

Innovative Strategies for Artificial Intelligence-Enabled Language Laboratory Teaching in the Context of Educational Modernization

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Abstract: With the development of science and technology, artificial intelligence has risen in the field of education, bringing new opportunities and challenges to language laboratory teaching. This study aims to explore effective strategies for language laboratory teaching from the perspective of artificial intelligence to improve teaching quality. Through theoretical analysis and practical cases, the application principles, personalized learning theories and strategy applications of artificial intelligence in language laboratory teaching are elaborated, including the innovative application of intelligent teaching platforms and the use of intelligent evaluation and feedback mechanisms. The practical effects of artificial intelligence in language laboratory teaching are analyzed, such as improving learning efficiency and effectiveness and creating rich learning resources and environments. Finally, the research conclusions are summarized, and the future research directions are prospected, including technological innovation and integration, deepening of personalized learning, transformation and development of teachers' roles, and education equity and popularization.

Keywords: Artificial intelligence, language laboratory teaching, teaching strategies, personalized learning.

1. Introduction

1.1. Background of the study

With the rapid development of technology, Artificial Intelligence (AI) has emerged strongly in the field of education. The potential of AI in education is exciting in its ability to be applied to enhance learning, assist teachers and drive more effective personalized learning, among other things. Today, AI is increasingly being used in education in a wide range of ways, from assistive technology to help students with special needs get a more equitable education, to powering interactive games to teach kids basic academic skills, to data and learning analytics to help teachers make smarter decisions.

In language lab instruction, AI also presents new opportunities and challenges. On the one hand, AI can provide personalized teaching solutions for language lab instruction. By analyzing students' learning data and behaviors, AI can identify students' learning needs and preferences, provide them with customized learning resources and paths, and dynamically adjust the content and difficulty of teaching according to students' learning progress and abilities [1]. On the other hand, AI also brings challenges to language lab teaching. Teachers need to adapt to new teaching methods and improve their information literacy and digital competence to better utilize AI technology for teaching; students also need to adapt to the changes brought by the new technology and develop their information literacy and digital competence.

The rise of artificial intelligence in the field of education has brought new opportunities and challenges to language laboratory teaching. An in-depth study of language laboratory teaching strategies under the perspective of artificial intelligence is needed to give full play to the advantages of artificial intelligence and improve the quality and efficiency of language laboratory teaching.

1.2. Purpose of the Study

This study aims to explore the effective strategies of language laboratory teaching under the perspective of artificial intelligence in order to improve the quality of teaching. With the continuous development of artificial intelligence technology, its potential for application in the field of education has become increasingly prominent. In language laboratory teaching, AI can provide students with a more personalized learning experience and meet the learning needs of different students. Through intelligent tutoring and learning analytics services, AI can understand students' learning needs and problems and provide targeted answers and suggestions. At the same time, students' learning data is analyzed to help them better understand their learning status and progress. The use of AI technology can automatically grade and provide feedback on assignments and test papers submitted by students, improving teaching efficiency.

In language lab teaching, AI can also enable interactive learning and gamification. By providing an interactive learning environment, it enhances students' engagement and interest in learning. Combining learning with games allows students to learn knowledge in a relaxed and enjoyable atmosphere. At the same time, real-time feedback and encouragement are given to students to help them maintain motivation and confidence in learning. In order to realize these goals, it is necessary to study in depth the application methods and effects of artificial intelligence in language laboratory teaching. Through the analysis of actual teaching cases, we summarize the successful experiences and existing problems and put forward corresponding improvement measures. At the same time, teacher training is strengthened to improve teachers' ability to apply AI technology and their teaching level. Students are guided to understand and adapt to the changes brought about by new technologies, and their information literacy and digital competence are cultivated. By

exploring the effective strategies of language laboratory teaching under the perspective of artificial intelligence, we can give full play to the advantages of artificial intelligence, improve the quality and efficiency of language laboratory teaching, and provide better support and help for students' language learning.

