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*Research Article*

# Application of Multimodal Multimedia Information and Big Data Technology in Teaching Chinese as a Foreign Language Course

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With the change of the times, under the leadership of big data, cloud computing, network technology, mobile Internet, and other high technology, education has gradually broken free from the traditional teaching mode. At the same time, advanced technology has also lifted the confinement of traditional teaching mode in space and time and opened the skylight of intelligent thinking mode. From the current situation of Chinese language fever around the world, the demand of Chinese language learners for learning materials and learning resources will continue to increase in the future. With the continuous development of Internet education, the combination of Internet technology and international Chinese education will definitely become the key direction for the development of international Chinese education. In this context, online teaching resources will become an important basis for the development of "Internet+Chinese international education", so it is necessary to investigate and study the online teaching resources of "Internet+Chinese international education." As a matter of fact, with the development of society and the advancement of technology, the era of informationization has come. As a result, the main theme of education in the information age is to provide suitable education for students who want to learn Chinese and to promote the active and lively development of each student. In the past, the one-size-fits-all education model of classroom teaching could not meet the individual development of students and the demand of society for diversified talents. Therefore, the traditional teaching of Chinese as a foreign language is in urgent need of change, and personalized teaching is attracting attention. With the emergence of technologies such as cloud computing, Internet of Things, and big data in education, personalized teaching has received technical support. This paper is aimed at exploring how to apply the new technologies in the teaching process to help teachers personalize teaching, stimulate students' interest in learning, meet their individual needs, break through the traditional teaching methods, and make it possible to teach according to their abilities. As one of the main learning resources, the quality of multimedia courseware will be the criterion to measure whether it meets the teaching and learning needs. Consequently, the use of big data, multimedia, and multimodal technologies to improve the Chinese language material library and develop special software for teaching Chinese as a foreign language, as well as the production of high-quality multimedia courseware that is highly compatible with the teaching materials, will become the trend of future research.

## 1. Introduction

Due to the rapid development of information technology, today's society has become a veritable information society. Consequently, every aspect of people's life has undergone great changes, and human beings have entered the era of network and multimedia from the era of reading and writing [1]. Especially in the field of education, with the continuous progress of science and technology, teaching tools, and teaching methods continue to enrich, multimedia technology is rapidly used in classroom teaching [2]. Against this background, teaching equipment is becoming more and more advanced, and teaching methods are becoming more and more abundant [3]. In other words, computers and multimedia classrooms have become widespread in almost all areas of education. Hence, in order to keep pace with the new teaching environment and teaching requirements, the teaching forms and teaching methods of various subjects must be reformed accordingly [4]. The research on multimodal discourse analysis in the field of teaching and learning has emerged in response to this situation, providing a new direction for the reform of teaching methods.

In recent years, with the proposal of "One Belt, One Road," the opening of the "Silk Road" economic corridor as well as the "Internet+" national strategy, Chinese international education has brought new changes and opportunities [5]. In fact, the "Internet + Chinese Language Education" is the most important and most important part of Chinese language education. As a matter of fact, "Internet + Chinese language education" represents the future development direction of Chinese as a foreign language under the new situation [6]. The continuous development of digital technology and new media platforms provides a technical platform to support the modernization of Chinese classroom teaching. Chinese teaching resources and teaching methods must be combined with the new technologies and products of new media platforms in order to better meet the future development needs of international Chinese education [7]. At the same time, as the "Internet+" strategy has become a national strategy, the use of information and communication technology and the combination of the Internet with traditional industries to create a new ecology in new fields has gradually become a major development trend. As a result, new technologies will fully integrate with traditional industries and lead human society to undergo radical changes [8].

As the demand for Chinese language learning continues to grow around the world, how to provide Chinese learners with effective Chinese learning resources and Chinese learning platforms will become an important task for the development of Chinese international education [9]. At the same time, the growing demand for Chinese language learning has also greatly promoted the construction and development of online teaching and learning resources for Chinese international education in recent years. In fact, the construction of online teaching resources is an important indicator of the development of "Internet+Chinese international education" [10]. As a result, it is relatively indispensable to investigate and study the online teaching resources of "Internet +Chinese International Education" in this context, and it has important research value.

