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A Study on the Pathways for Transforming Practical Instruction in Digital and Intelligent Language Labs

Xing Zhong
School of Foreign Language Literature, Zhaoqing University, Zhaoqing, Guangdong 526061, China
Email: 463791153@qq.com

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Abstract

The development of digital and intelligent information technologies has injected new momentum into language labs. This study thoroughly analyzes their profound impact on practical teaching, including their positive roles in language skill development and the innovation of teaching models—such as providing real-person-recorded foreign language materials for listening practice, creating innovative interactive platforms for oral training, and implementing blended online-offline teaching and flipped classroom practices. At the same time, this study highlights the advantages of these technologies, which provide teachers with efficient classroom management tools and students with rich instructional resources. However, challenges such as technological adaptability and shifts in pedagogical philosophy also exist, and corresponding solutions are proposed. The study concludes that digital and intelligent technologies have a profound impact on practical teaching in language laboratories, and their functions and applications should be continuously optimized in the future.

Keywords

Digital and Intelligent Technologies; Language Laboratory; Practical Teaching; Language Skills Development; Innovation in Teaching Models

1. Introduction

As a significant achievement in modern educational technology, the rise of digital and intelligent language labs in the education sector stems from educational institutions' ongoing exploration of innovative teaching methods and approaches to meet society's demand for high-quality language professionals. These labs integrate advanced information technology—including the Internet of Things (IoT), artificial intelligence (AI), and big data—to provide a richer and more efficient learning environment for language instruction.

Digital and intelligent language labs offer students a more authentic and vivid

language learning environment. Through advanced audio and video equipment and interactive teaching platforms, students can more intuitively experience the charm of language, thereby increasing their interest and motivation in language learning. The Intelligent English Translation Grading System and the Multilingual Intelligent Teaching System—successfully developed and implemented by the Key Laboratory of Multilingual Digital and Intelligent Education at Shanghai International Studies University—have effectively enhanced the innovation and efficiency of teaching models, providing students with a personalized and highly interactive learning experience.

Digital and intelligent language labs also provide instructors with more convenient and efficient teaching tools. Through the intelligent teaching platform, instructors can monitor students' learning progress in real time and deliver personalized instruction and feedback [1]. These labs also provide more scientific and precise data support for teaching management, thereby improving the efficiency and quality of teaching administration.

The rise of digital and intelligent language labs has brought new opportunities and challenges to language education. In-depth research into the profound impact of digital and intelligent language labs on practical teaching holds significant practical importance for improving the quality of language education and cultivating high-caliber language professionals. Based on this, the following practical optimization strategies are proposed: In terms of teaching resources, these labs can integrate a vast array of language learning resources, including audio, video, text, and other formats. As mentioned in "Management and Optimization Strategies for Language Labs in the Context of Big Data," language labs possess the capabilities to collect, analyze, process, and store data, thereby providing students with a wealth of learning materials. Students can independently select appropriate resources based on their own learning progress and needs, thereby enhancing the relevance and effectiveness of their learning [2]. In terms of teaching methods, these labs offer a variety of instructional tools. Interactive teaching platforms, pronunciation training platforms, and oral examination platforms enable students to improve their language proficiency through practical application. Regarding teaching assessment, intelligent assessment systems promptly identify students' challenges and shortcomings in language learning, providing teachers with personalized instructional feedback.

The application of language labs in practical instruction should be optimized, and teacher training should be strengthened to improve instructors' operational and application skills regarding digital and intelligent language labs, enabling them to better leverage the pedagogical advantages these facilities offer. Teaching resources should be continuously updated and refined to ensure their timeliness and practicality [3]. Collaboration with enterprises should be strengthened to introduce advanced technologies and concepts, thereby promoting the sustainable

development of digital and intelligent language labs. Establish and improve a teaching evaluation system to fully leverage the role of digital and intelligent language labs in teaching assessment and enhance teaching quality

2. Fundamentals of Digital and Intelligent Language Labs

2.1. Principles of Technical Support

The successful operation of digital and intelligent language labs relies on advanced hardware and software support. In terms of hardware, servers feature high processing capacity and can provide stable data storage and transmission services for a large number of student terminals. During instruction, servers centrally manage and store network data while enabling the unified distribution of operating systems; even under abnormal conditions such as network outages, power failures, or server crashes, data is unlikely to be lost. Servers also support remote control, ensuring the continuity and stability of instruction.

