# AN INTERACTIVE TEACHING MODE BASED ON ARTIFICIAL INTELLIGENCE TEACHING

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***ABSTRACT***

*With the continuous development of artificial intelligence, its impact on people's lives is becoming increasingly significant. Countries, universities, and students have increased their emphasis on learning artificial intelligence knowledge. This article designs and proposes a teaching mode called mo-tutor, which achieves the goal of learning artificial intelligence (AI)knowledge through video playback, segmented speech explanations, picture and text sketching, and online coding. This mode effectively coordinates the AI knowledge system and reduces the barrier for students to learn AI.*

***KEYWORDS***

*artificial intelligence, online education, education, talent cultivation, online learning*

## 1. INTRODUCTION

Artificial intelligence is one of the most promising and influential technologies in today's era. It has been widely applied in various industries, bringing tremendous changes and value to social and economic development[3]. With the continuous improvement of AI technologies such as machine learning [1] and deep learning [2], it has put forward higher requirements for talent cultivation. The Ministry of Science and Technology of China has issued a guideline "Guiding Opinions on Accelerating Scene Innovation and Promoting High Level Application of Artificial Intelligence to Promote High Quality Economic Development" regarding the cultivation of artificial intelligence talents. Universities in China have actively responded to the guideline by offering artificial intelligence courses. However, currently China still faces challenges such as a shortage of AI talents, low quality of existing talents, and brain drain of high level professionals[5]. Effectively imparting and learning artificial intelligence knowledge and skills, and cultivating more AI talents, has become an important challenge in the field of education. Mentors have an important impact on students' progress and development[4].

Professional mentors can provide students with clear explanations of concepts, timely evaluate and provide feedbacks on students' learning outcomes and experiences and enable learners to achieve more with less effort. Artificial intelligence is a highly technical and complex discipline that requires a solid understanding of mathematics, computer science, and data science. Therefore, unlike traditional disciplines, artificial intelligence has higher demands of teaching resources.

However, high-quality artificial intelligence teaching resource is currently very scarce in society, which makes challenges for student string to learn artificial intelligence. At the same time, due to the rapid development of artificial intelligence technology, from the initial introduction of theories such as neural networks[9]and back propagation[10],to the application of artificial intelligence theory to

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create AlphaGo [8]and defeating the Go world champion Lee Sedol in the human-machine Go battle, and now the creation of the large language models like Chat GPT[11],AI has entered the era of intelligent generation.

However, the speed of textbook updates lags the pace of technological development. Some textbooks are outdated and failed to cover the latest technologies and trends, making it hard for learners to keep up with market demands in terms of knowledge and skills. The information on the Internet is too abundance to be discerned, many learners waste a lot of time and effort to filter useful and high quality information. In addition, artificial intelligence education requires a large amount of practical experience, but due to limitations in equipment, data, and resources, many online education platforms are unable to provide students with sufficient hands-on opportunities. This limitaions might affect students to encounter obstacles in practical applications after graduation. And artificial intelligence is an interdisciplinary field that involves multiple disciplines, requiring teaching resources from mathematics, computer science, data science, and machine learning. However, many courses on online education platforms do not cover these aspects, resulting in students being unable to fully master the required knowledge and skills. This article introduces a teaching model called “mo-tutor”, which is an interactive audio and video code display and teaching tool.

It provides students with personalized, efficient, and interactive learning experiences, filling the gap in domestic artificial intelligence education resources. Compared with traditional online teaching resources, this mode offers higher level of personalization and interactivity, providing students with comprehensive teaching resources, abundant artificial intelligence practical exercises, and high-quality artificial intelligence instructors. Under this learning mode, it lowers the threshold for students to learn artificial intelligence and inspire their learning pleasure. This article explores the prospects and applications of the mo-tutor model, and emphasizes its advantages in personalized learning and knowledge mastery provided in AI education.

## 2. BACKGROUND AND RELATED WORK

### 2.1. Online Education

In the field of practice, there are non-computer science learners who are interested in AI but have no relevant ways to learn. Additionally some computer science students are lack of opportunity to take AI courses due to limited school conditions and teaching resources. These factors prevent many enthusiasts from accessing AI knowledge, thus hindering their progress beyond the introductory stage.