With the development of the Internet, the "Internet+" model is influencing changes in all aspects of education. At present, besides traditional offline classroom teaching, online teaching is also being adopted by teachers and students, especially under the impact of the epidemic; online education is particularly important [11]. As illustrated in Figure 1, in teaching Chinese as a foreign language, foreign students can use online courses to learn Chinese, and Chinese teachers can also use online courses to teach online or supplement offline teaching. Among all kinds of online courses, microlessons are one of the most common forms of teaching [12]. To be specific, it is a digital resource designed to support multiple learning styles by focusing on short and concise microearning videos for a particular knowledge point or teaching session. At present, no matter what type of microlesson, it is ultimately presented in the form of a microvideo [13]. As a matter of fact, the microlesson is a microvideo, which contains pictures, text, sound, and other media information. As a result, the multimedia information presentation design of microlessons should be an important indicator to evaluate the quality of microlessons. Whether the presentation of multimedia information in Chinese microlessons is scientific and consistent with the cognitive rules of learners directly affects the efficiency of foreign learners' Chinese learning [14].

At present, research on the design and application of Chinese microlearning for international students is in its initial stage. Although the number of Chinese microlessons is increasing, due to the lack of systematic theoretical guidance, there are still many problems in terms of quality, such as inappropriate graphic layout, excessive redundant information, and unreasonable subtitle design [15]. In order to solve these problems, the theory of multimedia teaching design can be used as the theoretical basis for evaluating the multimedia presentation of Chinese microlessons. After all, multimedia learning allows learners to construct mental representations from text and images [16]. Text refers to the material presented in verbal form. Pictures are materials presented in the form of images. The focus of microlearning design is on how to present the multimedia information in the form of text and images [17]. As a result, the theory of multimedia instructional design is highly applicable to microlearning design. The thirteen principles of multimedia instructional design proposed therein can be used as important indicators for the quality evaluation of Chinese microlessons.

With the development of the Internet, a series of new media platforms, such as cloud computing, big data, mobile terminals, social media represented by WeChat, Chinese learning APP, webcasting, and VR, has become annual Internet hotspots, representing the new direction of combining Chinese international education with Internet teaching [12, 18]. At present, "new media+education" is still in the exploration stage in China, and no complete model or case has been formed yet. Therefore, "new media+education" is a process that requires continuous exploration and experimentation, and it is an irreplaceable choice in the education field to follow the trend of the Internet [19]. As a result, in the context of "Internet+Education," the traditional teaching of Chinese as a foreign language has also entered the era of "Internet+Chinese International Education." With the development of the Internet, a series of annual Internet hotspots, such as cloud computing, big data, mobile terminals, social media represented by WeChat, Chinese learning APP, webcasting, and VR, represents the new direction of the development of Chinese international education combined with Internet teaching [20]. Although this new research area of new media platforms has just started, it is indeed a hot topic that needs to be studied urgently.

In the age of information technology, the traditional language and text-based teaching mode can no longer meet the needs of students to interpret and study information transmission and meaning expression in classroom teaching [21]. In order to stimulate students' interest and motivation and improve teaching efficiency and quality, teachers make full use of multimedia technologies such as PPT, audio, and video and use multimodal resources to teach (Figure 2). In fact, Chinese as a foreign language is a special and highly practical subject. At the same time, teaching

