

# A New Path to Enhance Students' Comprehensive Language Literacy based on Intelligent Language Laboratory

Xing Zhong\*

School of Foreign Language Literature, Zhaoqing University, Zhaoqing 526061, China

\*463791153@qq.com

## Abstract

With the acceleration of globalization and the rapid development of information technology, the enhancement of language ability has become an important part of students' comprehensive literacy. This paper discusses the concept of "Intelligent Language Laboratory" and its application in improving students' comprehensive language literacy. By integrating modern information technology, language learning theory and teaching practice, the Smart Language Lab provides an interactive and personalized language learning environment for students. The study shows that the laboratory can effectively improve students' language expression, listening and speaking skills and cross-cultural communication skills, thus opening up a new path for cultivating comprehensively developed language talents.

## Keywords

**Intelligent Language Laboratory; Comprehensive Language Literacy; Personalized Learning; Information Technology.**

## 1. Introduction

In today's era of multiculturalism, language is not only a tool for communication, but also an important bridge to understand and participate in global affairs. Traditional language teaching methods have gradually failed to meet the diverse needs of students for language proficiency, so it is especially urgent to explore new language learning modes. Intelligent language laboratory, as an emerging form of language education, is committed to creating an interactive and immersive learning environment with the help of advanced information technology. The purpose of this paper is to analyze the operation mechanism of intelligent language labs and explore their practical effects in enhancing students' comprehensive language literacy. Through the study of relevant cases and data, it will reveal how the Smart Language Lab promotes students' active participation in language learning through personalized learning experience, real-time feedback and diversified teaching resources, so as to enhance their comprehensive abilities in listening, speaking, reading and writing. Meanwhile, the article will also explore the challenges and solution strategies that may be encountered in the implementation process, so as to provide reference for promoting the innovative development of language education.

### 1.1. Research Background

In today's information age, language teaching is also advancing with the times. Intelligent language laboratory occupies a crucial position in language teaching. With the rapid development of network technology, the traditional language teaching mode gradually reveals its limitations, while the intelligent language laboratory brings new opportunities for language teaching. At present, more and more schools have started to introduce intelligent language laboratories, and its application status shows an expanding trend, which are used in many language courses such as foreign language teaching. These labs not only have the functions of

traditional language labs, such as broadcast teaching and group conversation, but also integrate network technology to realize resource sharing, independent learning and other functions. Intelligent language labs can support classroom teaching and promote collaborative learning and independent learning among students. The server stores a wealth of multimedia foreign language resources, including original novels, movies and a variety of learning materials, which are comprehensive and in various forms [1][2].

## 1.2. Research Purpose

The purpose of this paper is to study in depth the role of intelligent language laboratory on the improvement of students' comprehensive language literacy. Comprehensive language literacy covers listening, speaking, reading, writing, translation and other aspects, and the intelligent language laboratory provides students with a more efficient and convenient learning environment through its rich functions and advanced technology. By studying the application effect of the intelligent language laboratory, we can better understand its advantages and shortcomings in enhancing students' comprehensive language literacy, and provide a reference basis for further optimizing language teaching. At the same time, it is also hoped that it can provide decision-making support for education departments and schools in the input and construction of language teaching resources.

## 2. Theoretical Basis of Intelligent Language Laboratory

### 2.1. Characteristics of Digital Language Laboratory System

The digital language laboratory system is characterized by high efficiency, stability and sharing, which has a positive impact on foreign language teaching.

#### 2.1.1. High Resource Sharing and Utilization Rate

A number of colleges and universities have adopted cloud network language labs to realize the sharing of resources. For example, through cloud desktop laboratory technology, Liaoning Local College is designed for the "concurrent application" feature of language laboratory network, and adopts synchronous Ethernet high-fidelity audio and video transmission technology with superior performance. In terms of resource sharing, modern language laboratories are often equipped with advanced independent learning systems, while providing diverse and sufficient learning resources and materials [3][4][5]. Students can learn anytime and anywhere through the local database on-demand corresponding learning files, breaking the limitations of space and time. Teachers can also transfer teaching materials to multiple networked language labs, which improves the utilization of resources. In the cloud network language lab, teachers and students can easily access a huge amount of learning resources, no longer limited by the lack of traditional teaching resources. For example, students of different majors can share classic teaching materials for foreign language learning, film and television materials, audio of academic lectures, etc. These resources can be stored and managed on the same platform, which is convenient for students to call at any time. This resource sharing mode greatly improves the utilization rate of resources and avoids duplication of construction and waste of resources.

#### 2.1.2. Accurate Information Transfer and Function Expansion

The digital language laboratory system is equipped with a variety of practical functions, including free playback, digital repetition, e-book browsing, textbook reading, text sharing and mock exams [6][7][8]. Taking the digital voice room as an example, it introduces a number of new features for teaching and learning, effectively reduces the impact of noise, and provides professional-grade stereo sound effects. Teachers' teaching materials preparation can be accomplished with just a click of the mouse, selecting teaching materials from a rich resource library without the need to worry about data collection and storage. The scope of students'

learning has gone beyond traditional audio teaching, and they can freely access on-demand through the rich resources on the campus network at any time, realizing multi-language and multi-grade shared learning in the audio classroom. Students can flexibly choose the learning content according to their personal learning progress and interests, which fully meets their personalized learning needs. [7][9][10].

## **2.2. Application of Humanistic Psychology in Laboratory Openness**

The “open classroom” concept of humanistic psychology provides a theoretical basis for opening network language laboratories.