End-user devices are an indispensable component of digital and intelligent language labs. Student terminals utilize local hardware resources to provide a desktop experience featuring high-definition video and 3D rendering, enabling students to engage more intuitively with language learning content. Teacher terminals facilitate classroom control and management, allowing instructors to assign tasks and monitor student progress.

Instructional management software enables effortless device management, including power control and status monitoring. It also integrates with digital language learning systems to further streamline classroom instruction. Through this software, instructors can monitor students' learning progress in real time, facilitating personalized instruction and feedback [2]. Platforms like Xuexi Tong and Yu Classroom provide students with rich learning resources and diverse learning methods—such as self-directed study, group discussions, and mock exams—making language learning more enjoyable.

Solutions such as NewClas, Zhongke Zhuoyue, Lindge, Xuexi Tong, and Yu Classroom enhance language labs. Their core teaching platforms are simple and fast to operate, enabling one-click instruction, one-click questioning, real-time course recording, scenario-based interactions, and formative assessments. The systems also feature classroom extension functions designed to facilitate teaching, including wireless instruction and mobile classrooms, which effectively control the pace of classroom instruction and training. Remote instruction and training support visual teaching by instructors, visual interaction between teachers and students, and the free recording of student training sessions via dedicated channels. Furthermore, through in-depth collaborative development with third-party digital resource platforms, the system seamlessly integrates with third-party resource platforms, language training platforms, and exam platforms.

2.2. Educational Psychology Basis

The design and application of digital and intelligent language labs align with various educational principles, with personalized learning being particularly prominent.

2.2.1. Meeting Student Needs

Digital and intelligent language labs can provide personalized learning experiences for students based on individual differences, prior knowledge, learning styles, intellectual levels, interests, and needs. By analyzing students' learning histories and behavioral patterns through big data, the language lab identifies their strengths and weaknesses, thereby recommending suitable learning resources and pathways. Taking the digital and intelligent language lab system upgrade project at Zhongkai College of Agricultural Engineering as an example, its various functional modules—including the digital language teaching system's basic platform, cloud classroom, and speaking practice modules—meet the personalized needs of different students in areas such as speaking, listening, and writing. Some language labs are equipped with movable desks and chairs, large touchscreens, and multifunctional teaching systems that support the full teaching process—including pre-class preparation, in-class interaction, and post-class review and Q&A sessions. These facilities are particularly well-suited for small-class teaching activities such as flipped classrooms and inquiry-based learning in foreign language instruction, effectively accommodating the diverse learning styles and needs of students.

2.2.2. Promoting Self-Directed Learning

Digital and intelligent language labs play a crucial role in cultivating students' self-directed learning abilities. First, these labs provide a wealth of self-directed learning resources, including a vast array of foreign language learning materials covering listening, speaking, reading, writing, and translation across multiple languages—such as Chinese, English, Japanese, and lesser-taught Southeast Asian languages—allowing students to independently select learning content based on their interests and needs. Second, the digital and intelligent language lab's smart platform enables online assignment posting, homework grading, and Q&A sessions. Students can engage in online learning anytime, anywhere, implementing a new learning model characterized by "teacher guidance and student-centered learning," which enhances students' autonomy and the efficiency of their learning. On the digital and intelligent platform of the Guangxi University Language Center, students log in to the "Guangxi University Language Center Seat Reservation System," click on an available seat to begin self-directed learning, and gain access by swiping their campus ID card at the entrance of the Language Center. The simulation testing, reporting, and recording functions of the digital and intelligent language lab provide a simulation interface that is fully consistent with the procedures of the National Putonghua Proficiency Intelligent Testing System. The system generates diagnostic reports, records students' simulation test performance, and plots line graphs to

reflect learning progress trends, enabling students to gain a clearer understanding of their own learning status and thereby engage in more effective self-directed learning [4].