For a learner, obtaining knowledge in an efficient manner is important, and online education provides such an opportunity[6].Firstly, learners can learn anytime and anywhere based on their own pace, interests, and needs, without being limited by fixed course schedule and physical locations; Secondly online education enable learners to easily access and use varieties of learning resources and services through internet technology, without the need to spend extra time and money on purchasing or borrowing books, magazines, etc; Thirdly it exposes learners to knowledge and information from different countries, regions, cultures, majors, etc., broadening their perspectives and thinking, and increasing their awareness of internationalization and diversification. Fourthly it enables learners to use social network technology to communicate, collaborate, and share in real-time or asynchronously with other learners, teachers, experts, etc., enhancing the motivation and enjoyment in learning. Furthermore, online education has the characteristics of flexibility, convenience, openness, and sharing. It breaks through the limitations of time and space, providing learners with diverse learning resources and services. Learners can easily access and use the necessary information and tools. This opens up new opportunities and possibilities for artificial intelligence education.

Although there is a wealth of AI learning resources available on the internet [12], they are scattered across different websites and systems, lacking effective teaching models and structure teaching processes. This makes it difficult for learners to form a complete knowledge system and in-depth knowledge mastery. In addition, artificial intelligence online education also faces issues such as scarce teaching resources, outdated teaching content, and limited teaching methods, which negatively impact learners' learning effectiveness and experience. Therefore, it is necessary to build a new learning mode that integrates artificial intelligence knowledge and systems, and utilizes the advantages of online education to provide learners with personalized, efficient, and interactive immersive learning experiences.

### 2.2. Online Programming And Tutor To Explain

Artificial intelligence is a discipline that applies computer technology to solve intelligent problems. It requires learners to conduct programming practice on the basis of mastering theoretical knowledge, in order to consolidate the knowledge system and deepen knowledge understanding. However, the implementation of existing artificial intelligence models often relies on various Python toolkits and libraries, such as XGboost, numpy, scikit-learn, etc. The installation and configuration of these toolkits and libraries can be challenging and problematic for beginners, which is prone to version incompatibility, environment mismatch, and other issues, affecting the operation and debugging of the model. Therefore, providing a platform with pre-installed environments for all required AI models would be beneficial. This platform would allow learners to focus solely on starting the models and concentrate on code and knowledge learning, significantly saving time and effort while enhancing learner concentration and efficiency.

For learners, having professional mentors design and guide the learning process, and utilizing online programming platforms to support their programming practices, is beneficial for achieving effective integration of theoretical knowledge and practical skills, and improving learners' knowledge mastery level. Facilitating communication and collaboration amongamong learners and mentors through online communication tools is an important research issue in the field of online education [14] and a key factor affecting learners' learning experience. more than that, in the process of online learning, if learners can hear the mentor's explanation voice, and see the mentor's explanation screen simultaneously, including demonstration of concepts, module division, and explanation of thoughts, learners' sense of interaction and participation would be dramatically enhanced. This would achieve an organic combination of reality and virtual, theory and practice, and stimulate learners' interest and enthusiasm for AI knowledge.

## 3. METRODOLOGY AND INTERACTIVE MODE

The mo-tutor model is an interactive audio and video content code presentation and teaching tool that supports both screen recording and audio recording by teachers, rich media [16], various text styles, code writing, and code execution results display. After organizing the above content, provide students with the teacher's operation and explanation, as well as real-time code execution and display. This tool consists of several recording and playback component modules, including a storage management module, a recording mod, and a presentation mode. The storage management module is used for storing and managing recorded content, including screen recording and sound audio recording. The recording mode allows editing of the content on the presentation page, including adding text, rich media content, code blocks, etc. (Figure 1), and records screen operations and audio content, while setting playback tags for each recording operation. The screen operation includes: cursor movement, text selection, code execution, screen graffiti (free graphic brush, rubber, screen formula insertion, text box insertion, etc.) (Figure 3). The playback mode is based on the corresponding content recorded, and playback control

functions includes playback, rewind, fast forward, and playback speed adjustment. (Figure 4). The basic unit of pattern change is called a block, which can be divided into two types: rich text block that allows the insertion of content with styled text, images, videos, and other contents.
A code block allows code writing and executing and real-time browsing of code execution results.

