# Design of Interactive Learning System under the Background of Artificial Intelligence and Big Data

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**Absrtact.** With the continuous development of science and technology, the relationship between artificial intelligence and education is getting closer and closer, forming an advanced learning model. This learning style conforms to the purpose of quality education and has the characteristics of interactivity, diversity and openness. Based on this, this paper investigates the concepts of artificial intelligence and interactive learning, analyzes its educational significance, and discusses the advantages of mobile interactive learning system under artificial intelligence, focusing on rational thinking on effective ways to build interactive learning system, with a view to improving teaching quality and learning efficiency.

**Keywords:** artificial intelligence; Interactive; Learning system; Design and implementation

## 1. Introduction

The U.S. Department of Education pointed out in the briefing "*Improving Teaching and Learning through Educational Data Mining and Analysis*" that the application of big data in education mainly includes two major directions: educational data mining and learning analysis technology.[1] Data mining can integrate learners' knowledge, meta-cognition, motivation and attitude, quantitatively analyze and model learners' learning behavior and process, model and improve the fields covering the optimal teaching order and teaching content, further predict learners' future learning trends and promote efficient learning. Learning analysis technology is embodied in the application of data measurement, collection, analysis and other methods to the analysis of learning environment, understanding and optimizing the learning process, constructing learners' behavior characteristics by analyzing the educational big data organization, and providing personalized resources for different learners to meet their needs on this basis. Facts have proved that big data technology has broken the limitation that teachers analyze their academic situation according to their own teaching experience in the traditional teaching process. In various teaching scenarios, through data mining and learning analysis technology, we can identify, summarize and store the data of learners' whole learning process and learning behavior in various modes, and complete the in-depth understanding and accurate diagnosis of learning rules, which makes the learning support provided by teachers more scientific and reasonable, and contributes to the development of precision education.[2]

This paper proposes an interactive learning system based on artificial intelligence. It is more efficient and robust to obtain features through artificial intelligence, which realizes more

accurate recommendation, and alleviates the shortcomings that the traditional online learning system with manual rules has a single problem-setting mode and cannot improve the learning content. At the same time, compared with the traditional online platform, the intelligent interactive learning system based on microservices has the advantages of easy development, maintenance and fast online deployment, and compared with the traditional single application, it greatly shortens the update and release cycle of the platform.

## 2. Advantages of Interactive Learning System Supported by Artificial Intelligence

### 2.1 Artificial intelligence provides technical support for the innovation of educational technology

Artificial intelligence includes knowledge engineering, expert system, speech recognition, video recognition, semantic analysis, emotional computing, eye tracking, virtual reality (VR), augmented reality (AR) and many other advanced intelligent technologies, which is the most important and effective technical means to realize innovation and reform in education and teaching. For example, intention recognition technology can be used to explore the real needs of learners, and then provide corresponding personalized services according to this personalized demand; Knowledge catcher technology can capture different types of knowledge points in the article and recommend various learning materials related to the knowledge points for learners, so as to deepen the learning level and expand the learning boundary, thus providing more effective learning support services for learners; Augmented reality teaching (AR teaching) technology can provide the service demand of knowledge visualization, that is, by constructing AR scenes (augmented reality scenes), abstract knowledge can be visualized, so as to realize three-dimensional vivid explanation of knowledge points, thus enhancing students' interest in learning and promoting students' in-depth understanding and mastery of knowledge; Virtual reality teaching (VR teaching) technology can provide the service demand of multi-dimensional interactive experience, that is, provide a complete solution of classroom hardware, software, terminals and courses required by virtual reality technology, thus creating an unprecedented immersive learning experience;

### 2.2 Artificial intelligence provides a smart environment for interactive learning

Intelligent learning environment is a new learning environment that can not only provide general digital learning tools and resources, but also provide "virtual reality and augmented reality" functions. Generally speaking, the intelligent learning environment must be supported by "virtual reality and augmented reality" technology and related learning tools and resources. Augmented reality is to integrate digital information such as images, videos and audio into real space, and to combine objective reality with virtual environment, so that learners can interact with digital objects and bring new feelings and experiences to learners. Virtual reality is a computer-generated simulation of the real environment where people and things exist, which can make people feel immersive and realistic and perceive the real world in the virtual environment. These two kinds of immersion technology can make students get a more comprehensive and real understanding and experience of the real world, and then form deep

cognitive ability. Through the intelligent learning environment, let students identify with and actively find a suitable way to learn on demand.

