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Research Article

A Study on the Quality Improvement of Language Teaching in the IoT Environment

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IoT networks and Teaching System have attracted much attention from researchers of industry and academia. As a typical application of IoT tworks and Teaching System, the system studied in this paper is a three-way platform for IoT technology, language teaching methods, and language teaching quality is incorporated into the framework of language teaching system. Based on the current stage of language teaching methods in China and its digital needs, the role of IoT-based language teaching models on language teaching quality improvement is investigated by establishing an IoT language teaching model and using conventional comparison methods to compare conventional language teaching quality improvement models with language teaching models based on IoT platforms to consider the impact of IoT technology on language teaching quality improvement. The results show that in the educational context where digitalization and intelligence are the trends, the intelligent language teaching model integrating IoT technology is much better than the language teaching model under the conventional model in terms of teaching quality, and through IoT technology, more language enthusiasts can become language learners and improve their learning ability. The work in this paper provides an important application guidance to IoT networks and Teaching System.

1. Introduction

IoT networks and Teaching System have attracted much attention from researchers of industry and academia. As a typical application of IoT networks and Teaching System, the system studied in this paper is a three-way platform for IoT technology, language teaching methods, and language teaching quality is incorporated into the framework of language teaching system. In recent years, the in-depth application of Internet technology in the field of language teaching and the "Internalization" of traditional teaching have promoted the in-depth integration of the Internet industry with the field of language education, which has led to the rapid development of the quality of language teaching in China [1]. With the development and improvement of IoT educational facilities and the further increase of national support for policies related to the intelligent construction of language teaching, IoT technology will gradually penetrate into the field of language teaching, making an important contribution to the improvement of national language teaching quality and the modernization of education. Currently, the field of language teaching in China has opened a new journey of intelligent construction, and the improvement of language teaching quality by teaching methods with IoT as the main technical means has become a major research topic of great concern to the government and academia [2].

For IoT networks and Teaching System, the Internet of Things (IoT) technology is based on the traditional Internet and uses RFID, wireless data communication, and other technologies to build an interconnected world of everything, in which information can be transferred among different objects without manual human intervention [3]. In essence, the RFID technology is used to realize the automatic identification of goods and the interconnection and sharing of information through the computer Internet of Things.

Based on IoT networks and Teaching System, the biggest difference between the IoT and the Internet is that the IoT is directly connected to various types of sensors and does not

require people to enter information through keypads, but automatically obtains information and processes it automatically [4].

In foreign language teaching, IOT system combined with video sensor and speech sensor can effectively correct the pronunciation and accent of foreign language learners by comparing with the standard pronunciation that already exists in the software library, where the video sensor is to be used for English learners' accent acquisition and for computer analysis, and the speech sensor is mainly used for English learners' speech acquisition and for computer analysis [5]. The work in this paper provides an important application guidance to IoT networks and Teaching System.

2. Contribution

The main work of this paper is as follows: first, based on the perspective of IoT technology, this study explains in depth the contribution of IoT technology to language teaching quality and its underlying theoretical logic from three aspects: practical application, rationale analysis, and teaching quality research. Based on this, we propose the function of language mouth correction and language corrections based on IoT technology and empirically calibrate the research of IoT technology on language teaching quality issues. In addition, through IoT technology, an analytical framework integrating the three parties of technology platform, language teaching research, and teaching quality is established, and its moderating role in the whole framework is analyzed and explained. Third, an interactive teaching model based on IoT is proposed, which is universal and provides theoretical and technological support for language teaching and learning. Third, an interactive teaching model based on IoT is proposed, which is universal and provides theoretical and technical support for language teaching.

3. Literature Review

For IoT networks and Teaching System, technology can be used to correct learners' pronunciation through audio and video sensors, improve foreign language learners' speaking ability, provide digital construction for foreign language teaching, downgrade foreign language learners' learning cost, and improve foreign language teaching quality. At the same time, it also provides a case for the transformation of foreign language teaching to digitalization and intelligence, prompting more foreign language educators and learners to enjoy the dividends of IoT development and promoting the realization of the development concept of education modernization.