3. Specific Applications of Digital and Intelligent Language Labs in Practical Instruction

3.1. Language Skills Development

Digital and intelligent language labs play a crucial role in the development of language skills.

3.1.1. Advantages of Listening Training

Digital and intelligent language labs offer numerous advantages for listening training. They provide students with personalized foreign language materials recorded by native speakers, featuring authentic and authoritative accents whose linguistic accuracy is often beyond the reach of most local foreign language teachers. By listening to these materials, students significantly improve the accuracy of their foreign language expression, thereby boosting their motivation and confidence in language learning. The language lab meets students' needs for pronunciation from different regions, social classes, and industries; through personalized listening exercises, students naturally enhance their foreign language communication skills and test-taking abilities [5].

Students independently study relevant listening materials outside of class, reinforcing their listening skills by watching video content and mastering foundational English knowledge. Teachers design video learning materials on relevant listening topics based on students' proficiency levels and needs. In class, they provide targeted explanations and guidance based on what students have already mastered, and guide students to practice listening skills in a variety of contexts and tasks—such as listening to news, movies, and songs—to develop the ability to apply English listening skills in different situations. Through comprehensive assessments, teachers evaluate students' listening abilities and foundational knowledge, provide feedback, and guide students in developing and implementing plans to improve their listening skills. This teaching model places greater emphasis on students' initiative and interest in learning. Students can flexibly arrange their study time outside of class, which reduces the monotony and rigidity of instruction, allowing them to rapidly improve their listening skills through popular intensive listening courses.

3.1.2. Innovations in Speaking Training

The interactive platform of the digital and intelligent language lab has brought innovation to speaking training. Within the lab, the facial recognition management platform utilizes biometric technology to enhance communication efficiency and engagement. When teaching, instructors clearly identify students' names, seat

numbers, corresponding physical locations, and photos, which enhances interaction between teachers and students. Remote instruction and training support visual teaching by instructors, visual interaction between teachers and students, and the free recording of students' independent practice sessions.

In English flipped classrooms, instructors use online platforms to organize students for speaking practice and presentations. Students submit speaking assignments via recorded videos or online voice chats, and instructors provide timely feedback and evaluations. Some language labs are also equipped with oral exam platforms that support various exam formats—including paperless exams, oral exams, and specialized oral proficiency tests—providing students with a more objective and accurate environment for assessing their speaking skills. By recording students' mock test performance and generating line charts to illustrate learning progress trends, students gain a clearer understanding of their own learning status, enabling them to refine their speaking practice more effectively.

3.2. Innovation in Teaching Models

The emergence of digital and intelligent language labs has brought new opportunities for innovation in teaching models.

3.2.1. Blended Learning

The NewClass digital and intelligent language lab not only addresses the need for interactive instruction in remote teaching but also integrates on-campus, in-class, off-campus, and out-of-class environments, truly achieving unified management, unified teaching, unified training, and unified assessment. Instructors use the "Control Interface" of the NewClass system to exercise uniform classroom control and management over both on-site and remote students, conducting visual and interactive teaching activities such as lectures, skills training, and testing [6].

The simultaneous interpretation combined-classroom model is a novel classroom format pioneered by NewClass. It connects two or more simultaneous interpretation classrooms across different locations to form "a single class" for blended online and offline instruction. Every student in both on-site and remote classrooms is equipped with a NewClass terminal, facilitating interaction between teachers and students as well as among students. Instructors use NewClass's unique "Control Interface" to create "a single class," arranging on-site and online students sequentially while preserving the seating layout of each classroom, thereby supporting various visual simultaneous interpretation teaching activities. It supports interconnection between different campuses of the same school (private cloud deployment, "Branch Campus Connect") as well as between different schools and regions (public cloud deployment), bringing remote teachers and students closer to the classroom and allowing them to enjoy the same teaching experience as in an in-person synchronous classroom. Teachers use the NewClass "Control Interface" to centrally organize synchronous teaching activities. The system supports independent

dual-track recording for both online and offline participants simultaneously; dual-track storage and playback support four listening modes, providing a seamless synchronous learning environment.

