



Online Digital Teaching: Existing Issues and Technological Solutions

Xiaoman Li

Guangdong University of Science and Technology, Dongguan, Guangdong 523000,
China

lxm7855071@163.com

Abstract. Digitalization in education represents a significant breakthrough for China in forging new paths and shaping new advantages in educational development. Currently, through the comprehensive empowerment of teaching with digital technology, education is transitioning from large-scale standardized teaching to large-scale personalized learning, achieving significant results. However, there are still many areas of imperfection in the current teaching landscape. To address this, this paper proposes a technology solution for online digital teaching based on artificial intelligence from a micro perspective. The aim is to tackle some teaching challenges, explore the practical pathways of AI-enabled teaching, and promote the effective, standardized, and orderly integration of digital teaching into the educational ecosystem.

Keywords: Digitalization, Online Teaching, Technological Solutions

1 Introduction

Artificial intelligence, serving as the pivotal engine for empowering education and teaching, is dismantling conventional teaching models and reshaping teaching environments and procedural activities. Through an examination of the challenges prevalent in AI-driven digital teaching and adopting a multi-faceted perspective involving students, teachers, and educational institutions, this paper offers systematic and personalized technological solutions aimed at enriching learning experiences and refining the efficacy of course instruction.[1]

2 Current Status and Issues of Digital Teaching

Digitalization presents new prospects for teaching development in the modern era. The crux of teaching digitalization transformation lies in systematically reforming teaching ideologies, methodologies, tools, and facilities through the integration of digital technology. [2]This entails shifting teaching paradigms towards prioritizing student development, learning efficacy, and adopting a three-dimensional, multi-faceted, and adaptable teaching approach. Teaching objectives should encompass holistic literacy

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and professional competency. Teaching materials should embody systematic, dynamic, and diversified attributes. Feedback mechanisms should be intelligent and comprehensive. Teaching environments should seamlessly blend online and offline components. Presently, despite the utilization of modern intelligent devices to augment teaching content, enrich course materials, and integrate AI and other technologies, existing digital teaching systems still exhibit several imperfections. These include the persistent reliance on one-sided knowledge dissemination by teachers, hurdles in fostering student engagement and motivation, technical constraints in facilitating classroom communication and collaboration, limitations in expanding teaching content and formats, constraints on personalized teaching due to scalability issues, the inability to offer timely feedback and evaluation of teaching outcomes, the imperative to enhance teachers' digital teaching proficiency, and the necessity to enhance teaching management efficiency.[3]

3 Online Digital Teaching Technological Solutions

3.1 Introduction to Technological Solutions

(1) A method of online digital teaching based on artificial intelligence, characterized in that the method comprises the following steps(Figure 1):

Step one: Utilizing a textbook information collection program to collect and obtain textbook information, and storing the collected textbook information using the built-in storage module.

Step two: Controlling the normal operation of each module using the central control module, and classifying the collected textbooks separately using the information classification module.

Step three: Using an information matching program to match the textbooks that need to be taught, obtaining matched teaching content.

Step four: Organizing and summarizing the matched teaching content using the push module to produce teaching materials.

Step five: Broadcasting the produced teaching materials using an automatic playback program.

Step six: Students can mark areas of the teaching content that they don't understand during playback using the marking module, and the marked teaching content will be stored in the review module for students to review.

Step seven: Students can leave messages on teaching content that they still don't understand after reviewing using the messaging module.

Step eight: Teachers can view students' messages on the messaging module and provide explanations.

(2) According to claim 1, a method of online digital teaching based on artificial intelligence, characterized in that, in step one, obtaining textbook information includes: obtaining electronic version information of textbooks or scanning textbook images using a scanner and extracting text from scanned images.

(3) According to claim 1, a method of online digital teaching based on artificial intelligence, characterized in that, in step two, classifying the collected textbooks sepa-

rately includes: obtaining the classification of textbook directories corresponding to course topics and classifying the directories.