Liu [6] analyzed the problems of college English teaching in the context of Internet of Things with the entry point of the lack of culture in college foreign language courses, tiered teaching, and hybrid teaching mode, and put forward corresponding countermeasures to help the reform of digital college English teaching. Wang et al. [7] analyzed the significance of learning professional foreign language and the teaching status of professional foreign language courses, combined with their own teaching practice, put forward specific reform measures for the teaching of Internet of Things professionally. Xu et al. [8] analyzed the meaning of learning professional foreign language and the teaching status of professional foreign language class, combined with their own teaching practice, and proposed specific reform measures for the teaching of Internet of Things professional foreign language from several aspects, such as teaching content and teaching methods, assessment methods, teacher team construction, and textbook selection, in order to improve the current situation that students of Internet of Things engineering in colleges and universities pay little attention to professional foreign language courses, have low classroom participation and poor practical application ability. Zhou [9] argued that the application of computer Internet technology provides a means of teaching diversification to foreign language teaching and discussed the application of the support of IoT technology in foreign language teaching and explored the possibility of realizing the diversification of foreign language teaching mode through analysis to provide reference for its further application and foreign language teaching. Bayani et al. [10] proposed a new generation of educational application mode of IoT, taking the IoT educational resources. Nai [11] mentions that IoT can optimize teaching environment, enrich teaching resources, and improve teaching mode. Chen [12] believes that interactive English teaching mode should be implemented based on IoT, while Liang constructively proposes.

4. Research Design

4.1. The Role of IoT in Language Teaching for IoT Networks and Teaching System

(i) *Search and reception of information*. The Internet and Internet of Things technologies can serve as virtual massive libraries of language knowledge from which language learners can easily and quickly access the information they need [13]. For example, students can be asked to use online digital libraries and databases to learn to find professional journal literature and other reference materials

(ii) *Disclosure and supply of information* [14]. This type of activity consists of having learners take the initiative to provide some information and paste that information on a web page. The blogs written by students in English are published online and can serve the function of communication and mutual learning

(iii) *Online communication*. The online real-time communication platform provided by IoT technology allows language enthusiasts to communicate and share their language learning experiences on the Internet in real-time [15]. In addition, the platform supports video and text for instant communication, such as email correspondence, video chat, and real-

time voice communication between students learning English and their online friends

(iv) *Collaboration and learning*. This mainly involves the cooperation of two individuals or classes that are far apart, i.e. [16], participating in certain English activities together. This is an area that is currently less involved in teaching. Class exchange can be done with foreign school classes by creating a web page together and guiding students from both sides to study various aspects of each other's cities such as history, geography, climate, and environment. This mode of exchange would also allow students to gain additional knowledge beyond the classroom

4.2. Modeling of IoT Language Instruction for IoT Networks and Teaching System. Different languages have different accents, intonations, and frequencies in pronunciation [17]. The standard accent and standard speech of different languages are digitized by digital camera and digital recording of speech, and the accent and speech characteristics are described digitally by computer and then written into corresponding software [18]. Different languages have different software, and the software has the function of demonstrating the standard pronunciation and diction of the language, correcting the pronunciation and diction, and scoring the learners' learning. Teachers can choose different language teaching software according to their needs when teaching language courses.

Figure 1 shows the main parameters describing the mouth shape, including oral opening width, oral internal mouth opening, oral external mouth opening, face opening, and drumming. In the context of the Internet of Things, the computer's mouth shape and speech processing of different languages are mainly analyzed with the help of the above parameters.

In addition, Figure 2 shows the trend of each linguistic parameter over time, and the speech parameters mainly include frequency, intonation, amplitude, and speech rate can better assist the software to obtain more accurate technical indicators of linguistic speech [19].

