

Research on the design and application of smart classroom teaching models for promoting deep learning

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Keywords: Deep learning, Modern information technology, Reform of the teaching profession.

Abstract. The deep learning teaching model is a student-centred teaching method that emphasizes guiding students to deep understanding and internalization of knowledge. Compared with traditional shallow learning, it focuses on the cultivation of students' critical thinking, innovation ability and cooperation spirit. And under today's trend of deep integration of information technology and teaching, how to utilize information technology to promote deep learning of college students has become a hot topic in educational research. In this paper, we design a teaching strategy aimed at promoting educational change and innovation through modernized information technology, and take the course "Programming Fundamentals" as an example, and carry out research from the aspects of design principles, learning activities, teaching mode construction, and effect evaluation, aiming to improve the teaching effect of the course and cultivate talents with independent learning ability, teamwork ability and innovation ability.

1 Research background

In the development strategy of China Education Modernization 2035, it is proposed that the pace of education modernization should be accelerated and upgraded, and educational change and innovation should be promoted through modern information technology to provide services for realizing innovative talents. Deep learning, as a branch under learning science, has main features that match with the national demand of cultivating innovative talents. After combing through the literature, it is found that the flipped classroom, which is more closely connected with deep learning, generally has the appearance of flipping flowing from chronological reconstruction, and is unable to realize the transformation of shallow learning to deep learning. With its intelligent technology, diversified teaching methods, and precise teaching strategies, the smart classroom offers the possibility to

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improve the current classroom teaching status quo and promote students' deep learning. Driven by information technology, the integration of intelligent information technology and education makes classroom teaching realize the transformation process from "traditional classroom" to "flipped classroom" to "smart classroom". The program design course in the university is a basic program design course. As a widely used programming course, the research and exploration of intelligent classroom teaching mode has certain practical significance and promotion value. Teachers in the future teaching process of programming courses, the rational application of intelligent classroom teaching mode, stimulate the students' interest in learning, and actively participate in teaching activities, which can effectively improve the teaching effect.

2 Principles for designing a smart classroom teaching model that promotes deep learning

In a smart classroom, the design of teaching activities should follow specific principles, such as student-centeredness, equal emphasis on knowledge and ability, contextual learning, etc., in order to adapt to the needs of in-depth learning, and the process of learning is not only limited to the learning of knowledge, but also the application of more knowledge, and shaping the students' correct outlook on life and values during the process of solving the problem, therefore, the principles of the design of teaching mode in this paper are as follows:

2.1 Leading instruction based on values

In the teaching process, it is emphasized that the teaching of programming skills is integrated with socialist core values to cultivate students' moral sentiments, sense of social responsibility and good professional ethics. During the teaching, teachers should combine the knowledge of C language and introduce life cases to let students understand the relationship between technology and society, and guide them to think about how to utilize technology to serve the society and contribute to the country. Meanwhile, through teamwork projects, students are taught to be honest and trustworthy, compete fairly, and improve their team spirit and communication skills. In addition, teachers should also focus on cultivating students' sense of innovation and practical ability, and stimulate their love for scientific and technological development and the spirit of exploration. Overall, value-led teaching not only enhances students' programming ability, but more importantly shapes their personality quality and sense of social responsibility.

2.2 Teaching based on high-quality problem scenarios

First of all, teachers need to design complex problems closely related to the real world to stimulate students' interest in learning and motivation to solve problems. For example, problem situations related to social development and scientific and technological innovation can be proposed for students to solve by writing C language programs. For example, Intelligent Transportation System Simulation, design a simulation program for an intelligent transportation system to control the conversion of red and green lights through data to optimize traffic flow and reduce congestion; Data Analysis Application, write a program for analyzing public sentiment on social media to study the direction of public opinion on social events and to provide data support for public decision-making; Environmental Monitoring System, create an environmental monitoring system that uses

sensors to collect air quality data and analyze it through a C language program to predict future trends in environmental change;

Health monitoring application, develop a health monitoring application to provide personalized health advice and preventive measures through user input of living habits and health data. Through the solution of these real-world problems, students can not only deepen their understanding and application of C programming skills, but also cultivate their innovative thinking and problem-solving ability for real-world problems.

2.3 Integrative teaching and learning based on within and across disciplines

Encourage students to learn across disciplines, help them establish connections between different disciplines, and form a comprehensive cognitive structure. For example, C programming often involves algorithms, and the design of algorithms often requires mathematical knowledge, such as probability theory, geometry, algebra, etc. Teaching can integrate mathematical knowledge, so that students can understand and implement relevant mathematical formulas. In addition, some simulation programs involving physical knowledge can be designed, such as simulating the effect of gravity on the movement of objects. This can not only improve students' programming skills, but also deepen their understanding of physical concepts; organize some interdisciplinary projects, such as program interfaces designed with art, or bioinformatics programs written with biological knowledge. This kind of interdisciplinary integration not only enhances students' interest in programming, but also promotes their in-depth learning in other disciplines.

3 Design process of smart classroom teaching model for promoting deep learning

The Smart Classroom Teaching Model for Promoting Deep Learning focuses on three parts: pre-preparation, instructional activity design, and instructional evaluation design.

3.1 Preliminary

In order to ensure the effective implementation of teaching activities, it is necessary to analyze the learning objectives, learning content and learning environment before the start of classes. Questionnaire surveys can be used to obtain learners' characteristics and preferences and to understand students' learning styles; to clarify the learning content, set the structure and scope of the learning content in a scientific way, and realize the optimization of the teaching process; and to provide people-oriented learning resources that are rich in content and diversified in the form of resource expression to meet the needs of learners' intellectual development. The specific implementation is shown in Figure 1.