## 3. Characteristics of interactive learning system

In the era of 5G intelligent communication, with the development of big data technology, the traditional model has been gradually broken through the original boundaries by precision education, and gradually developed into a new technology-enhanced education model. Taking big data as a means, combined with accurate analysis of the basic situation of learning conditions, accurate customization of educational content, accurate design of educational activities and accurate evaluation of academic performance are the main manifestations of big data-driven precision teaching, and the process and results of education are quantified, monitored and coordinated. There are four basic principles to be followed in the accurate teaching of big data, namely: (1) Observability of behavior data; (2) The measurement index is multidimensional; (3) Pay attention to the use of learning situation analysis tools; (4) Learners' behavior data is an important basis for decision-making.

Under the background of big data precision education, multimodal data, including behavior, psychology and physiology, significantly enriches teaching evaluation indicators, so that behavior performance and learning process can be recorded and displayed in a traceable way. With the application of data technology, precision education no longer focuses on "directly observable behavior", but penetrates into hidden areas that people are not easy to find or measure, which makes formative assessment and predictive analysis have more scientific basis and provides more specific and personalized guidance for individuals and groups. (As shown in figure 1)
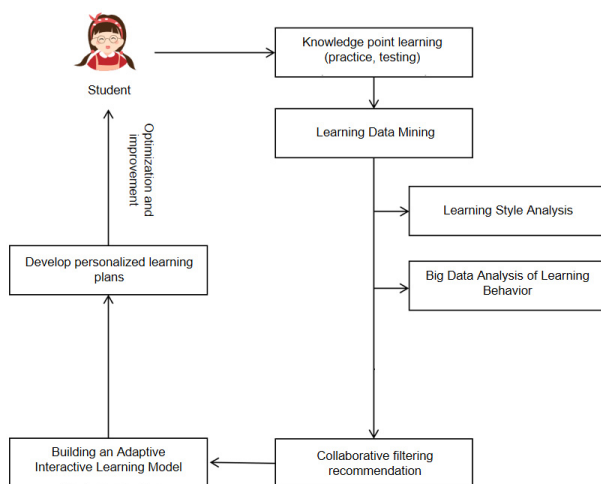


**Fig 1.** Intelligent teaching interaction model

Interactive learning system has high efficiency, which is an important index to measure the quality of teaching. The application of interactive learning system can form good study habits, teach students according to different people, gradually deepen, classify and set the

characteristics of the course, and meet the needs of students at different levels [3]. Interactive learning system has a good matching in the teaching process, and the selection of teaching mode, the setting of content and the setting of goals are all improved by combining the common problems of students [4]. Realize teaching students in accordance with their aptitude, and pay attention to students' understanding of knowledge and ability. After class, the system will be equipped with corresponding tests and timely adjust the teaching methods through data feedback.