### **2.2.1. Students' Autonomous Choice and Decision to Learn**

Maslow's humanistic psychology advocates that “learning cannot be externalized, but only internalized. Maslow advocates that the subject position of students in the open laboratory is emphasized. Humanistic psychology emphasizes the self-actualization and personal growth of human beings, and Maslow's hierarchy of needs theory holds that human beings have the need for self-actualization. In the open network language laboratory, students are able to independently choose the learning content and learning mode according to their own learning needs and interests. For example, students can independently choose language learning materials of different difficulty levels, from basic vocabulary and grammar to advanced oral expression and appreciation of literary works, etc. This fully embodies the students' subjective position in the learning process and satisfies their need for self-realization. Teachers cannot force students to learn; the activities of learning should be chosen and decided by students themselves. In the open online language learning environment, students are able to freely select learning contents and methods based on their personal interests and needs, thus fully demonstrating their learning initiative. [11] [12] [13].

### **2.2.2. Creating a Good Teaching Environment for Students**

The “open” network language lab should help teachers build quality teaching atmosphere and activities, and give students the right to choose and learn independently. For example, the intelligent language laboratory combines the simulation language laboratory and the network function, optimizes the application of traditional teaching methods such as broadcasting, intercom, monitoring, demonstration, discussion, etc., and thus enhances the teaching efficiency. [3][4][5][8][11]. Students can enter the laboratory at any time and any place for learning. This learning environment without time and space limitations is conducive to stimulating students' learning enthusiasm and initiative. At the same time, the laboratory is equipped with advanced equipment and comfortable learning space, so that students can feel comfortable and pleasant in the learning process, thus improving learning efficiency [14]. Diverse teaching methods, modern teaching tools and adequate teaching materials create a novel and ideal teaching and learning experience for teachers and students. Teachers can use the teaching function in the classroom to broadcast and display the content of the library, realize the synchronization of voice and text, analyze sentence by sentence, and clearly and intuitively deliver to students, which is in line with the natural law of language learning. In addition, the language lab also supports broadcasting of external device materials, teacher-student broadcasting exchanges, group discussions and lesson plan presentations. [3][4][5].

### **3. Enhancement of Teachers' Teaching by Intelligent Language Laboratory**

#### **3.1. Abundant Teaching Materials**

##### **3.1.1. Various Formats of Audio-Visual Files**

Teaching resources in traditional analog language labs are limited to tapes, which are in a single form and have a cumbersome updating process. In contrast, the intelligent language laboratory is compatible with a variety of popular audio-visual file formats such as DVD, MP3, etc. These resources can be conveniently copied and transmitted through the computer, storage devices, etc., which greatly improves the accessibility and mobility of resources [15][16]. At the same time, the computer is equipped with a huge library of materials that teachers can order at will, providing a rich selection of materials for teaching. For example, in English teaching, teachers can select English movie clips, songs and other resources based on teaching themes and students' abilities to create a lively audio-visual atmosphere to promote students' language learning [17]. This diversified audio-visual file format not only enriches the teaching content, but also stimulates students' interest in learning and improves the teaching effect. Moreover, the laboratory has a huge library covering learning materials of different languages, different fields and different difficulty levels, which teachers can call up at any time according to their teaching needs.

##### **3.1.2. Digital Lesson Preparation and Internet Resource Downloading**

Teachers can use digital means for lesson preparation, including audio processing, text editing and the creation of MP3 format courseware. With the help of the Internet, they can easily access diverse teaching resources, which are both abundant and extensive. For example, teachers can download the latest English teaching materials from professional educational resource websites, including English listening materials, English reading articles and English teaching videos. These resources can be integrated and edited according to the teaching needs and made into personalized teaching courseware. In addition, teachers can also use network resources to understand the latest teaching methods and teaching concepts, and constantly improve their teaching level.

#### **3.2. Innovative Teaching Methods**

##### **3.2.1. Controlling the Speaking Speed of Audio Files**

Using digital equipment, teachers can adjust the playback speed of audio files, using the characteristics of variable speed without changing the pitch to achieve personalized teaching to meet the learning needs of different students. For students with weak foundation, the speed of speech can be slowed down so that they can better listen to the pronunciation of each word and the structure of the sentence; for students with better foundation, the speed of speech can be accelerated to improve their listening comprehension and reaction speed. At the same time, students can synchronize listening and viewing through the student terminal, which improves the learning efficiency. For example, in English listening teaching, teachers can adjust the speaking speed of the listening materials according to the actual situation of students, so that students can watch the text materials while listening to deepen their understanding of the listening content. The variable speed and non-variable pitch function realizes teaching according to students' needs and improves the synchronization effect of students' listening and viewing. The language lab system of Intelligent Language Lab has the function of controlling the speech speed of audio files, so that teachers can adjust the playback speed of audio files according to students' listening level and learning progress. For example, for students with a weak listening foundation, teachers can slow down the speed of speech so that students have enough time to understand and digest the listening content; while for students with a higher

listening level, the speed of speech can be appropriately accelerated to enhance the challenge of learning. This function of changing speed without changing tone realizes teaching according to learning, and at the same time improves the effect of synchronization of students' listening and viewing, so that students can better combine images, text and other information in their listening training.