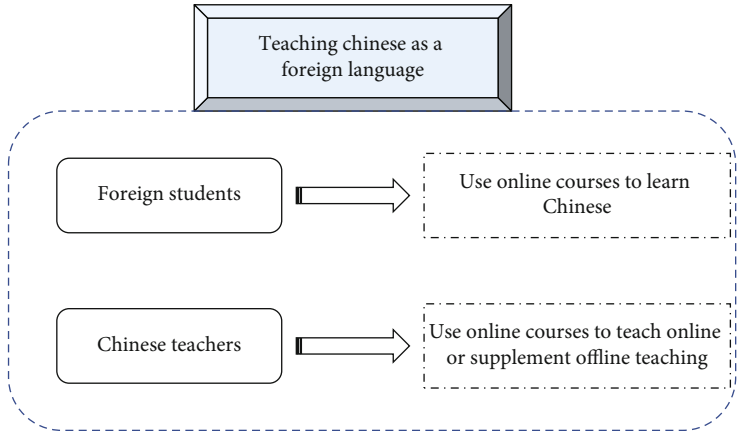


Figure 1: Teaching Chinese as a foreign language.

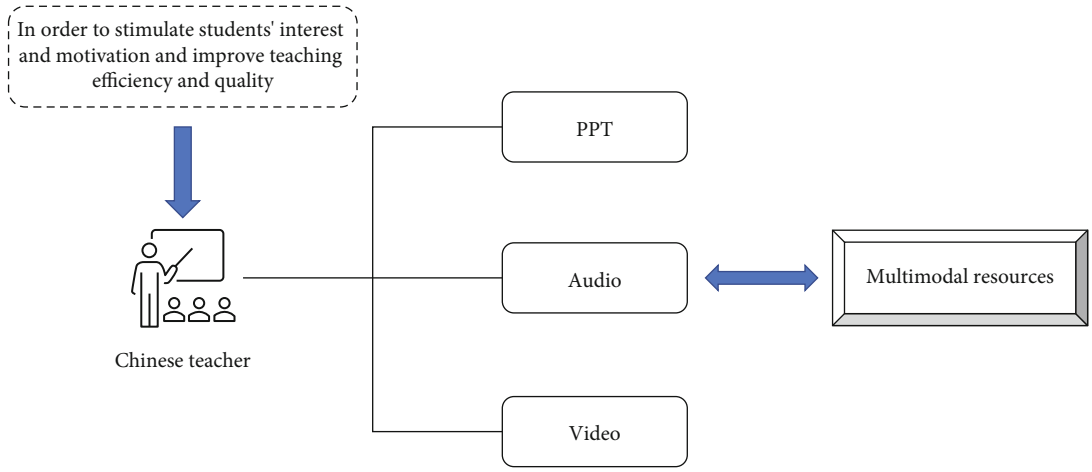


Figure 2: Teaching model of Chinese teachers.

Chinese as a foreign language is also a special teaching course [22]. After all, it is the teaching of Chinese as a second language to foreigners or people whose first language is not Chinese. In addition, it focuses on skill training and aims to develop Chinese communicative competence and is characterized by the diversity of knowledge and students [23]. As a result, the use of modern multimedia technology and multimodal teaching methods in the classroom can improve the teaching efficiency and meet the objective needs of teaching Chinese as a foreign language in the new era.

Traditional teaching is a thing of the past, and the integration of technology into the classroom has brought about significant changes in education [24]. At the same time, the era of big data is now entering. As a result, big data technology is being used in a wide range of industries as a means of extracting valuable knowledge and providing decision support. This technology is also being integrated into the education sector, opening up new horizons for the development of smart classrooms [25]. Technology advances and multimedia applications have brought opportunities for the transformation of traditional classroom teaching, and the rapid development of education informatization has provided opportunities for in-depth research on smart education and smart classroom.