The specific instructions of the storage management module, recording mode, and play mode are as follows:

## 3.1. Storage Management Module

The storage management module includes initialization, state management, audio management, and storage management functions, which will be introduced in detail as below. After entering the courseware, the storage management module initializes and starts listening for block operation events, global events, and brush events on the page. Block operation events include block selection events, block creation events, block deletion events, code block run completion events, notebook modification events, rich text block rendering events. Global events include scrolling events, mouse click events, keyboard input events, block click events, and cursor movement events; brush events including brush movements. Initialization also triggers the recording sound callback function and file save function, which are responsible for the sound recording function and file save function, respectively.

State management saves all operation records in the recording mode in the history object, including browsing records, drawing records, selection records, and directory records. The visual recording includes cursor movement, vertical scrolling of the page, and scrolling within the block. The painting record includes painting, disappearing, erasing, and mapping (Figure 3). The selection recording includes block selection actions, and the directory recording includes content, input, and output operations within the block. After saving the above content to the history object, it will be saved in memory.

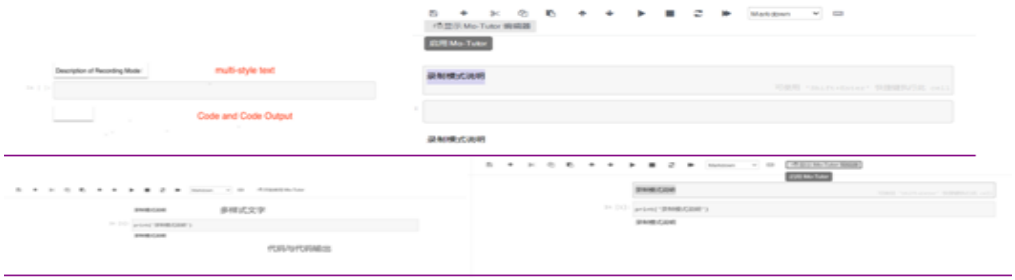


Figure 1 Figure2

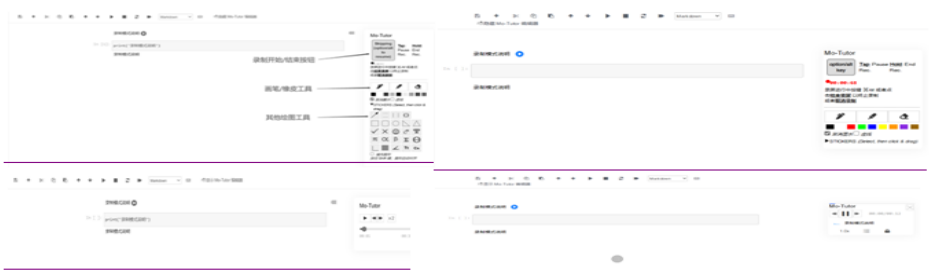


Figure 3 Figure 4

Audio management will call the audio recording interface in JavaScript to access the microphone device in the current device. It records the audio stream, and pushes it into the audio recording interface. After each recording segment, it is saved in the memory.

The storage management function is responsible for storing recorded content. The storage directory structure (Figure 5) consists of multiple blocks within a note book. Each block can have multiple mo-tutors, and each mo-tutor can have multiple recordings. The historical objects and audio records are compressed into text files (history. txt) and audio files (audio. txt) using base64 encoding, respectively.