2. Theoretical Foundation

2.1. Principles of the application of artificial intelligence in the field of education

The application of artificial intelligence in the field of education mainly relies on advanced technologies such as natural language processing and speech recognition, which affect the teaching process in different ways and bring about a new change for language laboratory teaching. [2]

2.1.1. The Role of Natural Language Processing

Natural language processing plays a crucial role in language teaching. In text translation, for example, by using natural language processing technology, students can quickly and accurately translate texts from one language to another, greatly improving the efficiency of learning foreign languages. According to relevant data, the accuracy rate of some advanced natural language processing translation tools can reach more than 80%, which facilitates students' reading of foreign language literature and cross-cultural communication.

Semantic understanding is also one of the important applications of natural language processing. Through semantic understanding technology, students can better understand the meaning of the text and improve their reading comprehension ability. In language laboratory teaching, teachers can use semantic understanding tools to analyze students' compositions, understand students' writing ideas and language expression ability, so as to give more targeted guidance. Natural language processing technology can identify grammatical errors, improper use of vocabulary and other problems in students' compositions, and give specific suggestions for revision to help students improve their writing.

2.1.2. The Value of Speech Recognition Technology

Speech recognition technology has an important value in language learning. The speech-to-text function can help students convert the content of speaking practice into text, which is convenient for students to self-check their pronunciation and grammatical errors. When students are practicing speaking, the speech recognition software can convert students' speech into text in real time and compare it with the standard text, point out the inaccuracies in students' pronunciation, and help students correct them in time. Speech synthesis technology, on the other hand, can provide students with standard speech demonstrations to improve their listening and speaking skills. In language laboratory teaching, teachers can use speech synthesis software to play standard English pronunciation for students, so that students can imitate and follow the reading to improve their oral expression ability. Natural language processing and speech recognition technology play an important role in language teaching and provide powerful technical support for language laboratory teaching under the perspective of artificial intelligence.

2.2. Personalized Learning Theory and Artificial Intelligence

2.2.1. Learner Characterization

Artificial intelligence has a strong ability to analyze learners' styles, interests and other aspects, providing a solid basis for personalized learning. Through machine learning algorithms, AI can collect and analyze a variety of data from students in the learning process, such as study time, question answering, interaction frequency, etc. At the beginning of 2023, the National Bureau of Statistics released data showing that the decline in the size of births in China has accelerated, and the demand for personalization in education will become higher and higher in the future. In this context, AI can analyze whether a student's learning style favors visual, auditory or kinesthetic based on the student's learning data, and understand whether the student's interests are in literature, science, art or sports. For visual learners, AI can recommend more learning resources such as images and videos; for auditory learners, it can provide audio materials and voice explanations; and for kinesthetic learners, it can recommend practical activities and interactive learning programs. Artificial intelligence can also analyze students' learning progress and ability level, and provide more challenging learning content for students with stronger learning ability; for students with weaker learning ability, give more basic knowledge and step-by-step guidance to meet the personalized needs of different students.

2.2.2. Personalized Resource Recommendation

Artificial intelligence realizes recommending learning resources according to learners' needs through various methods. On the one hand, the intelligent recommendation system is used to provide personalized learning resources and course recommendations for each student based on factors such as the student's learning history, interest preferences and learning style. The intelligent recommendation system can analyze students' interest areas and knowledge weaknesses based on the courses they have taken in the past, the learning materials they have browsed, and their interactive behaviors on the learning platform. If a student shows a strong interest in ancient civilizations in a history course, the system will recommend resources such as relevant history documentaries, books and special lectures. On the other hand, AI can also continuously optimize the recommendation results through deep learning algorithms. As the student's learning process advances, the system will continue to collect new data and dynamically adjust the recommended content to ensure that the recommended learning resources always meet the student's current needs. When a student's mastery of a certain knowledge point improves, the system will automatically reduce the recommendation of basic learning resources for that knowledge point and recommend more in-depth expansion content to help students further improve their learning level. At the same time, AI can also be combined with natural language processing technology to understand and analyze students' questions and provide students with more accurate learning resource recommendations [3]. For example, if a student asks a question about the principles of physics, the system can not only recommend relevant textbook chapters and teaching videos, but also recommend some academic forums and online learning communities that discuss the issue, so that the student can communicate and explore with other learners and enrich the learning experience.

3. Strategic Application of Artificial Intelligence in Language Lab Teaching

3.1. Innovative Application of Intelligent Teaching Platform

The intelligent foreign language teaching platform of Shanghai International Studies University shows significant advantages in terms of interaction design and algorithms.