In recent years, with the continuous development of modern education technology, it has become more and more common to use modern multimedia technology in teaching Chinese as a foreign language. After all, teachers of Chinese as a foreign language can use PPT, projectors, and other methods to teach in the classroom. At the same time, multimodal teaching mode is an active and effective teaching method, but most teachers of Chinese as a foreign language can use this mode with ease, but they do not know much about the theoretical basis of this teaching mode [26]. However, it can also act as a cache for multimedia content, thus allowing devices to retrieve that content locally, thus reducing latency [27]. Multimodal interfaces offer highly efficient and expressive human-computer interaction [28]. Therefore, this study is aimed at establishing a theoretical basis for the use of multimodal teaching mode in teaching Chinese as a foreign language by using multiple modalities to convey information and sensory perception. As a result, this paper can help teachers of Chinese as a foreign language to improve the quality and effectiveness of classroom teaching by understanding the theory of multimodal discourse analysis and to increase students' interest and desire to learn Chinese, as well as to improve students' ability to read and write in multiple languages and to use language in a comprehensive way.

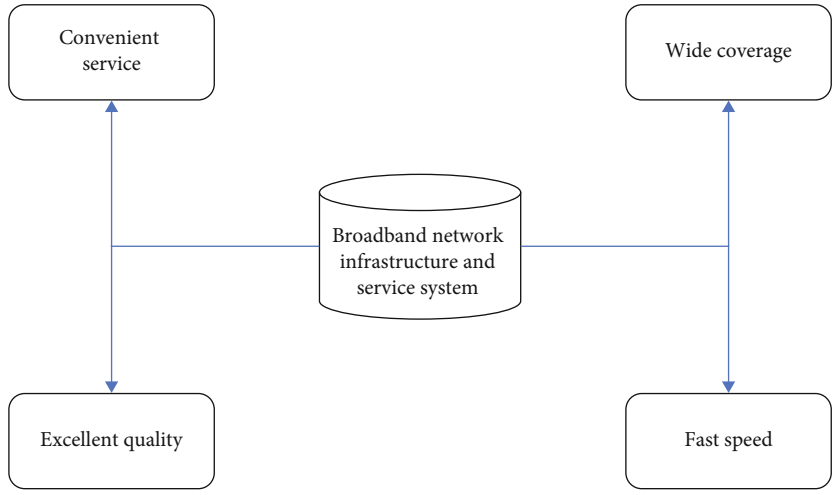


Figure 3: Characteristics of broadband network infrastructure and service system.

## 2. Overview of Chinese Teaching

*2.1. Feasibility Analysis of Online Teaching.* In recent years, countries have positioned public infrastructure for mobile communications networks as a national strategy. As depicted in Figure 3, it has become a national consensus to build broadband network infrastructure and service system with fast speed, wide coverage, excellent quality, and convenient service. As a matter of fact, these initiatives have been supported and recognized by countries in terms of facilitating national informatization, industrialization, and modernization. At the same time, with the emergence of a new round of technological revolution focusing on information technology, the Internet is increasingly becoming a pioneering force for innovation-driven development. In addition, information infrastructure has become the cornerstone of the new round of science and technology. Therefore, the construction of network facilities has a high strategic development status in all countries. In this context, it is necessary to actively introduce high-speed broadband support policies, accelerate space network exploration and layout, and increase universal service support to promote the evolution of network facilities to a new generation of information infrastructure. Overall, it seems that the global information infrastructure is accelerating in the direction of high speed, wide penetration, full coverage, and intelligence, and its strategic position is becoming increasingly prominent. This background provides a strong material foundation for various network services.

As such, it distinguishes itself from e-learning and digital learning that are generally given priority to the web and fixed desktop computers. The rapid increase in mobile applications has made it possible to deliver formal learning through mobile devices. Formal traditional learning is generally considered to be a long classroom model of instruction. However, mobile learning enables modularity of learning and thus a high flexibility of learning, especially for commuters who have to use mobile learning for fragmented learning while on the road. In addition, learning platforms with content tagging capabilities make learning content easily retrievable. At the same time, mobile learning platforms also help form personalized learning paths, making learning more responsive to the needs of all types of learners.