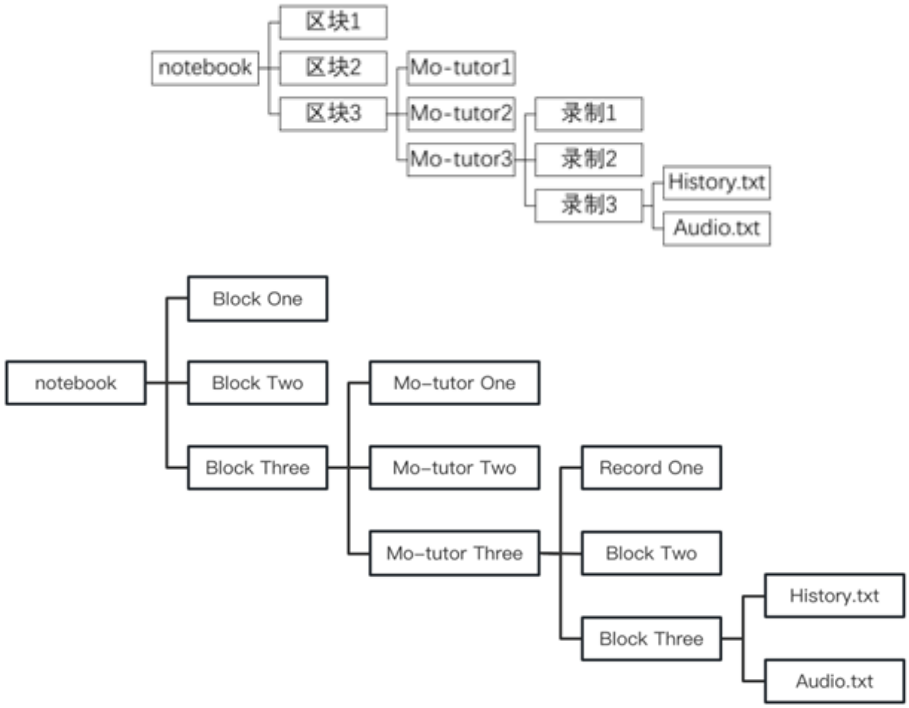



Figure 5

## 3.2. Recording Mode

After clicking the “Start Recording” button, the storage management module updates the recording status to "Recording” .It initializes the recording and history objects for relevant listening events, and calls the create record function to save the initial state. The painting status will be reset, and the audio recording interface will start receiving audio streams and pushing them into the recording audio. The history object continuously receives event streams and pushes them into the screen operation record.

## 3.3. Play Mode

The play mode includes initialization, cursor over button, and button click functions. The overview of each function will be as below.

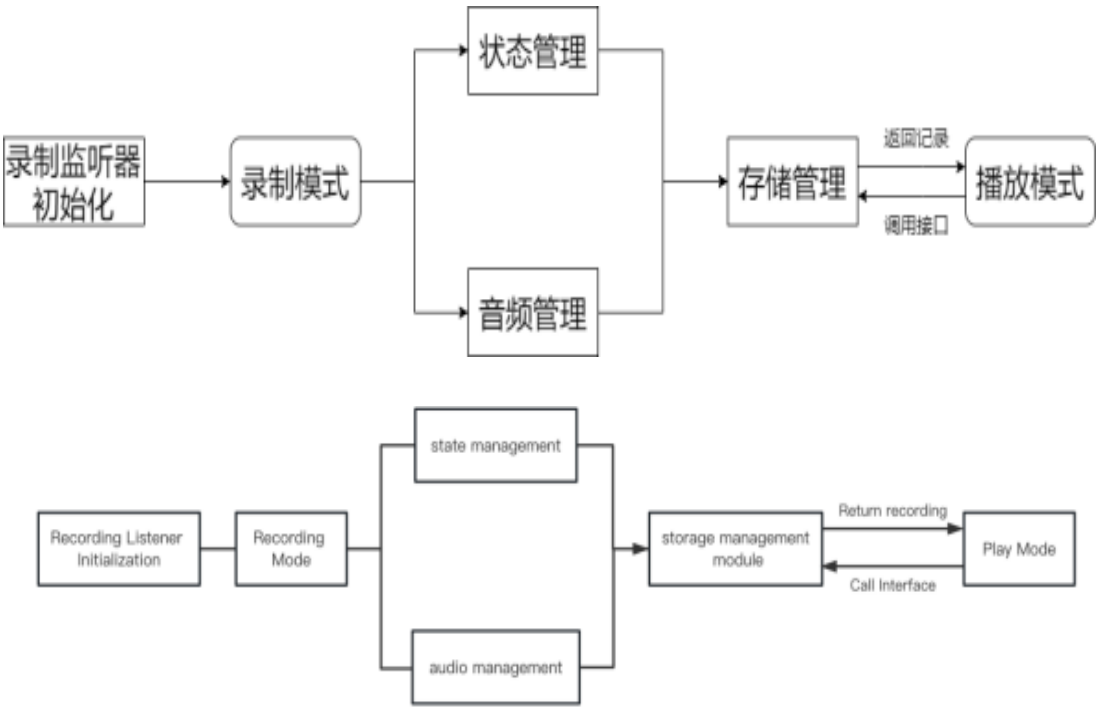
The initialization function will initialize the play mode. Firstly, use the loading manifest function to load all the recorded content in this notebook from the disk into the manifest, and call the refresh tool function to iterate each playback button, adding mouse enter , mouse leave , and mouse move events.