3.1.1. Highly Interactive Learning Environment Creation

The intelligent teaching platform creates a highly interactive learning environment for teachers and students through innovative interaction design. The platform adopts real-time interaction, so students can ask teachers questions at any time, and teachers can give timely feedback. This interaction is not only limited to text communication, but also includes voice, video and other forms [4]. According to statistics, the frequency of interaction between teachers and students has increased after using the platform. At the same time, the platform also sets up functional modules such as discussion forums and group activities, in which students can communicate and cooperate with their classmates to solve problems together. This interactive learning environment stimulates students' interest in learning and increases their participation [5][6].

3.1.2. Customized Teaching Content Delivery

Using advanced algorithms, the platform is able to provide personalized teaching content according to students' needs. First, the platform analyzes students' learning data to understand their learning progress, knowledge mastery, and learning styles. For students with weak basic knowledge, the platform will push more basic courses and practice questions; for students with faster learning progress, it will provide more challenging extension content. Secondly, the platform also recommends content based on students' interests. If a student is interested in literature, the platform will recommend relevant literary works and literature appreciation courses. The platform also continuously optimizes the algorithm and dynamically adjusts the teaching content according to the students' learning feedback to ensure that the students' personalized needs are always met. According to the survey, the learning effect of students is improved after using the platform.

3.2. The use of intelligent assessment and feedback mechanism

Take the Artificial Intelligence Laboratory of Beiwai as an example to discuss the practice of intelligent assessment and personalized feedback.

3.2.1. Accurately locating learning problems

Beiwai Artificial Intelligence Laboratory utilizes advanced automatic assessment technology, which can accurately help students identify their own problems in language learning. The automatic assessment technology analyzes students' learning data comprehensively, including homework completion, test scores, classroom performance and other aspects of data [7]. In the teaching of language labs, the automatic assessment system can recognize and analyze students' oral expressions phonetically, detecting problems in pronunciation accuracy, grammatical errors, and fluency. According to relevant statistics, the system has a high accuracy rate in detecting pronunciation accuracy and can

accurately point out the specific location of students' pronunciation errors and the types of problems. Meanwhile, for students' writing assignments, the automatic assessment system can utilize natural language processing technology to analyze grammatical errors, improper vocabulary use, and logical structure. Through this comprehensive and accurate assessment, students can clearly understand their weaknesses in language learning and provide a clear direction for further learning and improvement.

3.2.2. Efficient Adjustment of Learning Strategies

The personalized feedback mechanism plays an important role in the adjustment of students' learning strategies. The personalized feedback mechanism of Beiwai Artificial Intelligence Laboratory provides students with targeted learning suggestions and adjustment strategies based on the results of automatic assessment. When the automatic assessment system finds that students have problems in oral pronunciation, the personalized feedback mechanism will recommend appropriate oral practice resources, such as speech correction software and oral practice courses, according to the specific situation of the students. At the same time, the feedback mechanism will also provide specific practice methods and techniques to help students improve their oral pronunciation efficiently [8]. If students have more grammatical errors in writing, the feedback mechanism will recommend grammar learning materials and provide detailed grammatical explanations and example sentences for students' error types. According to the students' learning progress and feedback, the personalized feedback mechanism will also dynamically adjust the content of the suggestions to ensure that the students can continuously get the most suitable guidance for their learning strategies. According to the survey, after using the intelligent assessment and feedback mechanism of the Beiwai Artificial Intelligence Laboratory, students have become more efficient in adjusting their learning strategies, which greatly promotes their learning effectiveness and language proficiency.

4. Effectiveness of Artificial Intelligence Practices in Language Laboratory Instruction

4.1. Enhancement of Learning Efficiency and Effectiveness

4.1.1. Intelligent Speech Recognition Helps Pronunciation Correction

Intelligent speech recognition technology plays an important role in language laboratory teaching, especially in pronunciation correction. Baidu Brain AI supports language education, and intelligent voice corrects oral pronunciation and guides reading and reciting. Its voice recognition technology can capture pure English pronunciation and correct students' spoken pronunciation, making their spoken English standard and fluent. Through intelligent speech recognition, the system can listen to and recognize students' oral pronunciation in real time, accurately point out inaccurate pronunciation and provide the correct reading style when students are practicing speaking. According to relevant data, students who use intelligent speech recognition technology for oral practice have improved pronunciation accuracy.

