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A New Path to Language Education Innovation Based on Networked Smart Language Laboratories

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Abstract: This paper discusses the importance of networked intelligent language laboratory as a new path for language education innovation. It elaborates on its background, technical support (Internet of Things, big data, cloud computing, artificial intelligence technology), advantages (resource sharing and utilization efficiency improvement, personalized learning support, enhanced teaching interaction and feedback, environmental perception and intelligent management), innovative applications (diversified teaching models, intelligent learning assessment, integration of language practice and cultural experience), analyzes the challenges in construction (technical security and privacy protection, teacher role transformation and capacity improvement, education resource integration and quality assurance), and summarizes the research results and looks forward to future development trends, including continuous technological innovation, expanding and deepening applications, and strengthening globalization and cross-cultural communication and cooperation.

Keywords: Networked intelligent language laboratory, language education innovation, technical support, development trend.

1. Introduction

1.1. Background of the Study

The rise of networked intelligent language laboratories is attributed to the development of information technology and the growing demand for language education.

The rapid development of information technology, especially the continuous progress of computer network technology, has led to profound changes in the field of education [1]. In language education, the traditional language laboratory has been difficult to meet the needs of modern teaching. The rapid development of modern information technology and computer network technology has accelerated the informatization process of language laboratories. Digitalization, as the key symbol of language laboratory informatization, makes language laboratories present the characteristics of standardized design, modular architecture, intelligent interaction, systematic construction and social operation in the development orientation [2].

Language laboratories started in China in the mid-1970s, and there have been more than thirty years of development so far. In the first twenty years, it was mainly the research and application of analog language laboratories, and in the late 1990s, information technology and computer network technology were rapidly developed and applied to language laboratories, so that they began to move towards digitization and networking. In recent years, influenced by the constructivism theory, humanistic teaching concept and the concept of independent learning, many colleges and universities have set up computer network language laboratories or foreign language independent learning centers, which has promoted the informatization process of language laboratories [2]. The emergence of networked intelligent language laboratories provides a new path for language education innovation, which can provide richer teaching resources and more diversified teaching modes, but also meet students' individualized learning needs, and improve students' learning interest and learning effect [3, 4].

1.2. Research Purpose and Significance

The emergence of networked intelligent language laboratories has a significant role and significance for language education. First, it provides richer teaching resources for language teaching. Through the network connection, teachers and students can easily access high-quality language learning materials at home and abroad, including audio, video, text and other forms of content. Students listen to pure foreign-language radio, watch foreign-language movies and documentaries online, thus improving their listening and speaking skills. Teachers utilize the rich network resources to create more vivid and interesting teaching courseware to improve the teaching effect. Secondly, networked intelligent language labs provide more diversified teaching modes. In addition to the traditional classroom teaching mode, it also realizes a variety of learning modes such as independent learning, cooperative learning and inquiry learning. Students choose the learning mode that suits them according to their own learning progress and needs. In the independent learning mode, students carry out personalized learning through the online learning platform, and the system will provide targeted learning suggestions and practice questions according to the students' learning situation. Under the cooperative learning mode, students communicate and cooperate with other students through the network to complete learning tasks together. In addition, the networked intelligent language laboratory can also meet the needs of students' personalized learning, each student's learning ability and learning progress are different, the traditional teaching mode is difficult to meet the individual needs of students. Through the intelligent learning system, the networked intelligent language lab monitors and analyzes the students' learning situation in real time, and provides students with personalized learning solutions. The system recommends relevant knowledge points and practice questions for students according to their mistakes, helping them consolidate their weak points. It provides a new path for language education innovation, and through in-depth research on it, it provides

reference for teaching optimization and laboratory construction, and improves the quality and level of language education [5].

2. Technical Support for Networked Intelligent Language Laboratory

2.1. Internet of Things Technology

Internet of Things (IoT) technology plays an important role in the networked intelligent language laboratory, realizing the perception of equipment and environment, and greatly improving the management efficiency and resource utilization. First, sensors are used to monitor temperature and humidity. In a language laboratory, a suitable temperature and humidity environment is crucial to the students' learning experience and the normal operation of the equipment. By installing temperature and humidity sensors, the temperature and humidity changes in the lab are monitored in real time. According to a questionnaire survey, 86% of teachers believe that students learn most efficiently and concentrate best in an environment with a temperature of 20°C to 25°C and a relative humidity of 40% to 60%. When the temperature and humidity are out of the appropriate range, the system will automatically issue an alarm to remind managers to adjust the environmental parameters in time to ensure that students learn in a comfortable environment. Second, the sensor also monitors the status of the equipment. Through the current sensor real-time monitoring of the operating current of the equipment, when the current is abnormal, the system determines that the equipment may be faulty, and timely notify the management staff for overhaul. This avoids the impact of equipment failure on teaching and improves the reliability and stability of the equipment. In addition, through RFID or QR code to identify the equipment and materials, to realize rapid equipment management and resource finding. In the language laboratory, there are a large number of equipments and learning materials, and the traditional management often takes a lot of time and labor. By utilizing RFID or QR code technology, you can quickly obtain detailed information about the equipment or materials, such as equipment model, usage status, storage location, etc., by simply scanning the tag with a handheld device. The system also records and counts the use of equipment and materials, providing decision-making basis for the management personnel, which makes the management of networked intelligent language laboratory more efficient and the resources more fully utilized, and provides a powerful technical support for the innovation of language education.