### **3.2.2. Abundant Talking Functions to Train Listening and Speaking Skills**

The Intelligent Language Laboratory has a variety of call functions, such as call, answer, plenary call, notification, demonstration and group discussion, etc. The teacher can effectively utilize these functions to train listening and speaking skills. Using these functions, teachers can effectively carry out foreign language listening and speaking training, making the learning process closer to the actual situation and three-dimensional. For example, teachers can organize students to practice group conversations, in which students communicate with group members through the call function to improve their oral expression and listening comprehension. Teachers can also conduct demonstrations so that students can imitate the correct pronunciation and intonation. In addition, teachers can use the notification function to release learning tasks and assignments to improve teaching management efficiency. The laboratory's digital equipment has rich call functions, such as teachers can call individual students for one-on-one speaking instruction; they can also turn on the all-call function to allow all students to participate in speaking discussions. These call functions make the listening and speaking training more realistic and three-dimensional, and students can practice their oral expression and listening comprehension in different call scenarios. For example, in group discussions, students can improve their speaking fluency and accuracy by talking with group members; in role-playing, students can enhance their practical language skills by talking and interacting with different characters.

## **4. Enhancement of Students' Learning by Smart Language Laboratory**

### **4.1. Classroom Learning**

#### **4.1.1. Utilization of Audio and Video Synchronous Teaching Resources**

In the smart language lab, teachers use audio and video synchronized materials for teaching, which brings a new learning experience to students [18]. Students can realize the synchronization of listening and watching through the student terminal, and feel the charm of language more intuitively. For example, in the English classroom, teachers play English movie clips, students can not only hear the pure English pronunciation, but also see the vivid images, better understand the plot and language expression. This teaching method greatly improves students' learning efficiency and enables them to acquire more knowledge in the limited classroom time. Teaching with synchronized materials improves students' learning efficiency. In classroom learning, teachers can make use of the audio and video synchronized teaching resources of the Intelligent Language Laboratory for teaching. For example, when teaching foreign language courses, teachers can play foreign language movie clips with subtitles, so that students can hear the standard foreign language pronunciation while watching the movie and understand the plot and language expression with the subtitles. This kind of audio-video synchronous teaching method can improve students' interest and learning efficiency, so that students can learn the language in a relaxed and pleasant atmosphere. At the same time, audio and video synchronized teaching resources can also stimulate students' interest in learning. Rich and varied images and vivid sound effects can attract students' attention and make them participate in classroom learning more actively. For example, when learning an English song, students can watch the MV of the song and sing along with the lyrics to improve their English listening and speaking skills in a relaxing and pleasant atmosphere.

### **4.1.2. Group Conversation Practice and Collaborative Learning**

Collaborative learning methods such as group discussion and role-playing are fully utilized in the Intelligent Language Lab. Students can improve their English listening and speaking skills and cultivate teamwork through group conversation practice. In group discussion, students discuss a topic and express their views and opinions. They need to communicate in English, which enhances their oral expression skills as well as their listening comprehension [19]. Students can practice group conversation and collaborative learning in an intelligent language laboratory. For example, teachers can organize learning activities such as group discussion and role-playing for students [20]. In group discussions, students can exchange their views and ideas, and exercise their oral expression and thinking skills; in role-playing, students can simulate different language scenarios, such as business negotiation, tourism consulting, etc., to improve the practical use of language and resilience. Through these collaborative learning activities, students' English listening, speaking, reading and writing skills can be comprehensively improved.

Role-playing is also an effective way of collaborative learning. Students play different roles to simulate the real language environment and improve their language use ability. For example, in the English classroom, students can play the roles of doctor and patient, waiter and customer and practice dialogues. In this way, students can have a deeper understanding of the practical application of language and improve their language communication skills.

Cooperative learning can enhance students' teamwork spirit and sense of collective honor. In group activities, students need to cooperate and support each other to accomplish tasks together. When the group achieves good results, students will feel proud and satisfied, which in turn enhances their sense of collective honor [21]. This teamwork spirit is not only useful in language learning, but also important for students' future development.

## **4.2. Self-directed Learning**

### **4.2.1. Personalized Learning Equipment and Resources on Demand**

The Intelligent Language Laboratory provides personalized learning tools for each student, who can select learning materials from the resource library of the main computer and independently control the play, pause, fast-forward and rewind functions. This type of independent learning meets the learning needs of different students and allows them to choose the learning content according to their own learning progress and interests. For example, if some students are weak in listening, they can play listening materials repeatedly to strengthen their listening training; if some students are interested in English movies, they can choose to watch English movies to improve their English listening and speaking skills. In addition, students can also use the Intelligent Language Laboratory as an open reading room for electronic reading, reading various English articles and books to broaden their knowledge.

### **4.2.2. Embodying the Modern Education Concept of Teaching Students According to Their Abilities**

Independent learning according to students' level, progress and requirements fully embodies the modern educational concept of teaching according to students' abilities [22]. Each student has different learning ability and learning progress, and it is difficult for traditional teaching methods to meet the needs of each student. The intelligent language laboratory provides a platform for students to learn independently, so that they can make a learning plan according to their own actual situation and choose the learning content and learning methods suitable for them. For example, for students with better foundation, they can choose learning materials with higher difficulty to challenge their ability; for students with weaker foundation, they can start from the basic learning content and gradually improve their level. This way of teaching students

according to their abilities can better stimulate their interest in learning and improve their learning results.