Intelligent speech recognition technology can also be combined with gamification elements to increase the fun of

learning. Love Mouthpiece, developed by Silvermoon Networks, is based on a campus romantic love story, in which users play the role of a transfer student and engage in English conversations with teachers, classmates, and other characters, and can only continue to advance in the plot if their reading aloud meets the standards. During such conversations, Baidu Brain's intelligent voice technology constantly listens to and recognizes the user's spoken pronunciation, corrects errors, and provides the correct pronunciation, so that the user learns in every conversation. This gamified learning method stimulates students' interest in learning and improves their motivation and initiative in learning.

4.1.2. Personalized Recommendation of Learning Resources

Intelligent systems have significant advantages in recommending resources according to students' progress and level. The AI-based personalized learning recommendation system can recommend the most suitable learning resources for learners based on their behavior and performance. The AI teaching analysis software system can collect students' learning data in real time through big data analysis and machine learning algorithms, including learning progress, performance, learning habits and so on, and provide teachers with a comprehensive and accurate portrait of students. Based on these data, the system is able to intelligently recommend personalized learning resources and teaching strategies to help teachers achieve tailored teaching and improve teaching effectiveness. Smart Classroom pushes out different problems for different learning abilities of students, realizing tailor-made teaching. X2 Pro relies on its AI synchronous and precise learning function. When students select a textbook chapter, the learning machine will quickly and accurately find the weak points of the section through a small number of topic tests, and then the system will personalize and recommend a learning path and learning resources to help students learn and consolidate in a targeted way, so that they can ultimately overcome every weak point and master every test point of the subsection.

Intelligent recommendation of learning resources can also be combined with natural language processing technology to understand and analyze students' questions and provide students with more accurate learning resource recommendations [9]. For example, if a student asks a question about language learning, the system can not only recommend relevant textbook chapters and teaching videos, but also recommend some academic forums and online learning communities that discuss the question, so that the student can communicate and discuss with other learners and enrich the learning experience.

4.2. Create rich learning resources and environment

Artificial intelligence in language lab teaching not only improves learning efficiency and effectiveness, but also provides rich learning resources and immersive learning environment for language learning.

4.2.1. Multilingual Learning Resources Integration

Artificial intelligence plays an important role in providing multilingual learning resources. Through natural language processing technology and big data analysis, AI can integrate multilingual learning resources from all over the world to provide students with a wider range of language learning options. Some intelligent language learning platforms are able

to collect news, literature, movie and television resources from different countries and regions and transform them into language materials suitable for students' learning. According to relevant statistics, some mainstream language learning platforms can integrate more than 10 kinds of language resources to meet the multilingual learning needs of different students.

Artificial intelligence can also recommend multilingual learning resources in a personalized way according to students' learning progress and interests [10]. For students with specific language learning goals, the system can recommend relevant language courses, learning materials and communication communities. If students want to learn French, the AI system can recommend French movies, music, books and other resources, as well as online courses and language exchange activities related to French learning, to help students better master French.

4.2.2. Immersive Learning Environment Construction

Virtual reality and other technologies have created an immersive learning environment for language learning, which has a positive impact on language learning. Through visual, auditory, tactile and other multi-sensory stimulation, virtual reality technology makes students feel as if they are in the real scene of the target language country, and improves students' interest and participation in language learning. The immersive language learning virtual environment can simulate the streets, stores, restaurants and other scenes in the target language country, and students can have conversations and exchanges with virtual characters in the virtual environment to practice their language expression skills.

Augmented reality technology, on the other hand, can combine virtual content with real-life scenes to provide students with a richer learning experience. Students can see words, phrases, and sentences of the target language in the real environment through augmented reality technology and learn the language anytime and anywhere [5] [11]. According to research, students who use virtual reality and augmented reality technologies for language learning show a significant increase in their interest and learning outcomes.

Gamification elements also play an important role in immersive learning environments. By combining language learning with games, students can learn the language in a relaxing and enjoyable atmosphere, and increase their motivation and initiative in learning. Some language learning games allow students to complete various tasks in the virtual world and improve their language use ability through interaction and communication with virtual characters. At the same time, gamified learning can also stimulate students' sense of competition and promote communication and cooperation among students.