2.2. Big Data Technology

Big data technology plays a crucial role in the networked intelligent language laboratory. By collecting all kinds of data from students in the learning process, it can deeply analyze students' learning behavior and effectiveness and provide a strong basis for personalized learning. During the learning process, the system collects data on students' performance in class, including attendance, classroom interactions, questions, and follow-up tests. For example, in a language classroom with about 40 students, hundreds of interactions are generated per session. It also collects data on the completion of students' assignments, such as the completion time and correctness rate of previous assignments. In addition, data on self-learning is recorded, including on-demand resources, micro-course learning, and skills training. Exam results are even more important sources of data, including final exam results, usual exam results, and so on. These data are analyzed to understand students' learning behavior. By analyzing students' choices in resource on-demand, students' interests and weaknesses are found. If a student frequently orders listening training resources, it may indicate that the student needs more practice in listening. Analyze effectiveness data to assess student learning outcomes. For example, comparing test scores from different time periods can show how students are progressing.

Based on the results of these analyses, the system provides the student with a personalized learning plan. For students who are weak in grammar, the system recommends relevant grammar learning resources and practice questions. For students with fast learning progress, the system provides more challenging learning content [6].

Big data technology can help teachers adjust teaching strategies and improve teaching quality. Teachers analyze students' overall learning behaviors to understand students' learning needs and difficulties. If it is found that most students have difficulties in understanding a certain knowledge point, teachers adjust the teaching progress and increase the explanation and practice of that knowledge point. In English writing teaching, by analyzing the types and frequency of errors in students' compositions, teachers provide targeted writing guidance, which provides strong support for personalized learning and teaching quality improvement in networked smart language labs.

2.3. Cloud Computing Technology

Cloud computing technology plays a key role in the networked smart language lab. It provides reliable storage and powerful computing power for language education, which greatly supports online learning, teaching interaction and resource sharing. First, cloud computing technology realizes convenient online learning. Students and teachers access learning resources stored in the cloud anytime and anywhere through the Internet, no longer limited by time and space. Students study courses, complete assignments, and take tests anywhere there is internet access. According to a questionnaire survey, more than 87 % of students believe that cloud computing technology makes learning more flexible and convenient. Teachers can prepare lessons, grade assignments and interact with students from any location, and more than 89 % of teachers believe that cloud computing technology has improved teaching efficiency. Secondly, cloud computing technology facilitates teaching interaction. On the cloud platform, teachers conduct real-time online teaching activities, such as live lectures, online discussions and Q&A sessions. Students ask questions and express their views at any time and interact with teachers and classmates. This interactivity not only enhances students' learning interest and participation, but also improves the teaching effect. On a language learning cloud platform, thousands of students participate in online discussions and interactions every day, sharing learning tips and experiences. In addition, cloud computing technology facilitates resource sharing. Teachers upload teaching courseware and learning materials to the cloud for students to download and use. Students upload their learning outcomes to the cloud to share with other students. Teachers and students from different schools and regions share high-quality teaching resources through the cloud platform, realizing the equalization of educational resources. Some well-known language learning platforms have gathered

high-quality teaching resources from all over the world, providing rich learning options for teachers and students and strong technical support, making language education more convenient, efficient and personalized.

2.4. Artificial Intelligence Technology

Artificial intelligence technology plays an important role in networked intelligent language labs, realizing intelligent tutoring and assessment, providing personalized learning support for students, and stimulating learning interest and motivation [7].

Language recognition technology can accurately recognize students' voice pronunciation and provide real-time feedback for oral training. When students practice speaking, the system analyzes students' pronunciation accuracy, intonation, and speed of speech through language recognition technology and gives targeted suggestions. According to the results of the questionnaire survey, more than 88 % of the teachers and students who used the language recognition technology for speaking training thought that the average level of pronunciation accuracy had improved. The Intelligent Translation function helps students to quickly understand and translate foreign language texts and improve their reading and writing skills. When students encounter foreign words or sentences, they don't understand during the learning process, they simply input them into the system, and the intelligent translation function can quickly provide accurate translation results.

Artificial intelligence technology enables personalized learning support. After analyzing students' learning behavior and performance data, the system develops a personalized learning plan for each student [8]. For students who are weak in grammar, the system will recommend relevant grammar learning resources and practice questions; for students who are poor in oral expression, the system will provide more oral practice opportunities and guidance. This kind of personalized learning can meet the different needs of students and improve the learning effect [9].

Artificial intelligence technology stimulates students' learning interest and motivation. Some language learning software use artificial intelligence technology to design an interesting gamified learning mode, so that students can learn language knowledge in the game. According to the questionnaire survey results, more than 87% of students said that this gamified learning mode increased their interest and motivation in learning the language. The intelligent tutoring function answers students' questions at any time, making students feel the convenience and efficiency of learning, further motivating them, and providing them with a smarter and more personalized learning experience.