## 4. Design strategy of intelligent interactive learning system

### 4.1 Overall design

The mobile interactive learning system under artificial intelligence is mainly centered on students and learning, and students are the main users of the system. Therefore, when building the system, the following systems should be designed in figure 2:
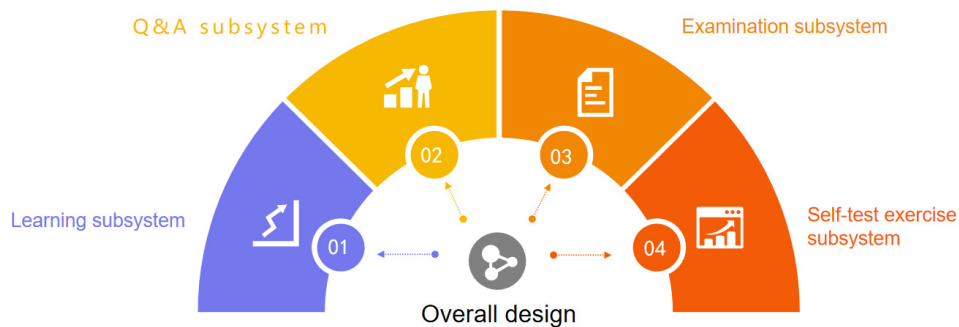


**Fig 2.** Overall design of interactive learning system

### 4.1.1 Learning subsystem

The system is based on artificial intelligence and combined with interactive learning environment to virtualize the learning environment, so that the system can break through the limitations of time and space and enable students to study independently and carry out personalized education. The subsystem of learning is one of the core parts of the whole system. It is mainly responsible for user's learning process management and data analysis. Specifically, the subsystem includes the following functions: 1. Learning plan making; 2. Learning progress tracking; 3. Evaluation of learning effect; 4. Learning resource recommendation and so on. With the support of these functions, users can complete their learning tasks more efficiently.

### 4.1.2 Question answering subsystem

The main application of the system is artificial intelligence, which is a technical science. By applying this technology, the intelligent behavior is studied and simulated, and the learning resources in each stage are effectively integrated, laying the foundation for effective communication between artificial intelligence and students. At the same time, language recognition and image recognition systems should be added, so that students can communicate with the system, and the system can effectively identify the images uploaded by students, and

then provide students with effective learning programs and problem-solving programs. Specifically, the system inputs a large number of knowledge bases into neural networks, and then uses training data to optimize model parameters. Finally, a model that can accurately answer the user's questions is obtained. In addition, in order to ensure the stability and reliability of the system, a series of data verification and testing work should be carried out. Finally, voice recognition function is added to the system, so that students can ask questions or questions to the system by voice. In this way, it can not only improve students' autonomy, but also better meet their needs.

### 4.1.3 Examination subsystem

In order to provide students with suitable learning plans and opportunities to test their learning level, an examination subsystem should be designed in this system. The system is an online examination based on mobile devices. The system can generate corresponding examination questions by combining students' learning content and learning purpose, so that students can accurately grasp their own learning level and then clarify their learning direction. Moreover, the system can also analyze the final examination results and point out the weak knowledge, so that students can adjust their study plans in time and carry out high-quality study. In order to ensure the authenticity and fairness of the examination, this system adopts various technical means to ensure the fairness of the examination. First of all, the system uses randomization algorithm to generate test questions to avoid the same question appearing many times; Secondly, the system also uses image recognition technology and voice recognition technology to verify whether the candidates' answers are correct, so as to ensure the reliability of the test results. In addition, the system can also record the answer process of each candidate, so that teachers can better understand the students' learning situation. In a word, the system can help students master their own learning situation more accurately, and also provide more comprehensive data support for teachers.

### 4.1.4 Self-test exercise subsystem

The mobile interactive learning system under artificial intelligence contains a large number of learning resources. In order to enable students to learn systematically, it is often necessary to classify the learning content according to standards such as difficulty, subject and form. The main function of the self-test exercise subsystem is to check the learning effect for students in time. When students finish learning the knowledge content of a chapter, they can call out the self-test exercise module through voice or touch screen, and then carry out the test in time, master their own understanding of the knowledge content of the chapter, and clarify the knowledge content with poor learning effect, so as to carry out the learning work in a targeted manner. Specifically, firstly, the learning content is divided into multiple levels, and each level corresponds to a group of knowledge points; Then use the deep reinforcement learning algorithm to train the model to predict the students' understanding and error rate of these knowledge points.