*2.2. Necessity Analysis of Online Teaching.* At present, it is obvious that the Chinese language teacher delivery mechanism cannot meet the huge demand. The main reason is that as they grow older, most Chinese teachers prefer to stay in their home countries for employment, making Confucius Institutes lack a sustainable development mechanism to ensure their teachers' strength. This also leads to a large number of teacher resources in China, and various countries or regions are unable to develop Chinese international education effectively. Combined with the above data, the problem of insufficient teachers for international Chinese language education will become increasingly prominent in the future. However, online Chinese education for foreigners breaks the limitations of time as well as space and can largely compensate for the shortage of teachers. To be specific, both teachers and students are able to schedule their own class time (Figure 4). At the same time, learners are able to choose the content, time, and place of study according to their different learning purposes. As a result, the freedom and flexibility of the learning style also enhances learners' interest in learning.

In terms of the existing Chinese language course teaching resources, no matter how they are divided to examine the current course teaching resources, they all highlight the current situation of insufficient resources. At present, as shown in Figure 5, Chinese language course resources can be divided into two categories: offline and online. Offline course resources are mainly concentrated in international colleges under universities and Confucius Institutes under language cooperation and exchange centers. Learners who are allowed to use these two types of offline course resources need to meet a variety of conditions, such as obtaining the qualification to study in Chinese universities and opening Confucius Institutes or Confucius Classrooms in their home cities. These objective conditions, however, to a certain extent limit the freedom of learners to learn Chinese and are not conducive to the further promotion of the

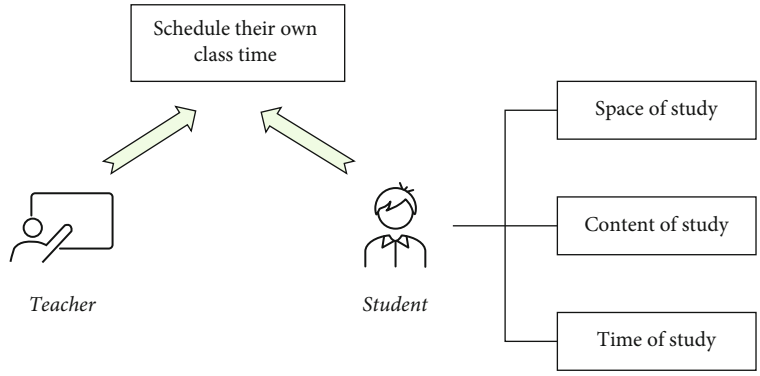


Figure 4: Task of teacher and student.

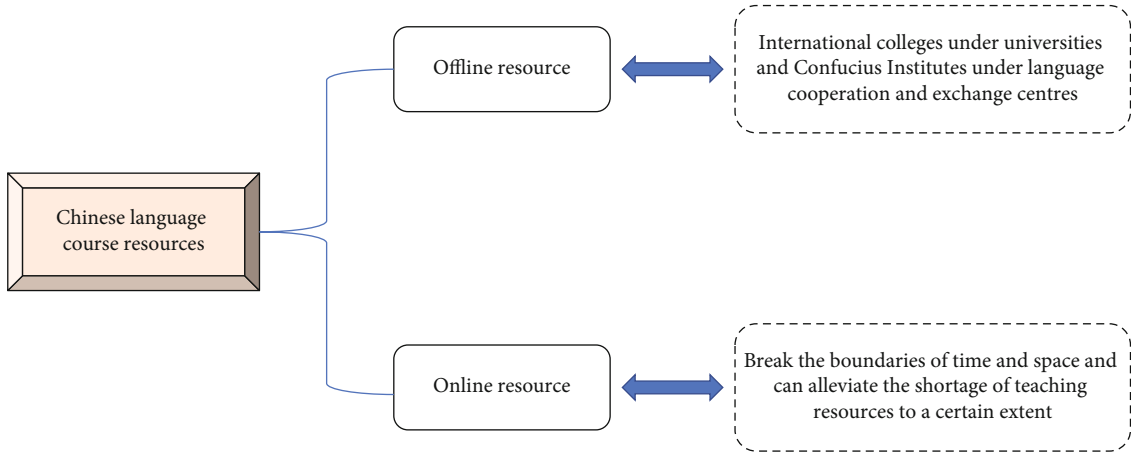


Figure 5: Chinese language course resources.

international Chinese language cause. As a result, in order to make up for the shortage of teaching resources in offline courses, online Chinese courses break the boundaries of time and space and can alleviate the shortage of teaching resources to a certain extent.