### **4.3. Collaborative Learning**

#### **4.3.1. Random Grouping and Group Discussion**

The Intelligent Language Laboratory is equipped with the function of random grouping, which enables teachers to divide the whole class into multiple learning groups according to teaching needs. Members of the group can strengthen the training of English listening and speaking skills through discussion, role-playing and other cooperative learning methods [15][16]. In the Intelligent Language Laboratory, teachers can utilize the random grouping function of the system to divide students into different groups. Group members can communicate through the computer and carry out group discussion activities. For example, when discussing a foreign language topic, group members can share their views and opinions with each other, while listening to the speeches of other members, and improve their English listening and speaking skills in the communication. This kind of random grouping allows students to learn cooperatively with different classmates and broaden their horizons and ways of thinking. In group discussions, students can share their learning experiences and methods, learn from and help each other. They can work together to solve the problems encountered in learning and improve the learning efficiency. For example, when discussing English grammar problems, students can analyze them with specific example sentences to deepen their understanding of grammar rules.

#### **4.3.2. Enhance the Sense of Participation and Collective Honor**

Collaborative learning can not only improve students' language skills, but also cultivate students' sense of participation and collective honor. In group discussions, every student has the opportunity to express his/her own views, every student has his/her own tasks and responsibilities, they need to actively participate in the discussions and activities, and when the group achieves good results, every member will feel proud and a sense of achievement, which enhances the sense of collective honor. Meanwhile, in the process of collaborative learning, students need to actively participate in discussions, listen to others' opinions and coordinate team relationships, all of which help to develop students' sense of participation and teamwork. , Each student has his or her own tasks and responsibilities, they need to actively participate in the discussions and activities to contribute to the group, when the group achieves good results, students will feel proud and satisfied, and this sense of collective honor will stimulate their learning motivation [21]. In addition, collaborative learning can cultivate students' teamwork and communication skills, laying a solid foundation for their future growth [23][24].

### **4.4. Paperless Examination**

#### **4.4.1. Automatic Marking and Data Output**

Paperless exams have the advantage of automatic marking. After the end of the exam, the exam system can automatically mark the written objective questions, which greatly improves the efficiency of marking and reduces the error of manual marking. At the same time, the examination results can be exported to Excel tables, which is convenient for data statistics, viewing and storage [25][26]. Convenience of automatic marking of exam system and exporting raw data in Excel table. The examination system of Intelligent Language Laboratory adopts the paperless examination form, and for the written part, the system can automatically mark the papers, which greatly improves the efficiency and accuracy of marking. Moreover, the system can output the examination data in the form of Excel tables, which is convenient for teachers to analyze the data and summarize the results. For example, teachers can analyze the data to grasp the students' learning status and weak points, providing valuable reference for subsequent teaching [27]. At the same time, by analyzing the test data, teachers can gain a deeper

understanding of the students' learning situation and deficiencies, so as to provide more targeted teaching guidance [28]. Students can also view their own test scores and answer questions to understand their own learning achievements and deficiencies, and adjust their learning methods and strategies in a timely manner.

#### **4.4.2. Human-computer Dialogues and Sampling of Exam Recordings**

The oral paperless examination adopts the human-computer interaction mode, and the students' examination recordings are saved in the computer, which is easy to be accessed at any time for review and supervision [15][16]. This kind of examination is more objective and fair, and can effectively ensure the quality of the examination. The human-computer dialogue allows students to express themselves more naturally and reduces their nervousness. At the same time, the callable sampling function of the exam recording can ensure the fairness and authenticity of the exam. Teachers can understand the students' speaking level and answer questions by checking the test recordings, which can provide feedback and improvement basis for teaching. Conducting the speaking test in the form of human-computer dialogue emphasizes the recallable spot check of the test recording. In the oral examination, human-computer dialogue is adopted, in which students can have a conversation with the system on the computer and the system will grade the students according to their oral expressions. At the same time, the recordings of the examination process can be saved, and the teacher can call for random checking at any time for review and assessment. This type of human-computer dialog and sampling of test recordings ensures the fairness and objectivity of the speaking test, and also provides teachers with more basis for assessment.

### **5. Differences in Literacy Development between Smart Language Laboratories and Traditional Language Laboratories**

#### **5.1. Differences in Experimental Operation and Management Style**

##### **5.1.1. Informatized Traceability of Experimental Operations**

In the intelligent laboratory, every step of students' experimental operations can be saved in informationization through the student terminal, making every experimental operation traceable. This advantage is also significant in the intelligent language laboratory. For example, in the process of language learning, every oral practice, listening training and other operations can be recorded, which is convenient for students to review their own learning history at any time, and find out their progress and shortcomings. Traditional language labs, however, lack such an informational tracing function, and it is difficult to record and analyze students' learning process in detail. In the intelligent language laboratory, every step of students' experimental operation can be recorded by the system to form a detailed operation log. This allows teachers to trace back students' experimental operation process and understand students' learning and operation habits. For example, if a student makes a mistake during an experiment, the teacher can check the operation log to find out the reason for the mistake and the link where it occurred, so as to give targeted guidance. This kind of informatized traceability function of experimental operation helps to improve the quality of teaching and the learning effect of students.

##### **5.1.2. Real-time Response to Data Dynamics**

The informatization management of the intelligent laboratory can reflect the real situation of laboratory lecture teaching or laboratory examination, and the real-time uploading of data of experimental operation can enable teachers and teachers and students to discover problems and solve problems in time in the process of teaching and learning, and further improve the ability of students to improve the accuracy of experimental operation. In the intelligent language laboratory, students' learning data can also be uploaded in real time, and teachers can

analyze the data to grasp the students' learning progress and comprehension, so as to adjust the teaching methods at the right time [29]. For example, based on the students' listening test data, teachers can find out that the students have problems in a certain voice pronunciation, so as to target the teaching. The data feedback of traditional language labs is relatively lagging, which is difficult to meet the needs of modern teaching. Intelligent language laboratory data can realize dynamic real-time response, and the data generated by students in the experimental process can be uploaded to the server in real time. Teachers can view the students' data in real time and understand the students' learning progress and experimental results in a timely manner. For example, when conducting a listening test, teachers can see the students' answers in real time and adjust their teaching strategies according to the data. This dynamic real-time response function of data allows teachers to better master the teaching rhythm and improve teaching efficiency.