5. Conclusion and Outlook

5.1. Summary of Research Conclusions

This study has deeply explored the teaching strategies of language labs under the perspective of artificial intelligence, and through theoretical analysis and practical cases, it has summarized that artificial intelligence has significant strategies and effects in language lab teaching.

In terms of strategies, the intelligent teaching platform greatly improves the frequency of interaction between teachers and students through the creation of a highly interactive learning environment and the provision of customized teaching content, which stimulates students'

interest and participation in learning. At the same time, personalized teaching content is provided according to students' learning progress, knowledge mastery, and interests to meet the learning needs of different students [1]. The intelligent assessment and feedback mechanism can accurately locate students' learning problems and efficiently adjust students' learning strategies through personalized feedback, which improves the efficiency of students' learning strategy adjustment and language ability.

In terms of effectiveness, the intelligent speech recognition technology helps to correct pronunciation and improve the accuracy of students' pronunciation, while the combination of gamification elements increases the fun of learning. Personalized recommended learning resources provide students with the most suitable learning resources according to their progress and level, which improves learning efficiency. The integration of multilingual learning resources and the construction of an immersive learning environment provide rich resources and a good learning atmosphere for language learning, stimulating students' interest and participation in learning.

Artificial intelligence has important application value and broad development prospect in language laboratory teaching. It brings new opportunities and challenges to language teaching, and the advantages of artificial intelligence should be fully utilized to continuously explore and innovate language laboratory teaching strategies to improve the quality and efficiency of language teaching.

5.2. Prospect of Future Research Direction

5.2.1. Technological Innovation and Integration

In terms of deep learning algorithm optimization, continuously optimize the deep learning algorithm to improve the accuracy and efficiency of natural language processing and speech recognition. Research on more advanced neural network structures to better understand and process the complexity of language. According to industry forecasts, the accuracy of deep learning algorithms in the field of language processing is expected to increase in the next few years. In the area of multimodal fusion, combining multimodal information such as images, videos, and audio to provide a richer experience for language learning. Virtual reality and augmented reality technologies are utilized to combine language learning with visual scenes to enhance students' memory and understanding. In terms of interdisciplinary research, strengthen the cross-research between AI and linguistics, pedagogy, psychology and other disciplines to gain a deeper understanding of the cognitive process and psychological mechanisms of language learning, and provide more scientific theoretical support for the application of AI in language teaching.

5.2.2. Deepening of personalized learning

In terms of dynamic learning path planning, develop a more intelligent learning path planning system that can dynamically adjust the learning path according to students' real-time learning status and feedback. When students encounter difficulties in a certain knowledge point, the system is able to timely adjust the teaching content and methods to provide more targeted counseling. In terms of emotion recognition and feedback, artificial intelligence technology is used to recognize students' emotional states, such as anxiety, frustration, excitement, etc., and provide corresponding emotional support and feedback. When students feel anxious, the system can provide encouragement and comfort, and

adjust the difficulty of learning tasks to improve students' motivation and self-confidence. In terms of social interaction and collaborative learning, social interaction and collaborative learning among students are encouraged, and AI technology is utilized to promote communication and cooperation among students. Through the intelligent social platform, students can form learning groups to work together to complete language learning tasks and share learning experiences and resources.

5.2.3. Teacher Role Transformation and Development

Provide teachers with professional training and support to help them master the application methods and skills of AI technology in teaching. Organize teachers to attend AI teaching training courses, provide online teaching resources and tools, and improve teachers' information literacy and teaching ability [12].

In the application of AI in teaching, the role of teachers will gradually change from knowledge transmitters to instructional designers [13]. Teachers need to design more personalized and interactive teaching activities to guide students to learn and explore independently. Teachers can utilize the intelligent teaching platform to design project-based learning activities, so that students can improve their language use ability in practice. Explore the collaboration mode between teachers and AI to fully utilize their respective advantages. Teachers can use artificial intelligence technology to analyze the learning situation and teaching assessment, and develop a more scientific and reasonable teaching plan; teachers can give students emotional support and humanistic care in the teaching process to improve students' learning effect and comprehensive quality.

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