The application of IOT technology to foreign language teaching is mainly done with the help of its video and audio sensors [20]. Among them, the video sensor records the data of foreign language learners' mouth patterns when practicing pronunciation, as shown in Equation (1), compares this video with the standard pronunciation video data already stored in the system, and measures the pronouncer's level by calculating the difference between them, and then achieves the function of correcting pronunciation.

$$I = \left| I_s - I_{\text{input}} \right|, \tag{1}$$

where I_s represents the standard pronunciation data in the program, and I_{input} represents the actual pronunciation data of the language learner, and the absolute value I is calculated to measure the pronunciation of the language learner.

The audio sensor is responsible for recording the frequency, intonation, and speed of the language learner in the process of pronunciation into the system and comparing it with the standard pronunciation database for analysis [21]. The system's own error correction function will intelligently correct the errors that exist in this pronunciation process to ensure the quality of the language learner's pronunciation. At the same time, language educators can monitor each student's learning situation, their own foreign language level in real time through the central monitoring system, and make different language learning plans according to different levels of language learners, providing 1-to-1 precise learning ability and improving the quality of language teaching. The process is shown in Figure 3.

The specific working principle is shown in Figure 4. The video and audio data of language learners are recorded through image and speech sensors, which are transmitted to the image and speech processing software for error correction and analysis, and each device is connected to each other through optical fiber, so that data can be shared among multiple terminals. In addition, each software processing terminal is equipped with monitoring equipment for error correction and progress monitoring to realize customized language teaching services.

In the IoT-based language model, the interactivity and intelligent error correction of education are established based on IoT-related websites and smart devices. Using the IoT platform as a second classroom for languages makes it possible to use it as a technological tool to complement language teaching and thus improve the quality level of language teaching [22]. We make full use of the IoT platform, mobilize language learners' subjective initiative and enthusiasm for foreign language learning, create a virtual and intelligent language teaching environment for the majority of language learners, and accelerate the modernization process of language education [23].

The IoT language platform contains modules commonly used in language learning [24], specifically, courseware learning, online communication, voice interaction, question practice, experience sharing, etc. Language learners can use the IoT learning platform to get the language teaching services they need on demand, in addition to voice interaction and online voice communication with other learners to achieve one-to-one language learning, which greatly stimulates language learners' enthusiasm for learning and can also harvest a pure friendship outside of learning. It greatly motivates students to learn the language [25].

Teachers assign prereading and review materials through the website, and students can solve their own problems in learning with the help of the IoT version of the courseware on the website. Teachers and students can communicate with each other through the Internet, and teachers can provide guidance and answer questions raised by students. In this way, teachers greatly save time in classroom instruction and question and answer sessions, can make full use of the classroom to drill students' language skills and language abilities, and can also take the form of group discussions and presentations in the classroom to improve students' ability to apply the language they have learned in several ways.