(4) According to claim 1, a method of online digital teaching based on artificial intelligence, characterized in that, in step four, organizing and summarizing the teaching content to be pushed to the organizing module includes: arranging and combining teaching content to produce teaching materials.

(5) According to claim 1, a method of online digital teaching based on artificial intelligence, characterized in that, in step five, broadcasting the produced teaching materials using an automatic playback program includes: setting the playback speed and repetition of automatic playback.

(6) An online digital teaching system based on artificial intelligence, characterized in that the system includes: a host end, a client end, and a storage module, wherein the host end includes a central control module, a textbook information collection module, a textbook classification module, an information matching module, a push module, an organizing module, and an automatic playback module, and the client end includes a marking module, a review module, and a messaging module.

(7) According to claim 6, an online digital teaching system based on artificial intelligence, characterized in that the central control module is connected to the textbook information collection module, the textbook classification module, the information matching module, the push module, the organizing module, the automatic playback module, the marking module, the review module, the messaging module, and the storage module respectively, for controlling the normal operation of each module through the host computer;

wherein the textbook information collection module is connected to the central control module for collecting and obtaining textbook information through a textbook information collection program;

wherein the textbook classification module is connected to the central control module for separately classifying the collected textbook information;

wherein the information matching module is connected to the central control module for matching the textbooks that need to be taught and obtaining matched teaching content;

wherein the organizing module is connected to the central control module for arranging and combining the teaching content to be taught and producing teaching materials;

wherein the automatic playback module is connected to the central control module for arranging and combining the teaching content to be taught and producing teaching materials;

wherein the marking module and the review module are connected to the central control module for marking teaching content that is not understood and transmitting it to the review module for students to review;

wherein the messaging module is connected to the central control module for students to leave messages on teaching content that they still don't understand after reviewing, and for teachers to provide explanations after viewing the messages.

(8) According to claim 6, an online digital teaching system based on artificial intelligence, characterized in that the client end is set as the student end, the host end is set

as the teacher end, and there are several client ends, and several client ends are connected to the host end through a local area network, and the host end is connected to the database through the Internet.

3.2 Specific Implementation of Online Digital Teaching

The technical solution presented in this paper revolves around an online digital teaching system empowered by artificial intelligence. It comprises a host end, a client end, and a storage module. [4]The client end is designated for students, while the host end is allocated for teachers. Multiple client ends are distributed, with several of them linked to the host end through a local area network, while the host end is connected to the database via the Internet. The built-in storage module is capable of storing textbook content.

The host end consists of a central control module, a textbook information collection module, a textbook classification module, an information matching module, a push module, an organizing module, and an automatic playback module. The textbook information collection module is linked to the central control module to collect and acquire textbook information using a textbook information collection program. The textbook classification module is connected to the central control module to categorize the collected textbook information separately. [5]The information matching module is linked to the central control module to match the textbooks requiring instruction and obtain corresponding teaching content. The organizing module is connected to the central control module to arrange and combine the teaching content for instruction and generate teaching materials. The automatic playback module is connected to the central control module to arrange and combine the teaching content for instruction and generate teaching materials(Figure 2).

The client end comprises a marking module, a review module, and a messaging module. The marking module and the review module are linked to the central control module to identify teaching content that isn't comprehended and forward it to the review module for student assessment. The messaging module is connected to the central control module, allowing students to leave messages on teaching content that remains unclear after review, and enabling teachers to provide explanations after reviewing these messages. The central control module oversees the normal functioning of each module in both the host and client ends, as well as the storage module, through the main control unit(Figure 3).