## **5.2. Differences in Subject Integration and Space Utilization**

### **5.2.1. Multidisciplinary Integration and Traditional Single Discipline**

Intelligent laboratory breaks through the limitations of traditional laboratories constructed with the orientation of a certain discipline, and can integrate multiple disciplines such as physics, biology, chemistry, etc. in one laboratory. The intelligent language laboratory can also integrate multiple language disciplines, such as English, French, German, etc., to provide students with a diversified language learning environment. In contrast, traditional language labs can only teach a single language subject and cannot meet the needs of students for multilingual learning. Intelligent language labs break the single-discipline limitation of traditional labs and can realize the integration of multiple disciplines. For example, in the process of language learning, knowledge from multiple disciplines such as culture, history and geography can be integrated. While learning a foreign language, students can also learn about the cultural background, historical development and other related knowledge of other countries, which broadens their knowledge and improves their comprehensive literacy. The traditional language laboratory mainly focuses on the language discipline itself, lacking the integration and penetration between disciplines.

### **5.2.2. Space Utilization and Modular Design**

Intelligent laboratory adopts top-loading modular design, which not only reduces the requirements of laboratory construction on the floor, but also reduces the difficulty and progress of construction, greatly improves the space utilization rate, facilitates space recombination, solves the problem of a single, single use of the traditional laboratory, and can be adapted to a variety of teaching modes. Intelligent language labs can also adopt modularized design to flexibly adjust the space layout according to teaching needs. For example, different learning areas can be set up, such as listening training area, speaking practice area, reading and writing area, etc., to improve space utilization. The spatial layout of traditional language laboratories is relatively fixed, making it difficult to adjust and optimize. Intelligent language labs adopt top-loading modular design, which makes the installation and layout of equipment more reasonable and improves the utilization of space. For example, while traditional language labs may require a lot of space for wiring and equipment placement, the top-mounted modular design of the Smart Lab allows equipment to be integrated in the ceiling, reducing the amount of floor space occupied. This makes the lab neater and more aesthetically pleasing, and also provides a more comfortable learning environment for students.

## **5.3. Difference in Teaching Efficiency**

### **5.3.1. Advantage of Experimental Teaching Operating System**

The Smart Lab is equipped with an experimental teaching operating system, which supports synchronous recording of teachers' online lesson preparation, and the 1080P high-definition

image quality can accurately capture the operational details of teachers' experimental demonstrations, completely solving the problem of students' onlookers' teaching, and the system is equipped with intelligent analysis of data for scientific planning of teaching strategies. In the intelligent language lab, teachers can also utilize the advanced teaching operating system for lesson preparation and teaching. For example, teachers can upload various language learning resources, such as audio, video, text, etc., through the language lab system, which is convenient for students to learn anytime and anywhere. Meanwhile, the language lab system can also analyze students' learning data and provide teachers with teaching feedback to help them develop more scientific and reasonable teaching strategies. The teaching operating system of the intelligent language lab has powerful functions that provide teachers with strong support for lesson planning and teaching strategies. For example, teachers can use the system's resource management function to quickly find the required teaching materials; they can use the system's course design function to easily design the teaching process and teaching activities. These functions can greatly improve the efficiency of teachers' lesson preparation, as well as make their teaching strategies more diversified and flexible [30].

### **5.3.2. Video Proctoring and Marking Function**

The video invigilation and marking function of the intelligent laboratory eliminates the need for a full-time invigilator and solves the problem of insufficient teachers to supervise students' centralized exams; and the exam system can automatically archive the exams through the exam video, reducing the intensity of online marking and freeing up the marking teachers. Intelligent language labs can also use video invigilation and automatic marking functions to improve the fairness and efficiency of the exam. For example, the audio and video recordings of speaking examinations can be saved in the computer for teachers to access at any time for supervision and checking to ensure the quality of the examination [16][31]. At the same time, the automatic marking function can greatly reduce the teachers' marking burden and improve the marking efficiency. During the examination process, the video proctoring function of Intelligent Language Laboratory can make it easier for teachers to conduct proctoring work. Teachers can view students' exams in real time through the monitoring screen and discover cheating behaviors in time. Meanwhile, after the examination, the automatic marking function of the system can quickly complete the marking work, saving teachers a lot of time and energy. All these functions help to improve the efficiency of teaching work.

## **6. Application of Intelligent Language Laboratory in Language Literacy Cultivation**

### **6.1. Value and Application of Language Laboratory**

In language education, language labs play an important value.