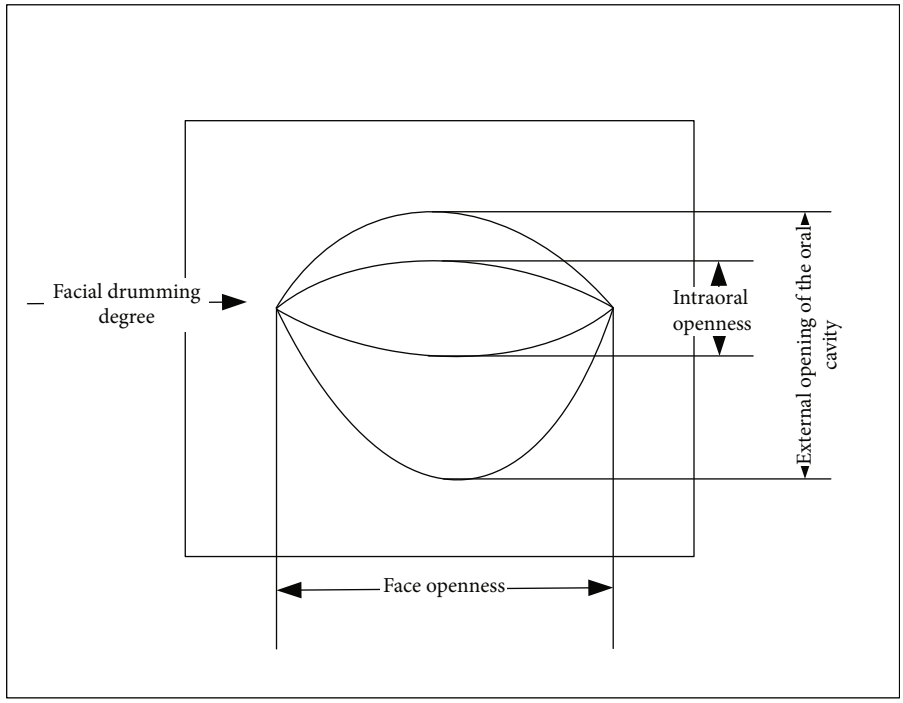

Figure 1: Port parameters diagram for IoT networks and Teaching System.

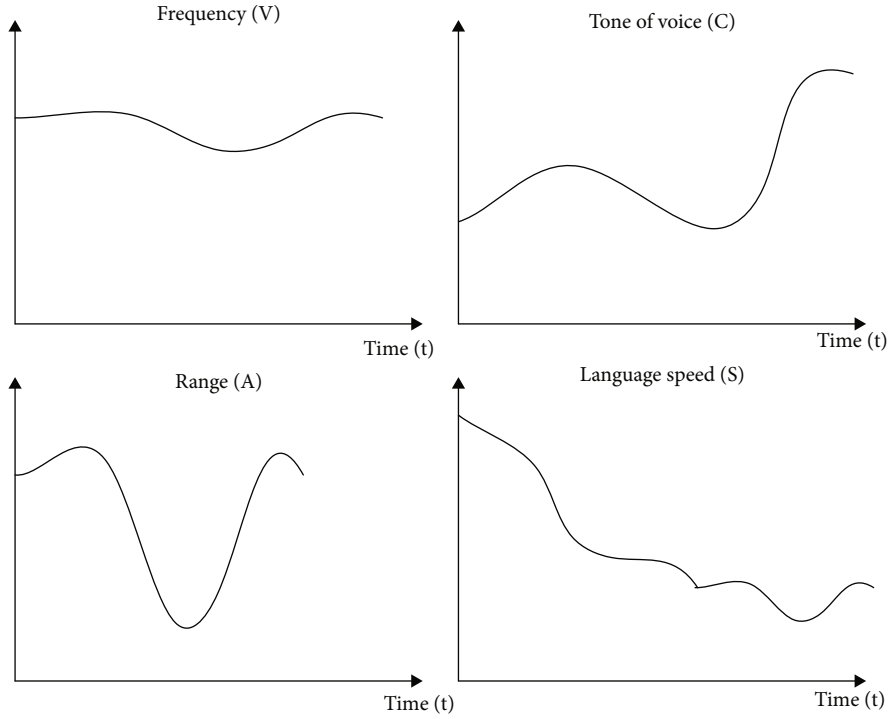

Figure 2: Pronunciation parameter chart for IoT networks and Teaching System.