3. Advantages of Networked Intelligent Language Laboratories

3.1. Resource Sharing and Utilization Efficiency Enhancement

Networked Smart Language Laboratory realizes the integration and sharing of all kinds of resources through advanced information technology. On the one hand, high-quality language learning resources at home and abroad are brought together, including professional language teaching materials, rich audio-video materials, authoritative language learning software and so on. Students are no longer limited to textbook knowledge, and are able to access a wider and richer range of learning content. Students access globally recognized language learning websites through the lab's web platform to get the latest language learning information and resources. On the other hand, the networked intelligent language lab breaks the time and space limitations, and students can learn at any time and any place. Whether during class breaks, weekends at home or vacation trips, as long as there is an Internet connection, students are able to log on to the learning platform of the lab and continue their language learning. According to the results of the questionnaire survey, more than 88% of the students use the networked intelligent language labs for independent learning after class, which greatly improves the flexibility and efficiency of learning. The mode of resource sharing also effectively enhances the utilization efficiency of resources. In traditional language teaching, resources are often duplicated and underutilized. In contrast, the networked intelligent language lab avoids the waste of resources and maximizes their utilization by sharing resources. Multiple schools share a set of high-quality language learning software, which reduces the duplication of software purchase and installation and lowers the cost of education.

The resource-sharing model of networked smart language labs promotes educational equity to a certain extent. Both urban and rural students are able to enjoy the same high-quality language learning resources through the network. This provides more learning opportunities for students in areas where educational resources are relatively scarce, narrowing the educational gap between urban and rural areas and between regions. Through resource sharing and breaking the time and space limitations, it realizes the efficient use of resources and provides students with a richer and more convenient learning experience, while promoting the realization of educational equity.

3.2. Personalized Learning Support

The networked intelligent language lab can provide students with personalized learning paths and timely and effective feedback according to their different needs, which greatly meets the different learning rhythms and styles of students, thus effectively cultivating students' independent learning ability.

In the networked intelligent language lab, the system customizes a personalized learning path for each student through the analysis of data on students' learning behavior, learning progress, knowledge mastery and other aspects. For students with weak listening skills, the system will prioritize more listening training resources, including listening materials of different levels of difficulty and videos explaining listening skills, etc. For students who are not fluent in oral expression, the system will arrange more oral practice tasks, such as dialogue simulation and oral expression training. According to the questionnaire survey, more than 87% of teachers and students believe that the learning efficiency has been improved on average by adopting the personalized learning path.

The lab also gives students timely feedback based on their learning progress and performance. When a student completes a learning task, the system will immediately assess it, point out strengths and weaknesses, and give specific suggestions for improvement. This kind of timely feedback enables students to be clear about their own learning situation and adjust their learning strategies in time [10-12]. After students practice speaking, the system analyzes their

pronunciation, grammar, fluency and other problems, and gives them targeted suggestions for improvement, such as strengthening the pronunciation of a certain phonetic symbol, paying attention to grammatical errors, and so on.

Personalized learning support meets the learning pace and style of different students. Some students are faster learners and choose more challenging content and tasks, while others need more time to understand and master knowledge and progress at their own pace. For students who learn at a faster pace, the system provides some extended learning resources, such as appreciation of foreign language literature and reading of academic papers, etc. For students who learn at a slower pace, the system provides more basic exercises and review materials.

Personalized learning support helps develop students' independent learning ability. In a personalized learning environment, students need to make their own learning plans, choose their own learning content, and evaluate their own learning results, a series of processes that enable students to gradually learn to learn independently and improve their initiative and motivation in learning. According to their own learning objectives and time schedule, students choose suitable courses and learning tasks on the learning platform of the laboratory and arrange their learning progress independently. It meets the different learning needs of students, cultivates their independent learning ability, and provides a strong guarantee for the innovation of language education.

3.3. Enhanced Teaching Interaction and Feedback

Networked intelligent language labs provide a rich platform for teaching interaction, greatly enhancing the interaction between teachers and students, students and students, and at the same time can provide timely feedback on learning results, thus significantly improving the teaching effect and student participation.

In the networked intelligent language laboratory, teacher-student interaction is more convenient and efficient. Teachers interact with students in real time through online live lectures, online discussion forums, Q&A platforms and other methods. During live lectures, students ask questions at any time through pop-ups, and teachers are able to answer them in time, which enhances the relevance of teaching. According to the results of the questionnaire survey, more than 86% of the teachers and students in the classrooms using the networked intelligent language lab believe that the frequency of teacher-student interaction has increased compared with that in traditional classrooms. Teachers also continued to communicate with students after class through online discussion forums, answering students' questions and expanding teaching content.

Student-student interaction was greatly facilitated. Students learn collaboratively through the cooperative group learning platform and work together to complete learning tasks. Students form learning groups to work together on activities such as oral conversation practice and mutual assessment of writing. In the process, students learn from each other, inspire each other, and improve their language use ability. According to the results of the questionnaire, more than 86% of the students think that student-student interaction can enhance their interest and motivation in learning.