The mouse over button function is responsible for loading corresponding records from the list and binding click events to the button when the button event is triggered (mouse over button) The button click function is responsible for playing the corresponding operation record when the button click event is triggered.

The playback process is as follows: loading and playing status modification, starting loading record and starting playback. At the beginning of playback, reset will be performed at the beginning (scroll position, canvas content, cursor position, etc.), and then real recording and playback will be performed, the Progress bar will be updated, and the screen will be updated.

The update screen content includes updating the slider, updating the event display, updating the display. The update display is to periodically iterate the contents of the operation records to update the content of the relevant record formation in the historical object.

When clicking the play icon, a floating player window will be displayed, which includes buttons for play, rewind, fast forward, and double speed function buttons. Click on these buttons will perform the corresponding functions.




**Flow chart**

## 4. USER STUDY

### 4.1. Analysis

In order to validate the effectiveness and advantages of the mo-tutor mode in artificial intelligence online education, this study compares the mo-tutor mode with the traditional online teaching mode, and examines the learning effects and experiences of students under both modes.

The aim of this experiment is to compare the mo-tutor mode and traditional online teaching mode, and investigate the impact of the two modes on students' learning outcomes and experiences in artificial intelligence education. Specifically, this study aims to answer the following research questions through experiments:

- What are the differences between the mo-tutor mode and traditional online teaching mode in artificial intelligence knowledge mastery?

- What are the differences between the mo-tutor mode and traditional online teaching mode in the application of artificial intelligence skills?

- What are the differences between the mo-tutor mode and traditional online teaching mode in terms of learners' interest and motivation in artificial intelligence learning?

- What are the differences between the mo-tutor mode and traditional online teaching mode in terms of learners' satisfaction and experience in AI learning?

This study adopts a randomized controlled trial design, in which participating students are randomly assigned into two groups. One group used the mo-tutor mode for online artificial intelligence education, and the other group used the traditional online teaching mode. Both groups of students underwent artificial intelligence knowledge and skill tests before and after the experiment, as well as an artificial intelligence learning questionnaire survey, to evaluate their changes in artificial intelligence knowledge mastery, skill application, learning interest, motivation, satisfaction, and experience. The following data collection and analysis methods were used in this experiment:

- Artificial Intelligence knowledge test: A test consisting of 20 Multiple choices was used, covering the basic theory, core concepts, important methods and practical applications of AI. Each question has four options, with only one correct answer. Each correct answer received 1 point, each incorrect answer received 0 point, and the full score is 20 points. This test is conducted before and after the experiment to evaluate students' progress in mastering artificial intelligence knowledge.

- Artificial Intelligence Skills Test: A test consisting of 10 programming questions was used, requiring students to write code in Python language to solve problems related to data processing, machine learning, deep learning, and other AI aspects. Each question has one or more input and output examples, and scores are given based on the correctness, completeness, efficiency, and standardization of the code, with a maximum score of 100 points. This test is conducted before and after the experiment to evaluate students' progress in the application of artificial intelligence skills.

- AI Learning Questionnaire: A questionnaire consisting of 20 five-point Likert scale items was used to gather information on students' AI learning interest, motivation, satisfaction, and experience. Each item had five response options ranging from 1 (strongly disagree) to 5 (strongly agree), and average scores were calculated for different dimensions. This questionnaire was administered after the experiment to evaluate students' attitudes and perceptions towards different instructional modes.

## 4.2. Process

A total of 40 computer science students were recruited for the experiment. To eliminate the differences in artificial intelligence knowledge among individuals as much as possible, none of them had received formal artificial intelligence education, but they were interested in artificial intelligence. Randomly divide them into two groups, each consisting of 20 members. Both groups conducted 3 artificial intelligence online education sessions, each lasting for 2 hours, through online platforms. The course content covers topics such as basic knowledge of artificial intelligence, machine learning, deep learning, and is accompanied by corresponding code examples and exercises. Two groups of students use different teaching modes for online education:

Mo-tutor mode: Students in this group watch interactive audio and video code displays and explanations recorded by professional instructors through the mo-tutor platform, and can pause, fast forward, rewind, or adjust the playback speed at any time. Mean while, students can write and run code on the platform and view the code execution results. They can also raise their own questions or confusion in the comments section and receive answers or assistance from instructors or other students.