3.2.2. Flipped Classroom Practice

In English flipped classrooms, digital and intelligent technologies are integrated into a digital and intelligent teaching model for English listening comprehension. Students self-study relevant course content outside of class through online video lessons and other resources provided by these technologies, and then discuss, solve problems, and present their work with teachers and classmates during class time. Teachers design tasks tailored to students' abilities by dividing them into groups, creating micro-lessons, and recording videos, encouraging students to create PowerPoint presentations or submit learning reports on their own after completing the material. Student engagement in the flipped classroom has increased; survey results indicate that students view the flipped classroom positively, noting that it has increased the frequency of their English study outside of class.

In the English flipped classroom, the digital language lab provides abundant learning resources and diverse teaching methods. Teachers use the online platform to assign learning tasks, upload resources, and assign homework, while students utilize the platform for online learning. Teachers and students, as well as students among themselves, engage in real-time communication and discussions via the online platform. During in-person instruction, teachers assess students' online learning progress, address difficulties encountered during online study, and organize further discussions on the course content. The blended learning model of the flipped classroom fully stimulates students' initiative and critical thinking, helps them achieve effective learning, and ensures learning outcomes [7–9]. It provides a richer and more efficient teaching environment for language instruction, thereby improving teaching quality and student learning outcomes.

4. Advantages and Challenges of Digital and Intelligent Language Labs

4.1. Analysis of Advantages

4.1.1. Efficient Classroom Management

Digital and intelligent language labs provide instructors with efficient classroom management tools. At a training session on the use of digital and intelligent language labs held by the School of Humanities, instructors were able to use the seating management system to view students' online status and speaking activity in real time. This allowed them to quickly assess student attendance and classroom participation, greatly facilitating classroom management. Instructors can gain a more precise understanding of students' learning progress, adjust teaching strategies in a timely manner, and improve the efficiency of classroom management.

Systems such as NewClass, Zhongke Zhuoruan, and Lindge, which have been integrated into language labs, feature facial recognition management platforms that utilize biometric technology. During class, instructors can clearly identify students' names, seat numbers, corresponding physical locations, and photos, thereby improving communication efficiency and engagement while further enhancing the effectiveness of classroom management.

4.1.2. Rich Teaching Resources

Digital and intelligent language labs provide students with an extremely rich array of teaching resources. NewClass and iFlytek offer support and services for language instruction across various application scenarios, including simultaneous interpretation systems, digital language labs, digital and intelligent classrooms, and distance learning systems. NewClass, Xuexi Tong, and Yuketang have developed deep partnerships with third-party digital resource platforms, seamlessly integrating with third-party resource platforms, language training platforms, and exam platforms to provide students with a vast amount of learning resources. Through these platforms, students can access learning materials in various formats—including audio, video, and text—in different languages, catering to the diverse learning needs of the student body. The digital and intelligent language lab inputs outstanding student essays and related works into a database for word-frequency analysis, providing strong support for students to quickly master vocabulary and improve their writing skills, while offering them diverse learning resources and efficient learning pathways.

4.2. Challenges

4.2.1. Issues with Technological Adaptation

Although the application of digital and intelligent technologies in language labs has brought numerous advantages, students and teachers do face certain challenges in adapting to these new technologies in practice. For students, some may feel unfamiliar with or confused by the new learning environment and technical equipment. During practical sessions in the language lab, some students may be unfamiliar with how to operate the equipment, interactive teaching platforms, or speaking exam platforms, which may affect their motivation and engagement. There are also differences in students' levels of technological acceptance; some may adapt quickly to new technologies, while others may require more time and guidance. For teachers, mastering the various functions and technologies of digital and intelligent language labs is no easy task. Teachers not only need to be familiar with the operation of tools such as instructional management software and digital learning systems but also need to learn how to utilize these technologies for personalized instruction and feedback. Some teachers may feel overwhelmed when using digital and intelligent language labs due to a lack of relevant training and experience;

others may not be adept at using remote teaching and training functions, making it difficult to facilitate visual interaction between teachers and students, which in turn affects teaching effectiveness. Consequently, this places higher demands on teachers' information technology literacy.