The AI-based online digital teaching method provided by the present invention includes the following steps(Figure 4):

S1: Use the textbook information collection program to collect and obtain textbook information, and store the collected textbook information using the built-in storage module;

S2: Control the normal operation of each module using the central control module, classify the collected textbooks separately using the information classification module, and classify the textbooks separately, including: obtaining the classification of textbook directories corresponding to course topics and classifying the directories;

S3: Match the textbooks that need to be taught from the classified textbooks using the information matching program, and obtain teaching content that matches the teaching needs;

S4: Use the push module to push the matched teaching content to the organizing module for arrangement and combination, and organize and summarize it into teaching materials;

S5: Use the automatic playback program to play the produced teaching materials, and set the playback speed and repetition during playback;

S6: During playback, if encountering teaching content that is not understood, mark it using the marking module, and the marked teaching content will be stored in the review module for students to review after the course ends;

S7: Leave messages on teaching content that is not understood using the messaging module;

S8: Teachers can view relevant messages from client-side students in the messaging module and provide explanations.

It's important to emphasize that the current invention represents an AI-driven online digital teaching method and system. In contrast to existing AI-based online digital teaching methods and systems, this innovation aims to enhance the precision and clarity of teaching content, streamline the preparation of teaching materials, offer more precise feedback on teaching outcomes for educators, and deliver timely and targeted responses and explanations to students. These advancements contribute to enhancing teachers' proficiency in digital teaching and fostering multidimensional growth in students' knowledge, skills, and literacy, thereby advancing the development of high-quality education.

3.3 Conclusion

By collecting and acquiring textbook content, and organizing, aligning, promoting, and summarizing the gathered textbook content, teaching materials are created. These materials are then elucidated through automated playback programs to develop comprehensive and thorough courses. This enhances students' comprehension of ideological and political education. The development of teaching materials in this study involves classification, alignment, promotion, and summarization, resulting in more precise and lucid teaching content. This streamlines the preparation of teaching materials, lessening the burden on teachers. Furthermore, students can flag content they find challenging for review and can also leave messages regarding unclear content for teachers to address. This allows teachers to receive precise feedback on teaching outcomes and promptly offer clarifications to students, thereby aiding students in grasping the knowledge they have acquired and enhancing teaching quality.