#### **6.1.1. Word Frequency Analysis and Writing Ability Improvement**

The language laboratory can record excellent student compositions and related works into the database for word frequency analysis. By finding out the high-frequency words in them, students can quickly master the vocabulary and thus improve their writing ability. For example, the results of analyzing secondary school students' compositions and related works on the basis of measurement are more authentic and effective. Teachers can guide students to deeply understand and use these high-frequency words to enrich the expression of the composition. At the same time, pulling out and analyzing the descriptive words of relevant characters can help students quickly grasp the understanding of the characters and improve the accuracy and vividness of the descriptions. This method based on data analysis provides a scientific and effective way to improve students' writing ability. In the language lab, the database can be used for word frequency analysis. Teachers can input students' compositions into the system, and

the system will automatically analyze the frequency of vocabulary use in the compositions. Through word frequency analysis, teachers can understand the problems of students in vocabulary use, such as insufficient vocabulary, improper use of vocabulary and so on. Then, teachers can conduct targeted teaching for these problems, such as instructing students to expand their vocabulary and use vocabulary correctly. This teaching method based on word frequency analysis can effectively improve students' writing ability.

### **6.1.2. Phonics Training and Efficiency Improvement**

For students from dialect areas, Mandarin training is not an easy task. With the help of the language laboratory, many students can make rapid progress in Mandarin training in a short time. For example, if students from a dialect area cannot distinguish between zh and z, ch and c, or sh and s, teachers can help them to differentiate between them in terms of pronunciation methods and parts of speech. For example, zh and z are both clear, unaspirated, and fricative sounds, but the difference is that zh is pronounced with the tip of the tongue backward, while z is pronounced with the tip of the tongue forward [29]. The tip of the tongue is aligned with the front of the hard palate during the production of zh, and the tip of the tongue is aligned with the backs of the upper and lower teeth during the production of z [32]. The key is that the tip of the tongue is cocked when pronouncing the zh sound, while it is not cocked when pronouncing the z sound. After explaining the key points, students can practice with the help of speech software and a microphone. If the students pronounce the sounds correctly, the computer shows that the comparison is successful, and the system can provide a standardized Mandarin pronunciation demonstration, so that the students can carry out voice training by following and imitating. At the same time, the system can also conduct real-time testing and evaluation of students' pronunciation, pointing out the errors of students' pronunciation and providing corrective suggestions. This timely feedback greatly improves students' learning motivation and training efficiency.

## **6.2. Training in the Use of Intelligent Language Laboratories in Colleges and Universities**

In colleges and universities, training in the use of the new Smart Language Laboratory plays a key role in the improvement of teachers' digital literacy.

### **6.2.1. Explanation of System Composition and Operation Points**

When technicians explain the smart language lab system, they usually cover several aspects. Taking the training of the College of Foreign Languages as an example, Zhao Shuai, the technical director, demonstrated and explained the operation software of the "Lingji Intelligent Language Laboratory V5.1" system on the teachers' side of the machine, while the teachers simulated the lectures on the students' side of the machine. Through the explanation and practice of the functions of screen broadcasting, multi-channel teaching, student speech, voice intercom, group discussion, topic discussion, audio-visual reading, etc., the teachers basically mastered the use of this system operation software. In the training for the use of the new intelligent language laboratory in colleges and universities, the technicians will explain in detail the composition and operation points of the laboratory system. For example, the technicians will introduce the functions and usage of the system's hardware equipment, such as servers, computer terminals, audio equipment, etc.; they will also explain the operation process and precautions of the system's software platforms, such as the teaching management software and the Learning Resource Library. Through these explanations, teachers can quickly familiarize themselves with the use of the laboratory system and prepare for the subsequent teaching work. In the explanation and demonstration of the operation of the Language Intelligence Language Laboratory System platform, the specific functions and usage of its interactive teaching platform, voice teaching platform, simultaneous teaching platform, speaking test platform and listening, speaking, reading and practicing platform were mainly introduced. At the same time,

Mr. Du Kai from Beijing Foreign Studies Research Institute (FSSRI) explained and demonstrated the main functions of the iTEST Intelligent Assessment Cloud Platform, such as how to log in and authenticate, how to publish exams and tests, how to supervise the exams, how to mark the exams, and the FSSRI's competition question bank, and so on.

### **6.2.2. Promoting the New Situation of Foreign Language Teaching**

The new language laboratory has brought a new situation for foreign language teaching in schools. On the one hand, it provides teachers with rich teaching resources and advanced teaching methods, making teaching more vivid and efficient. Teachers can make full use of the various functions of the language laboratory, such as strengthening students' English listening and speaking skills training through teamwork learning methods such as group conversation practice and role-playing [15]. On the other hand, the new language laboratory also provides students with a better learning environment and more learning opportunities. Students can learn materials on-demand in the main computer material library for personalized learning. Meanwhile, the automatic marking and data output functions of paperless exams, as well as the human-computer dialogues and sampling of exam recordings, provide a more objective and fairer way of evaluating students' learning and exams. All these help to improve students' learning enthusiasm and learning effect, and promote foreign language teaching to a new level.

### **6.3. KDDI Intelligent Language Laboratory**

The KU Xunfei Intelligent Language Lab program has significant advantages.

#### **6.3.1. Technical Advantages of Online-Offline Integration**

The remote intelligent language laboratory solution of KU Xunfei's online and offline integration solves the interactive teaching needs of remote teaching, integrates on-campus and in-class and off-campus and out-of-class, and truly realizes unified management, unified teaching, unified training and unified evaluation. The system's basic teaching platform is simple and fast to operate, and can realize one-click teaching, one-click questioning, real-time recording of lessons, situational interaction and itinerant assessment. For example, in the process of distance teaching, students can interact with teachers in real time through the network, and teachers can ask questions and answer questions at any time, which ensures interactive and participatory teaching; at the same time, the school can unify the management and distribution of all teaching resources, which improves the efficiency of resource utilization. Face recognition management platform adopts biometric technology, through the student unit camera, automatic collection, with real avatar displayed in the teacher control interface, to improve communication efficiency and interest. The professional simultaneous interpretation training is equipped with a seven-step training mode, which fits the actual teaching process and runs through the whole stage of teaching and training program for students from enrollment to practical operation. The test platform provides paperless test, oral test and professional oral test. Classroom extension function provides wireless teaching and mobile classroom, which can control the rhythm of classroom teaching and training well. Remote lectures and training support teachers' visualized lectures, teachers' and students' visualized interactions, and students' independent channel training free records. The system is also developed in deep cooperation with third-party digital resource platforms, seamlessly connecting with third-party resource platforms, language training platforms and examination platforms.