### 4.2 The main application of artificial intelligence technology

### 4.2.1 Intelligent Agent

The most critical factor in artificial intelligence is the part combined with the learning object, which is the intelligent agent, and its characteristics are autonomy, pertinence and

responsiveness. For mobile interactive learning system, the application of intelligent agent can effectively solve learners' learning problems, and in this system, multi-agent technology can be applied to solve more complicated problems. Intelligent agents are mainly divided into two types: active and passive. Active intelligent agent means that it can complete tasks autonomously, while passive agent means that it can only execute instructions. In this case, we need to choose a type of intelligent agent to meet our needs. In the mobile interactive learning system, the function of intelligent agent is mainly to help users better understand what they have learned and improve learning efficiency. Specifically, intelligent agents can provide students with corresponding feedback and suggestions by analyzing and predicting their behaviors. At the same time, intelligent agents can also recommend students individually according to their performance to meet the needs of different students.(As shown in figure 3)
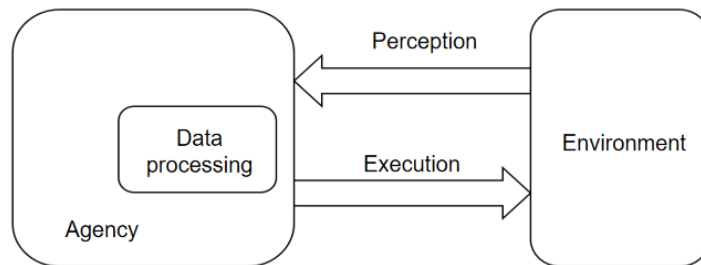


**Fig 3.** Intelligent Agent

## 4.2.2 Expert system

The expert system collects a great deal of expert knowledge to prevent students from making mistakes in practical use. In the mobile interactive learning system, the expert system is mainly composed of three parts, namely knowledge base, inference engine and user interface. By joining the system, the system can push the professional knowledge matched with learners, so that learners can realize the docking with professional knowledge. At the same time, the system can automatically generate questions and give answers to help learners better understand the knowledge points they have learned. In expert system, knowledge base is one of the most important parts. Knowledge base contains a lot of knowledge and experience in professional fields, which can be used to answer questions or provide suggestions.(As shown in figure 4)
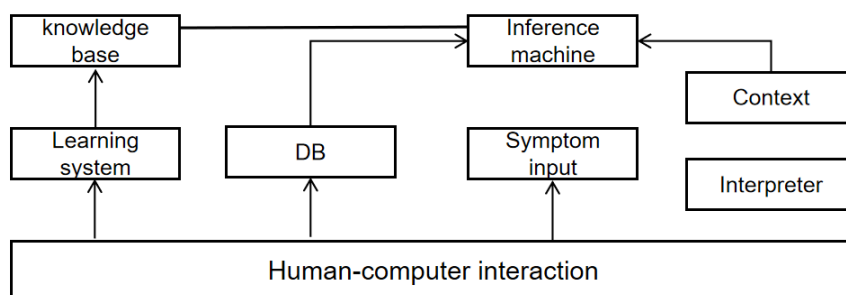


**Fig 4.** Expert system

### 4.2.3 Natural Language Processing

By designing natural language processing, people and systems can communicate effectively by using natural language and realize natural language communication between people and machines. In the interactive learning system, natural language processing is a very important technology. It can help users to input and output data more conveniently, and at the same time, it can better understand users' needs and provide corresponding services. At present, natural language processing is mainly divided into speech recognition, text analysis, semantic segmentation, machine translation and so on. Among them, speech recognition is one of the most basic natural language processing technologies. It is the process of converting human voice into digital signal, and then converting it into computer-readable form. At the same time, natural language processing can also be used in automatic summarization, sentiment analysis, question and answer system and other fields.[5]

## 5. Conclusion

To sum up, building a mobile interactive learning system based on artificial intelligence can completely break through the limitations of time and space and provide good interactive learning conditions for learners. Therefore, when constructing the system, we should pay attention to the connection between artificial intelligence and learning content and methods, and use artificial intelligence technology modules to improve learning quality and efficiency.

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