3.2 Design of teaching activities

The learning monitoring and intelligent analysis technology of the intelligent teaching platform helps teachers make teaching decisions, and the "hierarchical progressive intelligent classroom teaching strategy model" helps students realize personalized learning. It consists of a "three-stage" teaching process, namely, the pre-course knowledge construction stage, the layered cooperation and knowledge internalization stage, and the post-course knowledge consolidation and transfer stage;

Pre-course knowledge construction: Push learning resources, release the task guide, guide students to learn independently, check learning resources, complete the task guide,

control the learning progress, learning situation analysis to assist teachers to customize accurate teaching strategies, in order to promote students' personalized learning services.

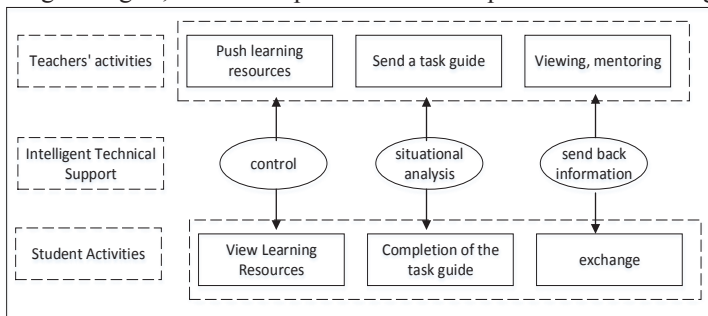


Fig. 1. Pre-course knowledge building.

Internalization of knowledge in class: Teachers are task-driven and create real and meaningful teaching situations in teaching design, which can trigger the cognitive contradictions of scholars and make up for the cognitive shortcomings and inexperience of learners; by using the technological means of smart classroom, such as online tests and instant Q&A, teachers can understand the learning status and comprehension level of students in real time, and adjust the teaching methods in a timely manner. After students complete the learning tasks, they can display the results of the tasks in a group through computerized screen casting to enhance students' self-confidence.

Post-course consolidation and enhancement: Teachers release task assignments through the cloud platform, which are presented in the form of projects, mainly focusing on the solution of poorly structured problems, with the aim of helping learners to realize the migration of knowledge and improve their deep learning ability. The implementation process is shown in Figure 2.

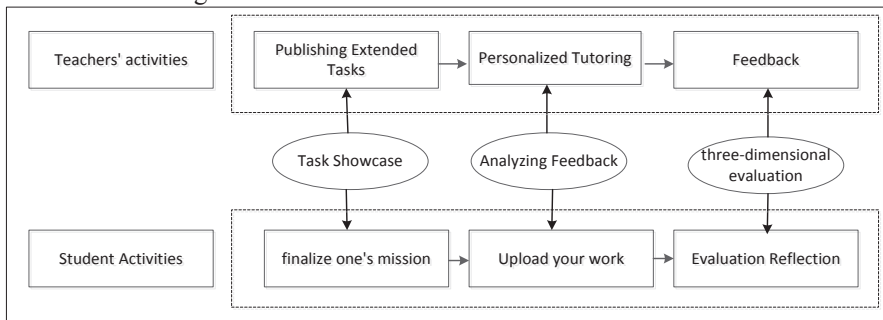


Fig. 2. After-school reinforcement.

3.3 Establishment of a diversified evaluation mechanism

The key to building a diversified evaluation mechanism in the smart classroom teaching model that promotes deep learning lies in comprehensively and objectively evaluating the learning process and outcomes of students from multiple dimensions. First, attention should be paid to process evaluation. In addition to the traditional test scores, attention should be paid to the performance of students in the learning process, such as classroom participation, group discussion contribution, project completion, etc.. Second, implement diversified evaluation methods. Combine with the actual situation of students, use a variety of evaluation methods, such as self-evaluation, peer evaluation, teacher evaluation and so on. In addition, using smart classroom technology to assist evaluation, smart classroom

technology can provide rich data support, such as learning behavior data, homework completion, etc., which can be used to accurately assess students' learning progress and level.

4 The value of applying a smart classroom teaching model that promotes deep learning

First of all, the teaching mode of the smart classroom significantly improves the learning effect of students. Through the introduction of deep learning technology, the smart classroom is able to analyze students' learning status and needs more accurately and provide personalized learning paths and resources for each student. Secondly, the smart classroom teaching mode helps cultivate students' independent learning and lifelong learning ability. In the smart classroom, students can actively participate in the learning process through interactive learning and online collaboration, thus cultivating independent problem-solving ability. At the same time, the introduction of deep learning technology also enables students to better adapt to the ever-changing learning environment, laying a solid foundation for future career development. In addition, the smart classroom teaching model provides teachers with more powerful teaching support. Teachers can have a more comprehensive understanding of students' learning through data analysis, intelligent recommendations and other functions, so as to adjust teaching strategies and improve teaching effectiveness.

5 Concluding remarks

The design of the smart classroom teaching model is a major innovation in the field of education, which is based on advanced information technology and is student-centered, aiming to cultivate students' ability to learn in depth. This mode of teaching requires teachers to have higher professionalism and technical skills, as well as adequate support and resources from educational administrators. The smart classroom not only improves teaching efficiency, but also provides a challenging and interactive learning environment for students, taking advantage of information technology to maximize the use of educational resources and personalized teaching.

1.2023 Research Project on Teaching Reform of Undergraduate Education in Shandong Concordia College: a Study on the Design and Application of Smart Classroom Teaching Models for Promoting Deep Learning - Taking Fundamentals of Programming as an Example. Project Number: 2023XJ21.

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