and guidance to better meet their learning needs.

4) Improve the evaluation mechanism of intelligent assisted instruction. By improving the evaluation mechanism of intelligent auxiliary teaching, the problems existing in teaching can be found and solved in time. For example, a database of students' learning behavior can be established to monitor and analyze students' learning progress and learning effect in real time, so as to adjust teaching strategies in time. At the same time, the feedback and suggestions of students, teachers and technicians on intelligent auxiliary teaching should be collected and processed in time. This will help to find and solve problems in time and continuously optimize the intelligent auxiliary teaching system.

5) Cultivate students' autonomous learning ability: Through intelligent auxiliary teaching, students' autonomous learning ability is cultivated and their learning enthusiasm and initiative

are improved. For example, students can be provided with personalized learning plans and guidance to help them better master knowledge and skills. At the same time, the application of the system also requires educational institutions and related enterprises to strengthen training and support, so as to improve the use ability and adaptability of teachers and students.

6)Promote the cooperation between teachers and technicians, and strengthen the training and support of relevant personnel. Strengthen the cooperation between teachers and technicians, jointly develop and optimize the intelligent auxiliary teaching system, and promote the effective application of intelligent auxiliary teaching technology. At the same time, we should strengthen the training and support of teachers, technicians and students in intelligent auxiliary teaching, and improve their ability and quality in intelligent auxiliary teaching. In order to better play the role of intelligent auxiliary teaching and improve teaching quality and effect.

To sum up, we should further study and develop a more intelligent, personalized and emotional communication auxiliary teaching system to solve the problems existing in intelligent auxiliary teaching. Establish a sound data protection and privacy management system to protect students' personal information security and learning rights. In addition, teachers also need to constantly improve their professional quality and technical ability, so as to better adapt to the application and promotion of intelligent teaching assistant system. Attention should be paid to strengthening the transformation of teachers' training and education concepts, improving the stability and security of the system, and reducing the cost of the system to benefit more schools and students.

7.The future development trend of intelligent teaching assistance system in civil engineering education

The application prospect of intelligent teaching assistant system in civil engineering education is broad. In the future, more technology and application will be added to the system, it will not only be limited to online learning platform, virtual experiment simulation, personalized teaching, online evaluation system[10], but also will be extended to the following areas:

1)Augmented Reality technology: The use of augmented reality technology can combine the virtual world and the real world to provide students with a more realistic learning experience.

2)Artificial Intelligence tutor: Using artificial intelligence technology, students can be provided with artificial intelligence tutors to achieve more intelligent and personalized teaching.

3)Big data analysis: With the continuous development of Internet of Things technology, the intelligent management function of the system will be more perfect, and more intelligent and automated laboratory equipment management and monitoring can be realized. Using big data technology, students' learning behaviors can be analyzed to provide teachers with more accurate teaching strategies and suggestions.

4) Mobile learning: With the popularization and application of 5G and other communication technologies, the real-time performance and response speed of the system will be further improved, and students can learn on mobile devices to achieve more efficient and smooth learning and communication, which is more convenient and fast.

With the deepening of educational informatization, the application of intelligent teaching assistant system will be more popular and extensive. In the future, not only in the field of civil engineering education, but also in other disciplines and educational fields, there will be more applications of intelligent teaching assistant systems. This will inject new impetus into the development of education and promote the progress and development of education.

8.Conclusion

Through the intelligent teaching assistant system, students can obtain more abundant and diversified learning resources, and at the same time, they can improve their practical ability by simulating practical operation. Teachers can realize personalized teaching and improve teaching quality and efficiency. However, we should also see that the intelligent teaching aid system is not omnipotent, it is only a teaching aid and cannot completely replace the traditional teaching methods. As a highly practical and theoretical discipline, civil engineering has high requirements for students' theoretical knowledge and practical ability. In civil engineering education, the accumulation of theoretical knowledge and practical experience is still very important. Only through systematic study and practice can students truly master the knowledge and practical ability of civil engineering. We should strengthen the connection between the intelligent teaching assistant system and the civil engineering industry, and design more practical teaching contents and methods according to the needs of the industry and actual engineering cases[11]. Further strengthen the research and application of intelligent teaching assistant system, and provide more reliable technical support for the development of civil engineering education. At the same time, we should strengthen the training and management of teachers, improve teachers' understanding and application ability of intelligent teaching assistant system, strengthen cooperation and exchange with related fields, jointly promote the development and application of intelligent teaching assistant system, and make greater contributions to the development of civil engineering education.

Fund Project: Shandong Province Undergraduate Teaching Reform Project in 2022"Teaching Research on Architectural Model Based on Theory and Practice Conversion Training" (Project No. M2022173);Shandong Province in 2023"Application Research of Architectural Model Assisted Teaching Mode in Civil Engineering Major" (Project No. 2023JX077) ; Shandong Labor Education research project in 2023 "Cultivating Five Young Students Based on Model Making" (Project No. 2023LD046)

References

[1] Wang Xiaodong. Application of intelligent teaching assistant system in civil engineering [J]. Modern Educational Technology, 2020, 20(3): 120-125. (in Chinese)

[2] Zhang Zhimin. Application and practice of intelligent teaching assistant system in civil engineering education [J]. Educational Research, 2021, 21(1): 60-65.

[3] Li Ming. Design of Civil Engineering Teaching Assistant System based on Artificial Intelligence [J]. Education Informatization, 2019, 19(5): 40-44.

[4] Wang Li. Application of Intelligent Teaching Assistant System in Civil Engineering undergraduate courses [J]. China Educational Technology and Equipment, 2018, 18(6): 43-47.

[5] Xi Chen. China Educational Informatization, 2018, 18(3): 60-64.
[6] Liu Chun, Li Shanshan, . Design of Interactive Teaching Music Intelligent System Based on AI and Big Data Analysis. 2023, :333-341.
[7] Paladines José, Ramírez Jaime, Berrocal Lobo Marta, et al. Integrating a dialog system with an intelligent tutoring system for a 3D virtual laboratory[J]. Interactive Learning Environments, 2023, 31(7):4476-4489.
[8] A. Deslandes, J. Avery, G. Condous, et al. EP31.15: Artificial Intelligence as a teaching tool for ultrasound in gynecology: a systematic scoping review[J]. Ultrasound in Obstetrics & Gynecology, 2023, 62:300-300.
[9] Chevalère Johann, Yun Hae Seon, Henke Anja, et al. A sequence of learning processes in an intelligent tutoring system from topic-related appraisals to learning gains[J]. Learning and Instruction, 2023, 87
[10] Guarnieri Vincent, Neagu Laurentiu Marian, Rigaud Eric, et al. Enhancing Load Evaluation in Intelligent Tutoring Systems Through Velocity-Based Training. 2023, :21-37.
[11] Rybina G. V., Grigoriev A. A., . Modern Architectures of Intelligent Tutoring Systems Based on Integrated Expert Systems: Features of the Approach to the Automated Formation of the Ontological Space of Knowledge and Skills of Students[J]. Pattern Recognition and Image Analysis, 2023, 33(3):491-497.