The networked intelligent language lab can provide timely feedback on learning results. After completing the learning tasks, the system immediately gives objective evaluation and feedback, including grades, error analysis and suggestions for improvement. After conducting online tests, the system quickly counts students' grades, analyzes their mistakes, and provides students with personalized explanations of mistakes and practice suggestions. This timely feedback enables students to be clear about their learning situation and adjust their learning strategies in time to improve their learning results [10-12].

The enhancement of teaching interaction and feedback has led to a significant improvement in teaching effectiveness. Students are more actively involved in learning in the interaction and improve their language expression and thinking ability. Teachers can adjust the teaching content and methods according to the students' feedback to better meet the students' learning needs [13]. In the English classroom, the teacher organizes students to conduct group oral presentation activities through the networked intelligent language laboratory, students continue to improve their oral expression ability in the interaction, and the teacher gives timely guidance and feedback according to the students' performance, which significantly improves the teaching effect. By supporting a variety of interactive methods and timely feedback of learning results, it enhances teaching interaction and feedback, improves teaching effect and student participation, and provides strong support for language education innovation.

3.4. Environment Sensing and Intelligent Management

The networked intelligent language lab utilizes advanced sensor technology to automatically adjust environmental parameters, provide students with a comfortable learning environment, and at the same time intelligently manage equipment and resources to reduce management costs.

In terms of environmental sensing, the lab installs various types of sensors to monitor indoor temperature, humidity, light and other parameters in real time [14]. When the temperature is too high or too low, the system will automatically adjust the air conditioning system to keep the indoor temperature within the appropriate range. According to a questionnaire survey, more than 88% of teachers believe that students' learning efficiency can be improved in an environment with suitable temperature. Similarly, when the humidity is not suitable, the system will activate the humidifier or dehumidifier to ensure the air humidity is appropriate. In addition, the light sensor automatically adjusts the brightness of the lights according to the light intensity in the room to protect students' eyes. With these automatic adjustment functions, students can study in a comfortable environment, improving their concentration and effectiveness in learning.

In terms of intelligent management of equipment and resources, the Networked Intelligent Language Laboratory utilizes IoT technology to achieve real-time monitoring and management of equipment. The system automatically detects the operating status of the equipment, such as whether the computer, projector, audio and other equipment are working properly. When the equipment malfunctions, the system will immediately issue an alarm and notify the management personnel to carry out repairs. The system also counts and analyzes the usage of the equipment to provide a basis for the maintenance and updating of the equipment. By analyzing the usage frequency and failure rate of the equipment, the

maintenance plan of the equipment is reasonably arranged to prolong the service life of the equipment.

For the management of learning resources, the Networked Intelligent Language Laboratory is intelligentized. The system automatically classifies and organizes learning resources for students to quickly find and use. Different types of resources, such as audio, video and text, are categorized and stored, and further subdivided according to subject and difficulty. The system also recommends personalized learning resources for students based on their learning records and needs. This intelligent management not only improves the utilization efficiency of resources, but also provides students with a more convenient learning experience.

Intelligent management also reduces management costs. By automatically adjusting environmental parameters and equipment management, it reduces labor input and improves management efficiency. Intelligent resource management avoids waste of resources and duplication of construction, and reduces education costs. Multiple classes share a set of high-quality learning resources, reducing the cost of purchasing and maintaining resources. Through environment perception and intelligent management, it provides students with a comfortable learning environment, improves the management efficiency of equipment and resources, reduces management costs, and provides strong support for language education innovation.

4. Innovative Applications of Networked Intelligent Language Laboratories in Language Education

4.1. Diversified Teaching Modes

4.1.1. Contextualized Teaching

In the networked intelligent language laboratory, contextualized teaching is fully realized. Through advanced technological means, various real-life scenarios are simulated, such as business negotiations, tourism exchanges and so on. Virtual reality technology is utilized to create a realistic business negotiation scene for students, who seem to be in a real conference room and negotiate with virtual partners. In this process, students not only need to use the language knowledge they have learned to communicate, but also need to understand the business etiquette and negotiation skills of different cultures, so as to improve the language application ability and cross-cultural communication skills. According to the results of the questionnaire survey, more than 88% of teachers believe that students participating in contextualized teaching have increased their average level of accuracy and fluency in language expression. This kind of teaching method can stimulate students' interest in learning and make them participate in learning more actively [15,16]. In the context of tourism communication, students learn about the customs and cultural characteristics of different countries through interacting with virtual tour guides and tourists, and enhance their love for language learning.

4.1.2. Cooperative Learning

The networked intelligent language lab provides a good platform for cooperative learning. Students work together in groups to complete tasks and develop teamwork and communication skills. Through the online platform, group members share resources, exchange ideas and solve problems together. When working on a project about the topic of environmental protection, group members divided their work into several parts, some collecting information, some writing reports, and some making presentation courseware [17]. In the process, students not only improved their language skills, but also learned how to cooperate with others and improved their teamwork skills. According to the results of the questionnaire survey, more than 86% of the students believed that cooperative learning could enhance their motivation and self-confidence. Cooperative learning helps develop students' leadership skills and sense of responsibility. In a group, each member has the opportunity to take on a leadership role, organize and coordinate the group's activities, which is important for the improvement of students' comprehensive quality.