To address these technical adaptation challenges, the following measures should be implemented: Schools should strengthen technical training for both students and teachers. Detailed operating guides and training courses should be provided to students to help them quickly become familiar with the equipment and functions of the digital and intelligent language lab, while professional information technology training should be offered to teachers to enhance their technical proficiency. Suppliers should also continuously optimize product design to improve the usability and stability of the equipment, lowering the technical barrier so that students and teachers can use the system more easily.

4.2.2. Shift in Teaching Philosophy

Promoting the transition from traditional teaching philosophies to digital and intelligent teaching is another major challenge facing digital and intelligent language labs. In traditional teaching, teachers are often the transmitters of knowledge, while students are passive recipients. In the environment of a digital and intelligent language lab, however, the emphasis is on students' independent and personalized learning, and the teacher's role shifts more toward that of a guide and facilitator. For teachers, shifting their pedagogical philosophy requires breaking away from traditional teaching models and actively exploring new teaching methods and approaches. Teachers should adopt innovative teaching models, such as the flipped classroom and inquiry-based learning, to encourage students' independent and collaborative learning. They should also focus on cultivating students' innovative thinking and practical skills, enabling students to improve their language proficiency through hands-on practice. However, due to their familiarity with traditional teaching methods and resistance to new pedagogical concepts, some teachers are reluctant to try new teaching approaches. For students, adapting to the philosophy of digital and intelligent teaching requires improving their self-directed learning and self-management skills. In digital and intelligent language labs, students need to learn to independently select learning resources, develop study plans, and monitor their progress. This may pose a challenge for some students, who may be accustomed to passively accepting the teacher's arrangements and guidance and lack the motivation and ability for self-directed learning.

To promote a shift in teaching philosophy, the school should strengthen teacher training and guidance, helping teachers recognize the importance and advantages of digital and intelligent teaching, and encouraging them to actively experiment with new teaching methods and tools. Additionally, through activities such as teaching demonstrations and experience-sharing sessions, teachers can share their successful experiences with digital and intelligent teaching, thereby fostering a

transformation in teaching philosophy. Schools should also focus on cultivating students' independent learning abilities and innovative thinking, providing them with more opportunities and platforms for self-directed learning so that they can gradually adapt to the concepts of digital and intelligent teaching through practical experience.

5. Conclusion and Outlook

Digital and intelligent technologies have profoundly impacted language laboratories and practical instruction. In terms of language skills development, they provide foreign language materials recorded by native speakers for listening practice, meeting diverse pronunciation needs and enhancing students' foreign language communication skills; in speaking practice, interactive platforms have revolutionized teaching methods, biometric technology has enhanced teacher-student interaction, and diverse assessment formats have created an objective and accurate testing environment. In terms of instructional model innovation, blended learning models—integrating online and offline elements—have achieved unified management, instruction, training, and assessment, while the flipped classroom approach has boosted student motivation and critical thinking, ensuring learning outcomes.

Digital and intelligent language labs provide instructors with efficient classroom management tools, such as real-time monitoring of student status and facial recognition management; they offer students rich educational resources, including a vast collection of learning materials and a word-frequency analysis database. Some labs even help students improve their writing skills and Mandarin proficiency. However, digital and intelligent language labs also face challenges, including issues with technological adaptation and difficulties in shifting teaching philosophies. To address these challenges, measures such as strengthening technical training, optimizing product design, and promoting teaching demonstrations and the exchange of best practices have been proposed. In future development, the functions and applications of digital and intelligent language labs should be continuously optimized to enhance their effectiveness in practical instruction and make greater contributions to cultivating high-caliber language professionals. Through ongoing technological innovation, in-depth research on personalized learning, teacher professional development, interdisciplinary collaboration, and international cooperation and exchange, digital and intelligent language labs will bring more innovation and transformation to language education and make even greater contributions to cultivating high-caliber language professionals.

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