In this IoT language teaching system, each user has a unique identity and can log in to the system after successful registration. After logging into the system, language learners can select various modules in the platform to learn the language. At the same time, the system will record the learners' learning situation, including learning progress, error feedback, and other behavioral activities to the background, and teachers can easily browse the learners' learning situation by accessing the background of the system as administrators, so as to grasp the learners' language learning

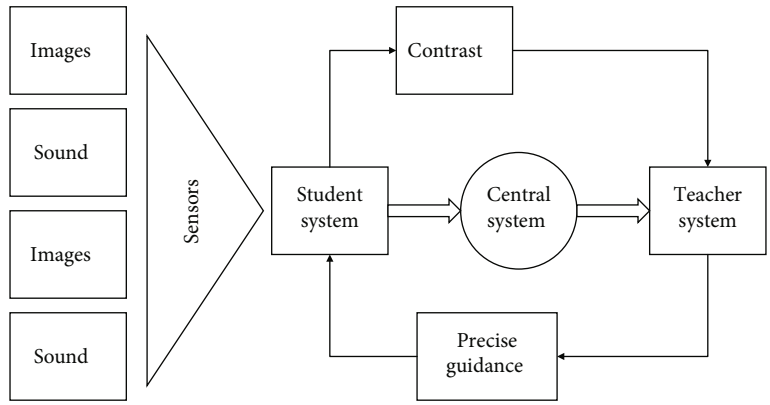

Figure 3: IoT language teaching model diagram for IoT networks and Teaching System.