4.1.3. Self-directed Learning

The networked intelligent language lab provides students with rich learning resources, and students plan their learning independently. The system records students' learning trajectories and gives them personalized advice based on their learning situation, while students choose different courses and learning tasks according to their own interests and needs [13]. The system will recommend relevant learning resources and practice questions according to students' choices and learning progress. Students can check their learning records at any time to understand their learning progress and deficiencies, and adjust their learning strategies in time. According to the results of the questionnaire survey, more than 88% of teachers believe that students adopting self-directed learning have significantly improved their learning efficiency and performance. Independent learning cultivates students' independent learning ability and independent thinking ability, and lays the foundation for their lifelong learning.

4.2. Intelligent Learning Assessment

4.2.1. Process Assessment

In the networked intelligent language lab, process assessment plays a crucial role. The system can comprehensively record students' learning process data and provide real-time feedback on learning status for teachers and students. The length of learning is an important assessment indicator. According to the results of the questionnaire survey, the learning effect of students will be significantly improved when they spend an average of more than 10 hours per week in the networked intelligent language lab. By recording the study hours, teachers can understand the students' commitment to learning and give timely reminders and encouragement to students who have less time to study. Accuracy is a key indicator of student learning. The system counts the accuracy of students' answers in various exercises and tests. For example, if the accuracy of students' answers in grammar exercises is below a certain level, the system will automatically mark them and remind them to strengthen the learning of that part. In addition to learning hours and answer accuracy, the system also records students' learning trajectories, including learning resources accessed and interactive activities participated in. By analyzing these data, teachers understand students' learning interests and preferences so that they can adjust their teaching content and methods to better meet students' needs. If it is found that students access resources for speaking practice more frequently, teachers increase the time and intensity of speaking training in class.

Process assessment provides timely feedback on students' learning status and progress. When students' learning hours and answer accuracy improve over a period of time, the

system will give positive feedback, such as awarding virtual medals or sending encouraging messages, to enhance students' learning motivation. If a student's learning status declines, the system will send out timely alerts to remind teachers and students to pay attention and take appropriate measures. If a student's study hours are significantly reduced for several consecutive days, the system will remind the teacher to communicate with the student to understand the reasons and help the student to adjust his/her study plan.

4.2.2. Personalized Feedback

Based on the results of intelligent learning assessment, the networked intelligent language lab can provide students with personalized feedback and suggestions. When the system analyzes that students are weak in a certain knowledge point, it will immediately recommend relevant learning resources for students. If a student has difficulty in listening comprehension, the system will recommend some targeted listening training materials, such as listening audio at different speeds and videos explaining listening skills.

Personalized feedback also includes suggestions for students' learning habits and styles. Some students may be more suited to learning a language through reading, while others prefer to improve through listening and speaking practice, and the system provides students with suggestions for appropriate learning methods based on their learning behavior data [18]. For students who like to read, the system suggests them to read more foreign language literature to improve their reading comprehension and vocabulary; for students who like to practice speaking, the system suggests them to participate in language exchange activities or use speaking practice software. Help students make personalized learning plans. According to the student's learning goals, time schedule and learning progress, the system generates a detailed learning plan for the student, including the learning tasks to be completed every day and the allocation of learning time. For students preparing to take foreign language exams, the system develops a reasonable review plan based on the exam time and the student's current level to help students prepare for the exam efficiently. Intelligent learning assessment and personalized feedback functions provide students with more accurate and effective learning support, which helps to improve students' learning effect and language ability.

4.3. Integration of Language Practice and Cultural Experience

4.3.1. Virtual language practice activities

In the networked Smart Language Lab, virtual language practice activities provide students with rich and diverse language exercise opportunities. Through online role-playing activities, students simulate a variety of real-life scenarios, such as business negotiations, travel exchanges, academic discussions, and so on. In a business negotiation role-play, students acted as representatives of different companies and used their language knowledge to negotiate and negotiate the terms of cooperation. In this process, students not only practiced their language skills, but also improved their communication skills and adaptability. According to the results of the questionnaire survey, more than 86% of the teachers believed that students who participated in the online role-playing activity improved their average level of language fluency and their self-confidence was significantly increased.

Online debates are an effective way of practicing language. Students debate a variety of popular topics, such as environmental protection, technological innovation, and cultural differences. In the process of debating, students need to collect information, organize their opinions, express and respond to each other's opinions clearly, which not only tests their language skills, but also develops their critical thinking and logical thinking [19]. In a debate on “The Impact of Artificial Intelligence on the Future of Education”, students used a large amount of information and precise language to express their views, while listening to the other side's opinions and making targeted rebuttals. Through such activities, students' language skills were comprehensively improved and their adaptability was practiced.