Traditional online education mode: In this group, students watch pre-recorded static video explanations recorded by profession although a common online education platform.

Before the start of the experiment, both groups of students underwent artificial intelligence knowledge tests and skill tests and filled out basic information forms. After the experiment, both groups of students underwent artificial intelligence knowledge test and skill tests again, and filled out an artificial intelligence learning questionnaire survey.

## 4.3. Result

Based on the data collected from the experiment, a comparative study has been conducted to analyze and compare the differences between mo-tutor model and the traditional online education model in terms of artificial intelligence knowledge acquisition, skill application, learning interest, motivation, satisfaction, and experience.

In order to answer the differences in AI knowledge mastery between the mo-tutor mode and the traditional online education mode, this article uses paired sample t-tests[17] to compare the AI knowledge test scores of the two groups of students before and after the experiment, and calculates their percentage improvement (G%) relative to the pre experiment scores after the experiment. Table 1 shows the mean (M) and standard deviation (SD) of the two groups of students before and after the experiment, as well as on G%. From the results, students who use the mo-tutor mode have a greater improvement in their scores on artificial intelligence knowledge testing results. Under the same time and testing conditions, students have a stronger grasp of knowledge and application of artificial intelligence skills in this mode, and at the same time, learners show more sufficient learning enthusiasm as well.

Table 1: Scores of Two Groups of Students on the Artificial Intelligence Knowledge Test

| Group | Pre experiment M (SD) | After experiment M (SD) | Percentage improvement (%) |
|---|---|---|---|
| Motutormode | 9.35 (2.12) | 16.25 (1.87) | 73.80 |
| Traditional mode | 9.40 (2.08) | 13.10 (2.01) | 39.36 |

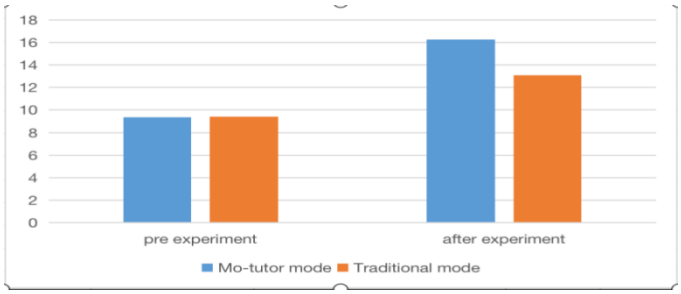



Chart 1:Histogram of artificial intelligence knowledge test results

## 5. DISCUSSION AND FUTURE WORK

In the future, the mo-tutor mode can provide students with more diverse, intelligent, and personalized learning resources and services. As an advanced artificial intelligence online teaching mode, it will also continuously improve and optimize its functions and performance to adapt to the different needs and levels of learners, providing learners with a more tailored, efficient, and interactive learning experience. To enable more students to learn artificial intelligence knowledge in the mo-tutor mode, the following are the key areas will be focused on.

### 5.1. Promote mo-tutor model

Currently, the mo-tutor model is only promote to limited universities in China. Many learners do not have effective channels to understand and use the model to learn artificial intelligence knowledge. Strengthen the promotion and awareness of the mo-tutor model, so that more students and teachers would understand and recognize the mo-tutor model and use it.

### 5.2. Expansion and Cooperation

Exploring and expanding the application scenarios and fields of the mo-tutor mode can involve other related or interdisciplinary knowledge fields in addition to artificial intelligence, providing users with more diverse and comprehensive learning content and methods. Strengthen cooperation and communication with relevant institutions such as universities, enterprises, and governments, strive for more support and resources, and provide more favorable conditions and guarantees for the development and application of mo-tutor.

## 6. CONCLUSION

This article takes artificial intelligence online education as the theme, introduces the background, function, effectiveness, and evaluation of the mo-tutor mode, and highlights the innovation and advantages of the mo-tutor mode through students' feedback on the learning experience using the mo-tutor mode, as well as comparative analysis of artificial intelligence learning methods. This study believes that mo-tutor is a forward-looking and practical online education model for artificial intelligence. It meets students' needs and interests in learning artificial intelligence, improves students' learning effectiveness and experience, and promotes active learning and innovative thinking.

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