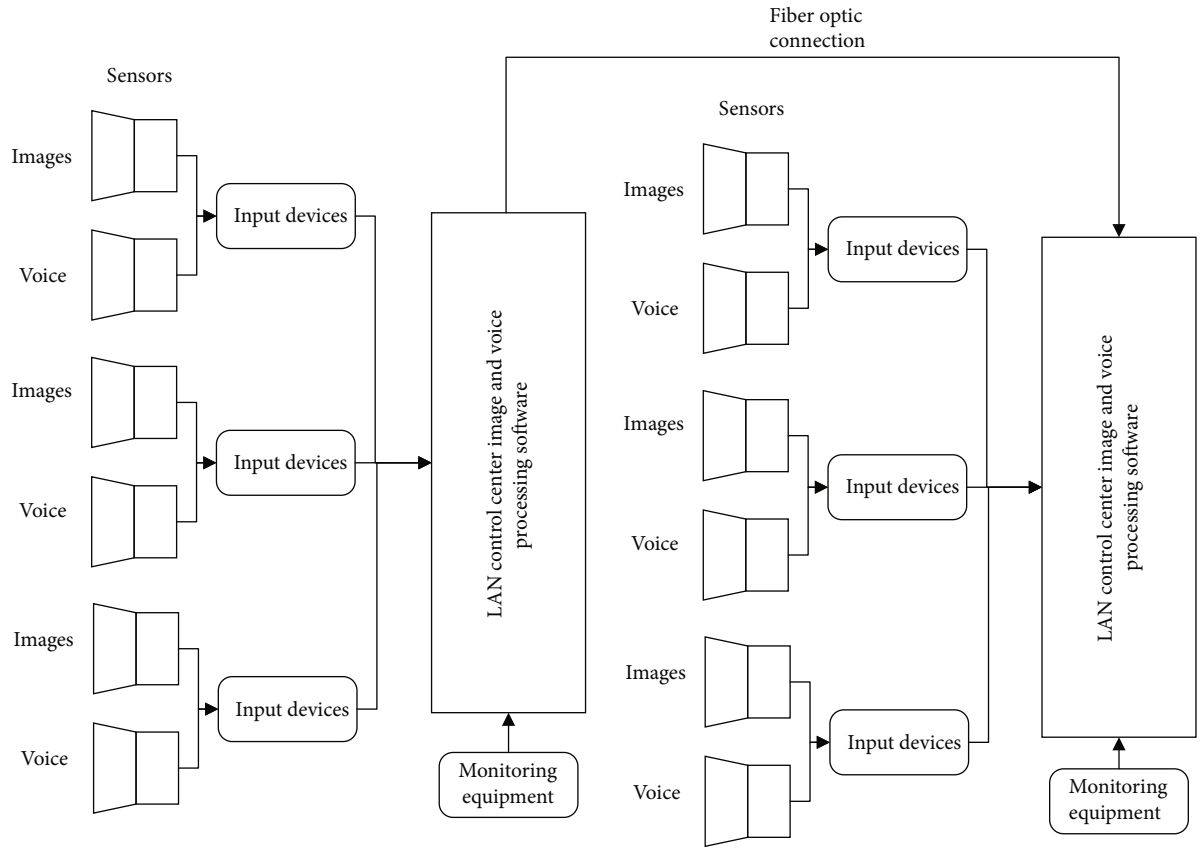

Figure 4: Principle of specific components of teaching system for IoT networks and Teaching System.

situation, learning shortcomings, and interests in a timely manner. The program is written in Java language, and the database is MySQL [26], which is open source, free, powerful, flexible, and easy to use. In the courseware learning section, it will share the language courseware needed for prestudy, review, and lessons, so that learners can easily review them. In addition, the platform also has a joint language learning test bank from which language educators can randomly select relevant test questions to assemble papers according to the test requirements. Language learners can also practice their language learning specifically as they wish.

The courseware learning board is mainly composed of three parts, as shown in Figure 5: registration system, login system, CAI teaching courseware (online version), and other courseware. The registration system enters the students' registration information and saves it to the MySQL database in the background, where the students' passwords are processed with MD5 [27] encryption to effectively prevent the problem of students' information leakage; the login system verifies the account number and password entered by the users and extracts the users' registration information (real name, department, class, etc.) from the database and saves

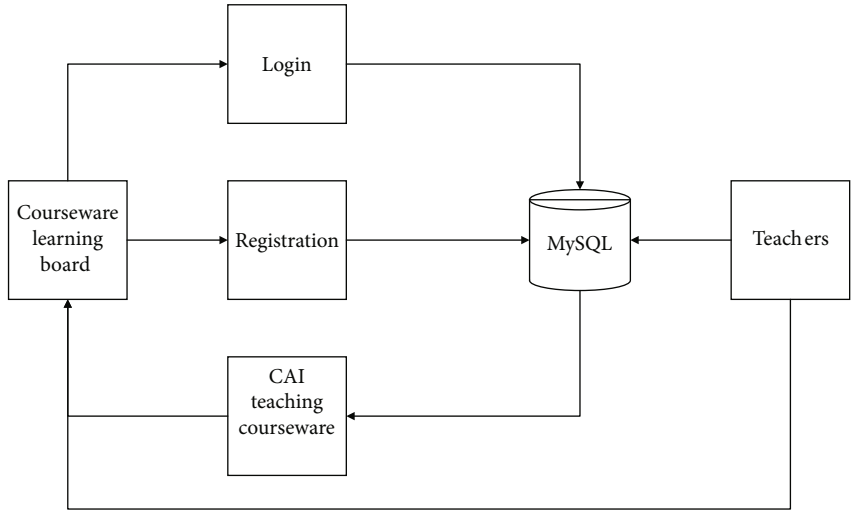

Figure 5: Learning module for courseware for IoT networks and Teaching System.

Table 1: Language learner table structure for IoT networks and Teaching System.

Fields	Attribute name	Type
Student name	Learner name	Varchar
Student kind	Category	Varchar
Student class	Classes	Varchar
Student contact	Contact information	Varchar
Student voice	Spoken language links	Varchar
Student error	Error collection	Varchar
Student improve	Lifting points	Varchar

it to another table in the database, where the users can check students' learning situation. The teaching courseware part is mainly provided by teachers and uploaded to the server, which can be called by teachers and students at any time through this platform. The database table structure is shown in Table 1.

The language learner's name is used to find information related to that learner, where the spoken link audio is stored in the object storage block, and the data can be stored in only its URL address in the object storage as shown in Figure 6, greatly reducing the data can overhead, in addition, the database also stores a collection of errors in the exercise process, which is convenient for educators and learners to review their learning and cooperate with the enhancement point to improve their language level more completely.