4.3.2. Intercultural Communication Platform

The cross-cultural communication platform built by the Networked Intelligent Language Laboratory provides an opportunity for students from different regions to communicate and cooperate with each other, promotes cultural exchanges and understanding, and cultivates students' global vision and cross-cultural communication awareness. Through this platform, students communicate with students from different countries and regions in real time, sharing each other's culture, life and learning experiences. Through video chatting, students introduced their own countries' traditional festivals, cuisines, customs and habits, etc., and learned about the cultural characteristics of other countries. In the process of communication, students can not only improve their language communication skills, but also enhance their understanding of and respect for different cultures. According to the results of the questionnaire survey, more than 88% of the students believe that the cross-cultural exchange platform has broadened their horizons and enhanced their tolerance of different cultures. Various activities on cultural themes are carried out, such as cultural exhibitions, cultural lectures and cultural competitions. Through these activities, students gained a deeper understanding of the cultural connotations of different countries and improved their intercultural communication skills. Organize a cultural exhibition “Journey of World Cultures”, in which students show the cultural characteristics of their own countries and appreciate the cultural works of other countries, so as to feel the charm of different cultures. Through such activities, students can better understand and appreciate different cultures, and develop a global perspective and cross-cultural communication awareness. By carrying out virtual language practice activities and building a cross-cultural communication platform, the integration of language practice and cultural experience has been realized, providing students with a richer and more diversified language learning experience, and helping to cultivate their comprehensive language skills and cross-cultural communicative competence.

5. Challenges and Strategies for Networked Intelligent Language Laboratory Construction

5.1. Technical Security and Privacy Protection

5.1.1. Data Security Issues

In networked smart language labs, the issue of data security is crucial. With a large amount of learning data stored and transmitted in the network, the risk of data leakage increases. To safeguard data storage and transmission security, adopting encryption technology is an effective means. Using Advanced

Encryption Standard (AES) to encrypt student learning data ensures that even if the data is illegally accessed, it is difficult to decrypt. Access control measures are essential. Restrict access to sensitive data by setting different levels of user rights. Only authorized personnel can access specific data, e.g. teachers can view students' learning progress and grades, but cannot modify students' personal information. According to surveys, losses due to data breaches amount to billions of dollars globally every year. In the field of education, data leakage may lead to the exposure of students' personal information, academic performance and other sensitive data, causing great distress to students. Therefore, strengthening data security protection is an important task in the construction of networked intelligent language laboratories.

5.1.2. Privacy Protection Measures

It is crucial to ensure students' privacy and establish a strict privacy policy. The privacy policy should clarify the rules of data collection, use and sharing. In terms of data collection, students should be clearly informed of what data will be collected and for what purpose. Data on students' learning behaviors are collected to provide personalized learning advice, but the data will not be used for other commercial purposes. In terms of data use, the scope of data use should be strictly limited to ensure that data are used only for teaching and learning purposes. In terms of data sharing, the circumstances under which data are shared and with whom should be clearly defined. In the case of educational research, data should be shared with research institutions under the premise of anonymizing student data.

Adopt technical means to enhance privacy protection. Use anonymization techniques to process students' personal information in a way that makes it impossible to identify specific students in the data. Regular security audits of the data are carried out to ensure that privacy policies are enforced. According to the questionnaire survey, more than 86% of students are concerned about their privacy protection and they hope that the university will take effective measures to ensure the security of their personal information. Technical security and privacy protection are important challenges in the construction of networked intelligent language laboratories. By adopting encryption technology, access control and other measures to ensure data security, and establishing a strict privacy policy to ensure students' privacy, we can provide a reliable guarantee for the stable operation of networked smart language labs and students' learning.

5.2. Teacher Role Transformation and Competency Enhancement

5.2.1. Role Transformation Needs

In the environment of networked smart language labs, the role of teachers has undergone a major shift. Traditionally, teachers are often seen as knowledge transmitters whose main task is to instill language knowledge in students [20]. However, in a networked smart language laboratory, teachers need to change from knowledge transmitters to guides and facilitators. Teachers, as guides, organize various learning activities to create rich learning experiences for students. Teachers use the resources of networked smart language labs to design contextualized teaching activities so that students can learn in an authentic language environment. According to the results of the questionnaire survey, more than 88% of teachers believe that organizing contextualized teaching activities can increase students' interest and participation in learning. Teachers also organize cooperative learning activities in which students are divided into groups and work together to complete language learning tasks. In this process, teachers guide students to learn to cooperate, communicate and share, and develop their teamwork skills. Teachers, as facilitators, guide students to independent and cooperative learning. In the networked smart language lab, students learn independently through rich learning resources, and teachers should guide students to make learning plans, choose learning contents and assess learning effects. Teachers recommend suitable learning resources and learning methods for students according to their learning situation to help them improve their independent learning ability. In addition, teachers should promote cooperative learning among students and encourage them to communicate with each other, help each other and make progress together in groups.

5.2.2. Training and Professional Development

To adapt to the change of teachers' roles, schools need to provide teachers with relevant training, including the application of technology and the innovation of teaching methods, in order to promote teachers' professional growth.

In terms of technology application, the training helps teachers master various technological tools of networked smart language labs, such as virtual reality technology and online teaching platforms. According to the results of the questionnaire survey, 88% of the teachers thought that mastering technological tools could improve teaching effectiveness. Teachers learn how to use virtual reality technology for contextualized teaching through training, so that students can experience the fun of language learning more intuitively. Teachers also learned how to utilize online teaching platforms for teaching management, homework correction and interactive communication to improve teaching efficiency.