Fragmented learning is a way of learning by fragmenting the content so that the learner learns the content in pieces. From another perspective, fragmented learning is the use of fragmented time to learn fragmented content. Breaking down this concept in this way allows people to look at fragmented learning more holistically. With the development of mobile Internet, such a learning method is in line with the change of people's lifestyle. As a result, the development of online Chinese education for foreigners has also adapted to the learning habits of learners in the Internet era.

*2.3. Educational Technology Theory.* Educational technology theory advocates that teaching should be learner-centered, emphasizing the main role of students and promoting a shift from teaching to learning. As a result, teachers should use all teaching techniques and teaching tools with the aim of helping students to acquire knowledge. In the whole teaching process, teachers only play the role of guiding and supervising students. As illustrated in Figure 6, educational technology theory suggests a shift in emphasis from teaching resources to learning resources in the teaching and learning process. When designing instruction, teachers should choose resources that are more relevant to student learning than those that are more conducive to teacher instruction. After all, the resources collected in this way are more relevant to student learning as well as can improve student learning at the source.

Under the guidance of educational technology theory, teachers need to provide students with richer and more vivid learning resources according to their learning characteristics and with the goal of facilitating their learning. The integration of educational technology theory into teaching Chinese as a foreign language can transform the teaching style and achieve good teaching effects. For example, when introducing the teaching content, teachers can show relevant pictures to arouse students' interest in learning. When teaching Chinese characters, teachers can demonstrate the stroke order of Chinese characters through animations. When practicing grammar, teachers can use pictures or videos to help students create conversational situations and provide a more realistic language environment. In these ways, students can internalize language knowledge more effectively and achieve their goals.

## 3. Application of Multimodal Multimedia Information and Big Data Technology

*3.1. Multimodal Teaching Model.* In recent years, with the continuous progress of science and technology, teaching

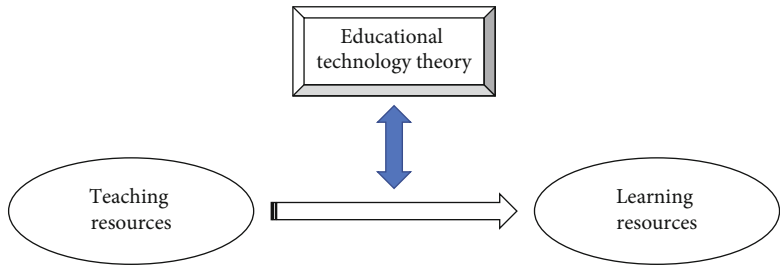


Figure 6: Educational technology theory.

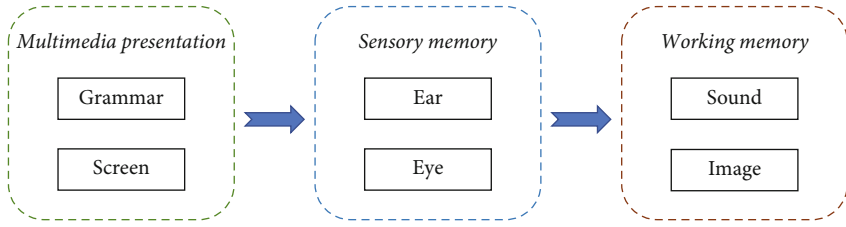


Figure 7: Cognitive theoretical model of multimedia learning.

tools and teaching methods have been enriched. In this context, the national education reform is facing a serious situation. In order to keep pace with the new teaching environment and teaching requirements, the teaching forms and teaching methods of various subjects must be innovated and reformed accordingly. The research on multimodal discourse analysis in the field of teaching and learning has emerged in response to this situation, providing a new direction for the reform of teaching methods.