In summary, IoT technology can effectively correct the spoken language and pronunciation of language learners through the language teaching platform. Also, with the help of the courseware learning board, it can provide audio materials and courseware for precourse anticipation and postcourse review, which can greatly improve the efficiency of learners. With the help of the IoT platform, it greatly liberates manpower and makes it possible for language learners to study anytime and anywhere. It effectively enhances the learning efficiency.

5. Model Regression Results and Analysis

In this paper, a questionnaire was used to investigate the areas of language learners based on the IoT platform versus those in the traditional mode, as shown in Table 2.

The results of survey are shown in Figure 7:

As can be seen in Figure 7, the number of respondents to the questionnaire shows that the acceptance of the IoT language education platform is at 87% and 85%, respectively, representing that the majority of language learners are receptive to the IoT language education platform. In addition, 79% of language learners maintained a high level of enthusiasm after a period of learning under the IoT education platform, compared to 65% under the traditional language model, a decrease of 0.18%. In terms of learning efficiency, the percentage of those who consider learning efficient is 84% and 64% in the IoT language teaching mode and traditional teaching mode, respectively, thanks to the convenience and speed of the IoT language learning platform. In the option of whether they are willing to continue learning, 74% under the IoT platform chose to do so, compared to 63% under the traditional platform. Similarly, in terms of whether they feel they are making progress, 72% and 68% under the IoT language learning platform and the traditional language learning platform, respectively. The survey data is a good reality that language learners' interest in learning, learning efficiency, willingness to learn, and self-improvement are all better under the IoT language learning platform than in the traditional mode of language teaching. It proves that the theory of language teaching quality improvement is effective in the IoT environment.

The experimental data prove that combining IoT technology with language teaching allows students to maximize the portability of the language they want to learn. Traditional language courses are taught by having students lecture in class, take notes, review outside of class, and complete assignments, but this inherent learning model does not motivate students to take the initiative to learn an unfamiliar language. The introduction of IoT allows students to learn

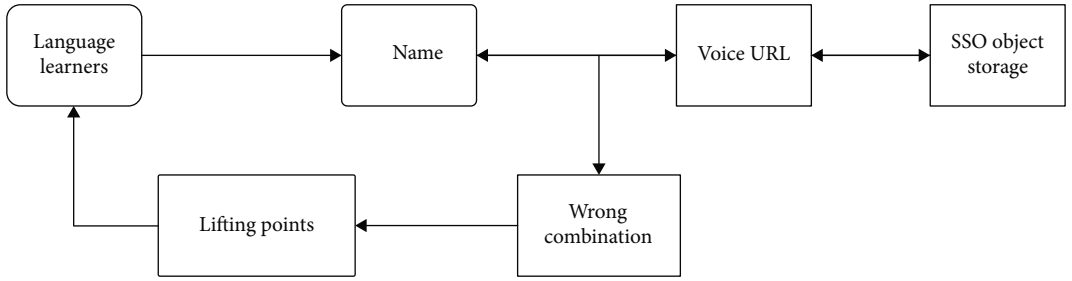

Figure 6: Schematic diagram of the object storage process for IoT networks and Teaching System.

Table 2: Questionnaire design table for IoT networks and Teaching System.