#### **6.3.2. Application of School-Enterprise Cooperation**

KU Xunfei Remote Intelligent Language Laboratory has also achieved remarkable application results in school-enterprise cooperation. For example, in the Remote Simultaneous Interpretation Combined Classroom, a new type of classroom created by KU Xunfei, two or more simultaneous interpreting classrooms across the space are merged to build "one teaching class" for online and offline hybrid classroom teaching. Local and remote classrooms, each

student is equipped with a terminal to undertake teacher-student and student-student interactions. Teaching teachers utilize the unique “control interface” to build “one teaching class”, with offline and online classes arranged in sequence, maintaining the seating layout of each classroom and supporting various visual simultaneous interpretation teaching activities. In the simultaneous interpretation online and offline synchronous classroom, remote students log in the client to “enter” the classroom, and the teacher uses KDDI's “control interface” to unify and organize the classroom simultaneous interpretation teaching activities, online and offline at the same time to support dual-track independent recording and dual-track storage, Playback supports four kinds of listening modes, so that you can have a non-discriminatory simultaneous interpretation learning environment. When used as an examination room, students log in remotely, and the system supports real-time audio/video and dual-channel simultaneous recording or videotaping for online students. When used as a remote simultaneous interpretation conference or practical training, the interpreter enters the system after logging in at the remote end, and the conference delegates can normally choose to listen to the local or remote interpreter channel. These successful cases demonstrate the broad application prospect and great value of KDDI Intelligent Language Lab in school-enterprise cooperation.

## 7. Conclusion and Outlook

### 7.1. Summary of Research Conclusion

This paper draws the following main conclusions through the study of the application effect of the intelligent language laboratory in the cultivation of comprehensive language literacy.

First of all, with its rich teaching materials, innovative teaching methods and diversified learning modes, the Smart Language Lab provides students with a more efficient and convenient learning environment, which significantly improves their comprehensive language literacy. In terms of teacher teaching, the rich audio-visual file formats and digital lesson preparation provide teachers with more teaching resources and tools, while the control of audio file speed and rich call functions help to realize teaching according to students' needs and improve teaching effects. In terms of student learning, audio and video synchronous teaching resources, group conversation practice, personalized learning devices, random grouping and other functions promote students' classroom learning, independent learning and collaborative learning, while paperless exams improve the validity and credibility of the exams.

Secondly, compared with traditional language laboratories, intelligent language laboratories have obvious advantages in terms of experimental operation and management methods, discipline integration and space utilization, and teaching work efficiency. The functions of informatization traceability and data dynamic real-time response make the learning process of students traceable, and teachers can adjust the teaching strategy in time; the integration of multiple disciplines and modular design improve the utilization of space and meet the diversified learning needs of students; the advanced teaching operating system and the function of video invigilation and marking improve the efficiency of teaching work.

Finally, through the application cases with colleges and universities, it further proves the value and role of intelligent language labs in different education stages. The language lab improves students' writing ability and Putonghua proficiency through word frequency analysis and voice training; the training on the use of the intelligent language lab in colleges and universities improves teachers' digital literacy and promotes a new situation of foreign language teaching; and the KDDI Remote Intelligent Language Lab demonstrates its broad application prospects and great value through the technological advantages of on-line and off-line fusion and the application of cooperation between schools and enterprises.

## 7.2. Outlook of Future Research Direction

In the field of intelligent language laboratory in the future, one is the technical innovation aspect. With the continuous development of artificial intelligence, big data, virtual reality and other technologies, it is possible to explore the application of these technologies to intelligent language laboratories to provide students with a more personalized and immersive learning experience [33]. For example, the use of artificial intelligence technology to achieve intelligent voice evaluation and personalized learning recommendations, the use of virtual reality technology to create realistic language learning scenarios to improve students' language communication skills. Second, the innovation aspect of teaching mode. Further research can be conducted on how to better utilize the functions of the intelligent language laboratory, innovate the teaching mode and improve the teaching effect. For example, explore the application of project-based learning, problem-oriented learning and other teaching modes in language teaching to cultivate students' independent learning ability and innovative thinking. Third, the aspect of improving the evaluation system. Although the current paperless examination has improved the validity and credibility of the examination, there is still much room for improvement in the improvement of the evaluation system. By strengthening technical research and development, expanding the evaluation system, strengthening the security and confidentiality of the examination and encouraging teachers to actively participate in other measures, the evaluation system of paperless examination can be further improved to better serve the development of education.