In fact, multimodal teaching and learning is the use of modern multimedia technology. To be specific, it breaks through the conventional limitations of natural language in classroom teaching, making the construction of language knowledge clearer and more accessible to learners. The multimodal teaching model has advantages that traditional teaching models cannot match. It meets the requirements of the digital and information era and uses original video and audio teaching materials to make abstract language teaching concrete and provide learners with a more realistic language acquisition environment. This allows learners to perceive the cultural background of the target language clearly and comprehensively in a realistic and concrete language context, so that language acquisition can be achieved with half the effort and that language learners can imitate the purest language.

*3.2. Multimedia and Big Data Technology.* Cognitive theory of multimedia learning is a theory that examines how people learn through words and images. As a theory of learning within Meyer's multimedia learning theory, the cognitive theory of multimedia learning is an explanatory theory. To be specific, it explains the learning mechanism by which learners construct knowledge by processing the information presented by multimedia. According to the cognitive theory of multimedia learning, one of the fundamental goals of multimedia teaching and learning is to enable learners to fully process existing materials in multiple formats, build consistent mental representations, and finally complete the cognitive construction of new knowledge.

The cognitive theoretical model of multimedia learning is shown in Figure 7. As a matter of fact, learners must go through five steps in order to learn meaningfully: word selection, image selection, word organization, image organization, and two-way integration. This model can provide a solid scientific foundation for multimedia instructional design theory. In other words, multimedia instructional design should allocate limited cognitive resources in the most optimal way to realize the effective combination of words and images, so that learners can realize meaningful construction.

Through a survey of new media platforms at home and abroad, we found that new media platforms have been used in teaching Chinese as a foreign language in China. At present, research on WeChat is mainly focused on the practice of teaching Chinese as a foreign language on WeChat public platform, the study of teaching spoken Chinese as a foreign language based on WeChat public platform, the case of blended learning with the assistance of WeChat, and task-based teaching design. Research on Chinese learning APPs has focused on the last three years, and the current study focuses on analyzing representative cases of Chinese learning APPs and focusing on users' feedback. This study concludes that Chinese learning APPs have a broad market prospect and development potential, but the quality of the current software varies, the professionalism is not enough, and the form and content are not perfectly combined. At present, studies on new media platforms in overseas Chinese language schools show that new media platforms are effective tools for improving the quality of teaching Chinese as a foreign language and promoting Chinese language and culture. In the field of teaching Chinese as a foreign language in China, new media platforms are still a novelty. With the continuous development and popularization of modern

Table 1: Result of questionnaire before applying the multimodal teaching model.

| | |
|---|---|
| Basic attitudes of students towards current Chinese language learning | 65% of the students are interested in learning Chinese |
| | 67% of the students are dissatisfied with the current classroom pattern of Chinese as a foreign language and hope that the teachers can change the current teaching style |
| | 73% of students do not initiate interaction with teachers |
| Students' perceptions of multimodal teaching methods | 32% of the students never use the Internet to learn Chinese |
| | 84% of the students would like their teachers to include their favorite modalities such as video, audio, and animation in the PPT teaching materials for teaching |
| Students' learning difficulties | 59% of the students think that their greatest difficulty in learning Chinese is that they do not have strong self-control and do not pay attention in class |
| Students' existing study habits | 32% of the students have the study habit of studying before class and reviewing after class |

Table 2: Result of questionnaire after applying the multimodal teaching model.

| Question | Yes | No |
|---|---|---|
| Are you more interested in learning Chinese? | 89% | 11% |
| Do you like the current multimodal teaching model? | 81% | 19% |
| Has the learning efficiency increased? | 92% | 8% |
| Has participation in teaching activities become more active? | 73% | 27% |
| Has the Chinese language level improved? | 76% | 24% |
| Do you study before class? | 83% | 17% |
| Do you review after class? | 86% | 14% |

information technology, more and more Chinese teachers and experts will pay attention to the research and use of new media platforms to assist the teaching of Chinese as a foreign language.