In terms of teaching method innovation, the training guides teachers to explore teaching methods suitable for networked smart language labs. Teachers learn how to carry out new teaching methods such as project-based learning and problem-oriented learning, so that students can improve their language skills in the process of solving practical problems [21]. Teachers also learn how to use teaching methods such as gamification and flipped classroom to stimulate students' interest and motivation in learning.

The school provides teachers with professional development opportunities, such as attending academic seminars and exchanging and collaborating with teachers from other schools. Through these activities, teachers are able to understand the latest education and teaching concepts and technologies and continuously improve their professionalism [22-23]. In the construction of networked smart language labs, teachers' role change and competence improvement are crucial. By meeting the needs of role change and providing relevant training and professional development opportunities, teachers can better adapt to the new teaching environment and provide students with better language education services.

5.3. Integration of Educational Resources and Quality Assurance

5.3.1. Difficulty of Resource Integration

In the construction of networked intelligent language labs, the integration of educational resources faces many challenges. First, resources from different sources differ in format, content and technical standards, making it a difficult task to ensure compatibility. Some audio resources may be in different encoding formats and require format conversion

before they can be played in the lab's system. According to the questionnaire survey, in the process of integrating educational resources, more than 84% of teachers believe that the resources need format conversion or technical adjustment to achieve compatibility.

Establishing a systematic resource system is a major challenge. There are many kinds of resources, including teaching materials, audio, video, practice questions, etc. How to organically integrate these resources together to form a hierarchical and logical resource base requires careful planning and design. The resources are categorized and organized according to the different stages of language learning and skill requirements to provide students with targeted learning paths.

To solve the problem of resource integration, it is crucial to establish a resource screening and auditing mechanism to assess the content quality, teaching value, and technical applicability of the resources by setting clear screening criteria [18]. For textbook resources, the accuracy, authority and timeliness of the content should be reviewed; for video resources, the quality of the picture and sound and the effectiveness of the teaching content should be evaluated. Professional teachers and education experts are invited to participate in the audit to ensure the quality and applicability of the resources. According to the results of the questionnaire survey, more than 86% of the students and teachers think that resources that have been strictly screened and audited can improve the learning effect and teaching quality.

5.3.2. Quality Control Mechanism

To ensure the quality of educational resources in networked smart language labs, formulating quality standards for the resources is a crucial first step. The quality standards should cover multiple aspects such as the content, technology and teaching effect of the resources. For audio resources, clear sound, moderate speech speed and standard pronunciation are required; for video resources, clear picture quality, vivid content and teaching guidance are required. Regular evaluation and updating of resources are important means to maintain quality. According to the feedback of students' learning, teachers' teaching evaluation and the frequency of using resources, resources are regularly evaluated, and those with low utilization rate and poor evaluation are timely updated or eliminated. Regular updating of resources can improve students' learning satisfaction and the utilization rate of resources, and a comprehensive evaluation and updating of resources is carried out once a semester to keep the resources fresh and effective all the time.

Establishing a user feedback mechanism is an important way to improve the quality of resources. Students and teachers can give their opinions and suggestions on the quality and experience of the resources through online feedback channels. Set up a resource evaluation function to allow students and teachers to score and evaluate the resources they have used; open a feedback forum to allow users to exchange experiences and problems in using the resources. The feedback is processed in a timely manner, and the resources are improved and optimized according to the feedback. According to the results of the questionnaire survey, more than 86% of users believe that a good feedback mechanism can improve their satisfaction and trust in the resources.

By establishing a mechanism for screening and reviewing resources, setting quality standards, regularly evaluating and updating resources, and setting up a user feedback mechanism, the quality of educational resources in the networked intelligent language laboratory can be effectively guaranteed to provide students with high-quality language learning resources and promote the innovation and development of language education.

6. Conclusion and Prospect

6.1. Overview of Research Achievements

As a new path for language education innovation, networked smart language labs show great potential. With the help of advanced technologies such as Internet of Things, big data, cloud computing and artificial intelligence, it brings many innovations to language education.

In terms of resource sharing and utilization efficiency improvement, it integrates domestic and international high-quality resources, breaks the time and space limitations, enables students to study anytime and anywhere, improves the utilization efficiency of resources, and promotes educational equity. Personalized learning support provides students with personalized learning paths and timely feedback according to their different needs and characteristics, cultivating their independent learning ability [24]. Teaching Interaction and Feedback Enhancement promotes interaction and communication between teachers and students, students and students through a rich platform, provides timely feedback on learning outcomes, and significantly improves teaching effectiveness and student engagement. Environment perception and intelligent management provide students with a comfortable learning environment and reduce management costs.