Question	Options
Is it an IoT language learning platform	Yes/no
Acceptance of IoT language learning platform	Acceptable/fair/not acceptable
Interest in learning the language after a period of study	Increase/no change/decrease
Learning efficiency	High/slow/low
Willingness to continue learning	Yes/no
Do you feel that you are improving	Clearly/fairly/not at all

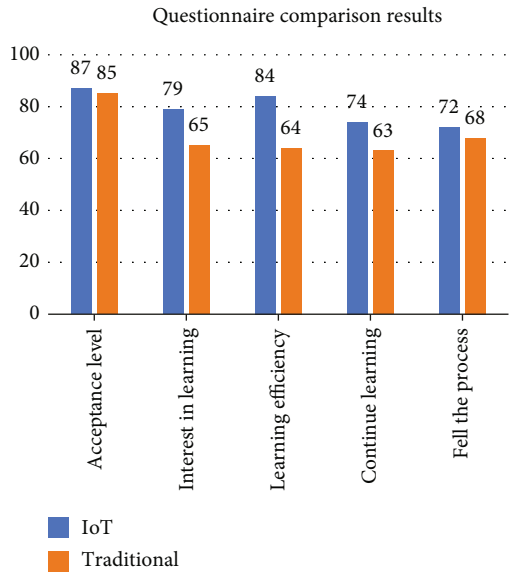

Figure 7: Comparison chart of survey results for IoT networks and Teaching System.

the language while adding interest so that they can use learning the language as a tool for entertainment and communication, fully motivating them to be active and subjective in the language. Since the IoT environment is interactive, students will involuntarily make active choices in the IoT environment, and teachers can choose different materials according to different levels of students, which is more conducive to the improvement of students' learning level according to their abilities. In addition, teachers also highlight the teaching of learning methods, through demonstration, explanation, and other ways to guide students to complete learning tasks. IoT teaching can provide students with virtual classrooms [28], where teachers' lectures and students' learning can take place in different locations, and teachers and students can fully communicate and interact with each other. To make the Internet of Things better assist teaching, teachers can be arranged to regularly communicate online and online forum two columns, on the students in the process of self-learning to provide timely answers to questions, so as to get a better learning effect, so that the Internet of Things teaching effectively play its advantages. In this way, the limited classroom English learning time of students each week is expanded into an all-round and multichannel learning space.

6. Conclusion and Suggestion

IoT networks and Teaching System have attracted much attention from researchers of industry and academia. As a typical application of IoT networks and Teaching System, the system studied in this paper is a three-way platform for IoT technology, language teaching methods, and language teaching quality is incorporated into the framework of language teaching system. In this paper, we construct an interactive teaching model for language courses based on the Internet of Things by analyzing the teaching model of language courses. Based on the analysis of language course teaching, the parameters of mouth shape and voice pronunciation in language learning are analyzed to discover their intrinsic connection in the learning process of language learners, and the effectiveness of using video sensors and audio sensors to collect the parameters of mouth shape and voice pronunciation of language learners in the language learning process and compare and correct errors with the standard parameters in the system is demonstrated.

The IoT language teaching platform has unique advantages over traditional language teaching means. It can realize

intelligent error correction, peer-to-peer service, and customized teaching, in addition, it is not bound by time and place, and through IoT technology, it can also significantly extend and expand the connotation of classroom teaching and effectively improve the quality of language teaching. It has been valued and applied by many university language educators, but we have found some problems in practice.

Although IoT-assisted teaching has been generally recognized, however, in the actual teaching, there are still many teachers who still stick to the traditional teaching methods. Therefore, it is necessary to strengthen teachers' learning of teaching theory, including "IOT learning theory, IOT curriculum and teaching theory, IOT education communication theory, so that teachers have the ability to master IOT teaching".

The use of IoT-assisted teaching requires rich and varied network courseware, which not only requires language teachers on the front line of teaching to provide teaching materials, design, and write electronic lesson plans and update web pages but also requires schools to invest a lot of money to purchase software and hardware, for example, various online versions of courseware that have been published are very conducive to teaching. However, due to many reasons such as the shortage of funds in schools, the courseware is not enough to meet the needs of students adopting the website.

To sum up, the impact and influence of the application of IoT-assisted teaching on foreign language teaching will be immeasurable. Through the joint efforts of language educators, IoT teaching will certainly develop its pedagogical strength and serve language teaching at all levels.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declared no conflicts of interest regarding this work.

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