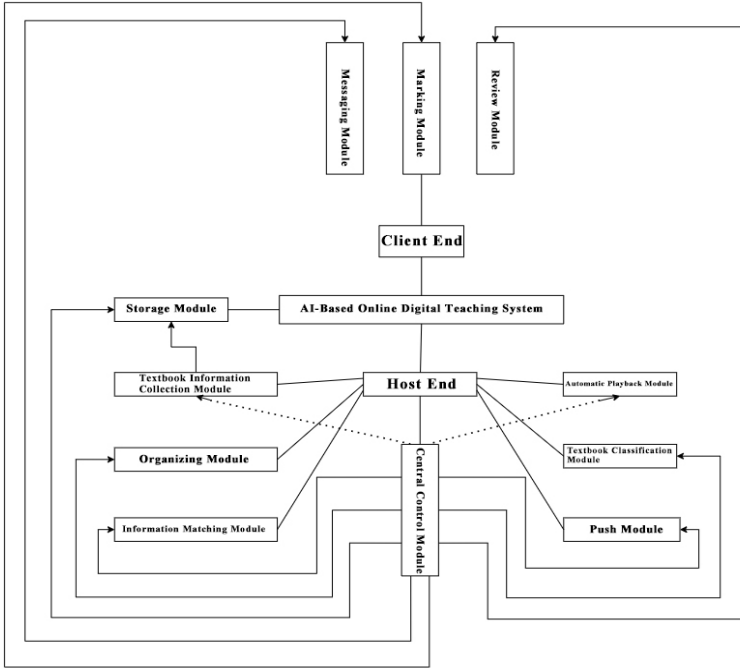


Fig. 1. Block diagram of an AI-based online digital teaching system

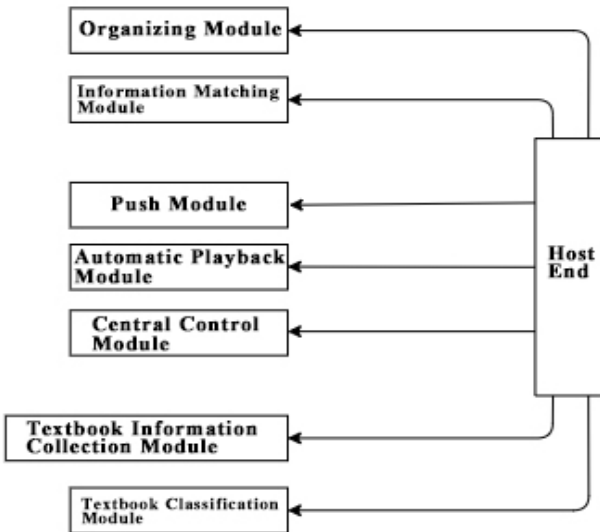


Fig. 2. Block diagram of the main body of the online digital teaching system

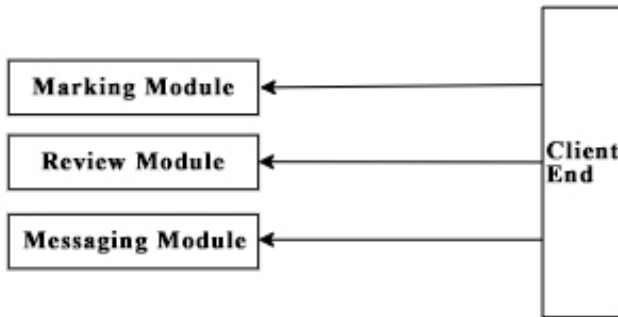


Fig. 3. Object-end block diagram of the online digital teaching system

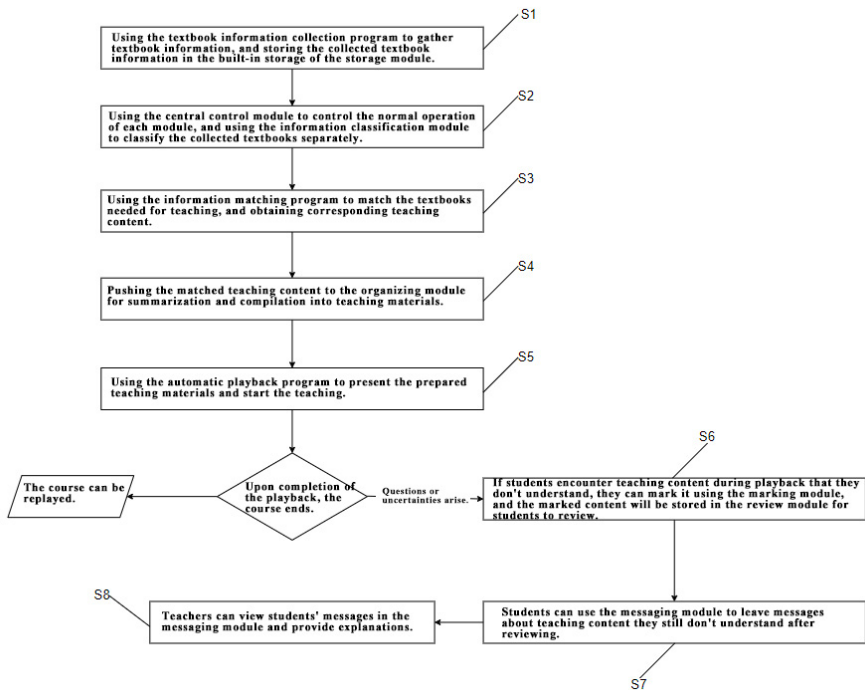


Fig. 4. Flowchart of AI-based online digital teaching methods

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Author Profile

Li Xiaoman, born in 1967, female, Han nationality, professor at Guangdong University of Science and Technology. Research interests: Marxist theory. Address: No. 99 Xihu Road, Nancheng District, Dongguan City, Guangdong province, Postal Code: 523000, Contact Number: 13999151549. Email: lxm7855071@163.com

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