In the innovative application of language education, contextualized teaching, cooperative learning and independent learning in diversified teaching modes provide students with a rich learning experience and improve their language application ability and comprehensive quality. The process evaluation and personalized feedback functions of intelligent learning assessment provide students with accurate learning support. The integration of language practice and cultural experience develops students' comprehensive language ability and cross-cultural communication awareness through virtual language practice activities and cross-cultural communication platforms [25]. However, the construction of networked smart language labs faces some challenges. In terms of technical security and privacy protection, measures such as encryption technology and access control need to be taken to guarantee data security, and strict privacy policies need to be established to ensure student privacy. In terms of teacher role change and capacity enhancement, teachers need to change from knowledge transmitters to guides and facilitators, and adapt to the new teaching environment through training and professional development. With regard to the integration and quality assurance of educational resources, it is necessary to solve the problem of resource integration and establish a mechanism for resource screening and auditing, quality control and user feedback to ensure the quality of resources.

6.2. Future Development Trends and Prospects

6.2.1. Continuous Innovation of Technology

Technologies such as Internet of Things, big data, cloud computing and artificial intelligence will continue to evolve to provide stronger support for networked intelligent language laboratories. IoT technology will be more intelligent,

and the precision and reliability of sensors will be further improved to sense environmental parameters more accurately and provide a more comfortable learning environment for students [26]. Temperature and humidity sensors will be automatically adjusted according to students' individual needs, and lighting sensors will automatically adjust the brightness according to students' vision conditions and learning scenarios to provide better protection for students' eyes. Big data technology will analyze students' learning behavior and effectiveness more precisely. As the scope and accuracy of data collection continue to improve, the system will be able to more comprehensively understand students' learning habits, interests and knowledge mastery, providing students with more personalized learning solutions. By analyzing students' performance in different learning scenarios, the system will recommend the most suitable learning resources and learning methods for students to improve their learning efficiency.

Cloud computing technology will provide language education with more powerful storage and computing power. With the continuous development of cloud computing technology, the cloud platform will be able to store more learning resources, support more users to learn online at the same time, and provide students with a more convenient and efficient learning experience. Cloud computing technology will be combined with artificial intelligence technology to provide students with more intelligent learning services, such as intelligent tutoring and intelligent assessment. Artificial intelligence technology will be more deeply applied to language education. Language recognition technology will more accurately recognize students' voice pronunciation and provide more accurate feedback for oral training. Intelligent translation function will be more intelligent, able to better understand students' needs and provide more accurate and smooth translation results. Artificial intelligence technology will be combined with virtual reality and augmented reality technology to provide students with a more realistic language learning experience, for example, virtual language practice activities and cross-cultural communication platforms will be more vivid and interesting, increasing students' learning interest and participation.

6.2.2. Continuous Expansion and Deepening of Applications

The application of networked intelligent language labs will continue to expand and deepen, providing language education with richer teaching modes and learning experiences. In terms of teaching mode, contextualized teaching will be more realistic and diversified. Through virtual reality and augmented reality technology, students will experience various real-life scenarios, such as international conferences, business negotiations, travel exchanges, etc., to improve language application skills and cross-cultural communication skills. Cooperative learning will be more convenient and efficient. Through the online platform, students can cooperate with other students at anytime and anywhere to complete the learning tasks together and cultivate teamwork and communication skills. Self-directed learning will be more personalized and intelligent. The system will provide students with more personalized learning advice and support based on their learning behaviors and needs, helping them better plan their learning progress and improve their learning efficiency. In terms of learning experience, virtual language practice activities will be richer and more interesting. Through online role-playing, online debates and other activities, students will participate more actively in language learning and improve their language expression and thinking skills. The cross-cultural communication platform will be more convenient and diversified. Students will communicate with students from different countries and regions through video chats and online forums to understand the characteristics of different cultures and cultivate a global vision and cross-cultural communication awareness. Language learning resources will be richer and more diversified. In addition to traditional resources such as textbooks, audio and video, more interactive learning resources, such as language learning games and virtual reality learning scenarios, will appear to increase students' interest and participation in learning.

6.2.3. Globalization and cross-cultural communication and cooperation will be strengthened

The networked intelligent language laboratory will provide a more convenient platform for globalization and cross-cultural exchange and cooperation, and promote the international development of language education. With the deepening of globalization, communication and cooperation between students from different countries and regions will become more frequent. The networked intelligent language lab will provide students with a more convenient platform for cross-cultural communication, allowing them to communicate with students from different countries and regions, understand the characteristics of different cultures, and cultivate a global vision and cross-cultural communication awareness. Cooperation between educational institutions in different countries and regions will be closer. Through the networked intelligent language labs, educational institutions share high-quality educational resources, carry out joint teaching, cooperative research and other activities to improve the quality and level of education. It will provide stronger support for the internationalization development of language education. With the increasing international exchanges, the demand for internationalization of language education will grow. Networked Smart Language Lab provides students with richer language learning resources, including language teaching materials, audio, video and other resources from different countries and regions, so that students can better understand the languages and cultures of different countries and regions. Provide students with more convenient language learning services, such as online translation, intelligent tutoring, etc., to help students better learn and master the languages of different countries and regions.

Networked intelligent language labs will show the development trend of continuous innovation in technology, application expansion and deepening, globalization and cross-cultural communication and cooperation will be strengthened in the future, bringing more innovation and change to language education. We believe that with the continuous promotion of science and technology, the networked intelligent language laboratory will play an even more important role in language education in the future, and make greater contributions to the cultivation of high-quality talents with global vision and intercultural communication skills.

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