## References

- [1] M.H.Zhu: Minghui. Networked Digital Language Laboratory and Foreign Language Teaching. Journal of Anhui University of Technology (Social Science Edition), Vol. 26 (2009) No.1, p125-126.
- [2] T.K.Liu: The use of network digital language laboratory to improve the independent learning ability of college students in English. Journal of Hulunbeier College, Vol. 17 (2009) No.6, p103-105+98.
- [3] Y.F.Zeng: Enhancing the Application and Management of Intelligent Language Laboratory. Education Teaching Forum, (2010) No.19, p236-237. 2010-07-05.
- [4] L. Wang: The application of intelligent language laboratory in foreign language teaching. Science and Technology Information, (2011) No.18, p187-188.
- [5] H.Y.Yang, L.Yu: Construction and management of digital network language laboratory. Experimental Science and Technology, Vol. 12 (2014) No.2, p194-196.
- [6] L.Zhou: Exploring the digital time and space of language teaching. Journal of Huaihua College (Natural Science), (2006) No.5, p 61-62.
- [7] X.K.Zhang: Talking about the construction of multimedia network digital speech laboratory. Information Technology, (2006) No.7, p 76-77+81.
- [8] [Digital language laboratory management essay: Talking about the development and management of digital language laboratory. Information on: (<https://www.doc88.com/p-9035222754597.html>). 2020.
- [9] P. B.Leung: A preliminary study of digital language teaching environment, Journal of Guangdong Institute of Economics and Management, (2004) No.5, p92-96.
- [10] Q.Yu, H.L. Liu, M.G.Pan, L.F.Xu: An investigation on the application of catechism in the teaching of college language in higher vocational medicine. Chinese character culture, (2022) No.S1, p98-100+116.
- [11] Y.F.Chen: Open construction of language laboratories in colleges and universities in the twenty-first century. Modern Educational Technology, (2004) No.5, p 68-70+74.
- [12] H.T.Wei: Innovation of the training method of law graduate students--the combination of advantageous teaching method and team study method. Research on Graduate Education, (2014) No.2, p 43-47.

- [13] Z.G.Yang: The integration strategy of elementary school language teaching and information technology under the background of new curriculum reform. *Enlightenment and Wisdom (above)*, (2023) No.10, p 42-44.
- [14] X.Zhong: Research on the optimization management problems of language laboratories in colleges and universities [J]. *University Education*, (2023) No.1, pp 10-12.
- [15] An Introduction to the Digital Management of Digital Network Language Laboratory. Information on: (<https://www.yjbys.com/bylw/lunwenfanwen/18228.html>).2017.
- [16] J.Liu, H.Q.Qiao, X.L.Cao: Discussion on the digital management of digital network language laboratory... *Going Abroad and Employment (Employment Edition)*, (2011) No.18, p 105-106.
- [17] W.C.Chen, W.B.Jiang: The application of experiential teaching in secondary school English teaching, *China Education Technology Equipment*, (2013) No.16, p 14-16.
- [18] Xing Zhong: Challenges and Strategies for Improving Digital Literacy of Language Lab Teachers[J]. *International Journal of Social Science and Education Research*, Vol.6 (2023) No.8, pp205-211.
- [19] Y.T.Zhu: Contextualization. The integration of parts of speech. The teaching of Grade 9 Unit 5 Art world as an example. *New Curriculum*, (2024) No.11, p73-75.
- [20] L.Y.Zong: Cultivating the ability of word-wheel switching in elementary school English teaching. *Proceedings of the Sixth Academic Forum on Life Education 2023. Conference Proceedings*. p763-766.
- [21] P.Z.Cheng: Analysis of cooperative group learning strategies in junior high school English efficient classroom. *Campus English*, (2024) No.34, p 154-156.
- [22] X.Zhong: Exploring the Practical Teaching Mode of Language Laboratory Based on Artificial Intelligence [J]. *International Journal of Education and Humanities*, Vol.16(2024)No.3, pp24-29.
- [23] K.Q.Wang: The effective use of dialogic teaching in high school history teaching. *Chinese loose-leaf anthology (Teacher's Edition)*, (2023) No.16, p 130-132.
- [24] X.M.Fan: Exploring the teaching path of group reading in high school language under the perspective of unit teaching. *Seeking Knowledge Guide*, (2024) No.15, p 47-49+52.
- [25] W. Y. Zhang: Reforming the examination mode and constructing a paperless examination platform, *Journal of language and literature (foreign language education and teaching)*, (2010) No.5, p 134-135.
- [26] R.Chen: The integrated application of information technology in the interactive teaching of college English. *Science and Technology Perspectives*, (2013) No.13, p 26+16.
- [27] X.A.Sun: Exploration and reflection of medical English informatization teaching mode, *Journal of Chifeng College (Chinese Philosophy and Social Science Edition)*, Vol. 42 (2021) No.6, p 91-94.
- [28] X.C.Wang: Confusion and countermeasures in the implementation of information technology programs. *Information technology education in primary and secondary schools*, (2022) No.12, p52-54.
- [29] H.T.Duan: Analysis of the application of modern educational technology in computer teaching in colleges and universities. *Information Systems Engineering*, (2024) No.9, p 165-168.
- [30] X.Zhong: Trends and prospects for the use of AI technology in language courses[J]. *Journal of Education and Educational Research*, Vol.8 (2024)No.2, pp99-102.
- [31] Q.Huang: Effective application of digital network voice room in language teaching. *Gansu Science and Technology* Vol.28, 2012, No.17, p86-88.
- [32] Y.J. Song: Discussion on the difficulties and countermeasures of Chinese language learning for Laotian zero-start students ( MS., Soochow University, China 2016).
- [33] X.Zhong: Research on the Concept, Architecture and Construction Strategy of Intelligent Language Laboratory[J]. *Academic Journal of Science and Technology*, Vol.11 (2024) No.1, pp257-264.