The big data environment is a branch environment in the information technology environment. The teaching of Chinese as a foreign language in this environment is the culmination of the development of information-based education. In fact, technology can realize the communication between human language and machine language and build data models to comprehensively record and collect behavioral data. Then, the combination of data collection, intelligent data analysis, real-time analysis of learning data, real-time pushing of resource data, and dynamic feedback results can promote the construction of a big data environment, thus completing the construction and implementation of a smart classroom model in the new era of big data environment. It allows students to experience the teaching process as interactive, intelligent, data-driven, and dynamic and promotes the rapid development of education in the direction of informatization and wisdom. The key to the completion of intelligent learning lies in the use of terminal tools and big data analysis technology to grasp the real-time learning dynamics of students in the big data environment.

*3.3. Case Study.* In order to validate the multimodal teaching model proposed in this paper, a case study was performed through a questionnaire. Specifically, the survey was conducted in two classes of a secondary school in Qingdao, China, in the class of 2021. A total of two questionnaires were implemented in this study. The first one was conducted before the application of the multimodal teaching model to find out the students' attitudes toward the current teaching method, their current learning habits, and learning styles. The second questionnaire was performed after the application of the multimodal teaching model to find out whether students' attitudes and learning habits had changed after a period of teaching in the multimodal teaching model and whether they recognized and accepted the multimodal teaching mode. In the first survey, 100 questionnaires were distributed and 97 questionnaires were returned, with a return rate of 97%. In the second survey, 100 questionnaires were distributed and 99 were returned, with a return rate of 99%. The analysis results of the questionnaire survey are shown in Tables 1 and 2.

The results from the second questionnaire showed that the students' learning attitudes, study habits, and Chinese language skills have changed and improved greatly compared to those before the multimodal teaching model. Therefore, the multimodal teaching mode meets the development requirements of teaching Chinese as a foreign language in the new era. It can make full use of modern multimedia technology and modern education technology to combine text, pictures, video, audio, gestures, and other dynamic and static modalities and apply them to teaching Chinese as a foreign language in the classroom. In addition, it can create realistic language learning environments and situations that enable students to perceive and understand Chinese with multiple senses, thus achieving the best teaching effect to the greatest extent possible.

## 4. Conclusion

Multimodal teaching mode is a teaching method derived from the theory of multimodal discourse analysis. It is a teaching method that uses modern multimedia technology

combined with audio, video, animation, physical demonstration, facial expressions, and body movements to engage students' visual, auditory and tactile senses in classroom teaching activities. Compared with the traditional teaching mode, multimodal teaching mode is obviously more advantageous, in addition to the basic advantages of efficiency, speed, flexibility, and specificity. More importantly, it can significantly improve students' overall academic performance, especially in listening, speaking, and reading. In addition, the multimodal model is more popular and accepted by students than the traditional model. The multimodal model is more popular and accepted in the classroom than the traditional model. The theory of multimodal discourse analysis explains the multimodal expressions of language from different levels, which makes the application of multimodal discourse analysis theory in teaching Chinese as a foreign language scientifically and feasibly. Multimodal discourse analysis provides objective explanations of the various modalities of language expressions at the cultural, content, contextual, and expressive levels and provides theoretical guidance for teaching Chinese as a foreign language in the classroom. However, due to various constraints, there are many shortcomings in this paper, such as the lack of empirical investigation. However, this study hopes to provide some practical suggestions and guidance for front-line teachers of Chinese as a foreign language, so as to contribute to the improvement of the teaching level of intermediate integrated classes. In the future, multimodal teaching frameworks and models that combine with other advanced technologies can be designed to better facilitate the development of Chinese language teaching.

## Data Availability

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

## Conflicts of Interest

There are no conflicts of interest.

## Acknowledgments

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