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Research on the Application of New Technologies in Digital International Chinese Education Textbooks

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Abstract: With the advent of the information age, the traditional teaching concepts and the form of international Chinese education textbooks have been unable to meet the development needs of international Chinese education. Giving full play to the advantages of information technology in international Chinese education and using new technological means to develop digital International Chinese education textbooks will contribute to the spread of international Chinese education in the new era. In view of the current situation of the development of Digital International Chinese education textbooks, this paper describes and analyzes the morphological characteristics of several different levels of Digital International Chinese education textbooks, such as paper-based textbooks, multimedia digital textbooks, interactive digital textbooks and centralized digital textbooks, and analyzes the two-dimensional code or web page link and mobile terminal technology, VR technology and AR technology in the development of Digital International Chinese education textbooks The application of new technical means such as human-computer interaction and artificial intelligence technology is discussed to provide reference for the research of Digital International Chinese education textbooks and better promote the innovation and development of international Chinese education.

Keywords: Digital Teaching Materials; International Chinese Education; New Technology.

1. Introduction

With the advent of the information age, the concept of education and teaching, as well as the form of educational resources, are constantly changing, bringing about changes to the education industry. The rapid development of information technology, the widespread application of new technologies, and the emergence of new formats have had a disruptive impact on traditional publishing. Traditional teaching concepts and textbook forms are no longer able to meet people's learning and reading needs. Informationization has weakened people's reliance on traditional paper textbooks, and instead, they are making more use of network and multimedia means for learning. Compared to traditional paper textbooks, electronic and interactive textbooks that use multimedia technology to digitize traditional paper content are more in line with people's reading habits and learning methods. Therefore, in the information age, the digitization of textbooks is inevitably an irreversible development trend. Digital textbooks fully leverage the advantages of information technology, utilizing new technological means to organically combine various elements such as text, audio, images, videos, and animations, with the characteristics of portability, interactivity, and entertainment.

To promote the development of international Chinese education, the development of international Chinese education textbooks must keep up with the pace of the times and accelerate the construction of digital international Chinese education textbooks. According to Ying Xuefeng's article "Analysis of the Transformation of Digital Publishing of Chinese Language Teaching Materials for Foreign Languages in the Context of International Promotion of Chinese Language", in terms of the hierarchical division of digital textbooks, digital textbooks can be divided into four levels: digital paper textbooks, multimedia digital textbooks, interactive digital textbooks, and aggregated digital teaching materials. In view of the current situation of international Chinese language education textbooks, there is an urgent need to build "multimedia" and "interactive" digital international Chinese education textbooks, and strengthen the exploration of "clustered" international Chinese education digital textbooks. The digitization of international Chinese education textbooks is an inevitable requirement for the development of international Chinese education in the new era. The development of digital international Chinese education textbooks must have distinct characteristics of the times. The development of digital international Chinese education textbooks must fully consider the application of new technological means on the basis of the original development ideas and paths, and at the same time, use information technology to build a three-dimensional teaching resource platform, Improve the quality and efficiency of international Chinese language teaching. The construction and development of digital international Chinese language education textbooks can make international Chinese language education go further and further on the path of specialization, and help better serve the international Chinese language teaching in the new era.

2. Current Status of Digital International Chinese Education Textbooks

There are various types of international Chinese language education textbooks. According to the latest statistical data on global Chinese language education textbooks in the "Report on the Development of International Chinese Language Education Teaching Resources (2021)", as of now, there are a total of 19530 international Chinese language education textbooks worldwide (7278 were published from 2001 to 2010, and 8039 were published from 2011 to 2020), There are 3679 digital textbooks (1744 developed in China, accounting for 47.40%, and 1935 native Chinese numerals textbooks developed in 18 foreign countries, accounting for 52.60%). The report also points out that among these 3679 international Chinese language education digital textbooks, Asia has 2462,

accounting for 67%, North America has 806, accounting for 22%, Europe has 253, accounting for 7%, and Oceania, Africa, and South America have fewer, accounting for only 4%.

The development of information technology in education has led to an increasing demand for digital international Chinese education textbooks, and supporting resources have also been increasingly developed and improved. The "Report on the Development of International Chinese Education Teaching Resources (2021)" also conducted relevant data statistics on MOOCs, WeChat courses, learning websites, and apps. The data shows that there are currently 485 international Chinese education MOOCs, mainly concentrated on MOOCs platforms, including 364 domestic platforms and 121 foreign platforms. There are currently 4865 international Chinese online micro courses, mainly constructed through micro course competitions. There are currently 404 international Chinese learning websites based on computer terminals, with users worldwide and developers covering 25 countries on five continents, including 107 Chinese teaching websites developed in Asia, 266 in the Americas, 24 in Europe, 6 in Oceania, and 1 in Africa. There are currently 334 Chinese learning apps, of which the development was rapid from 2016 to 2020, with about 50 apps being launched annually.

From the review of the "Report on the Development of International Chinese Education Teaching Resources (2021)", it is not difficult to see that the construction of international Chinese education textbooks has achieved remarkable achievements in the past 20 years, achieving a comprehensive upgrade from traditional paper textbooks to digital textbooks at the macro level. However, although the construction of digital international Chinese education textbooks has achieved significant results, there are also many problems. Through analysis of existing digital international Chinese education textbooks and their affiliated resources, and comparison with other relevant research literature, it is found that many digital international Chinese education textbooks only achieve multimedia digitization of paper textbooks, There are very few digital international Chinese education textbooks such as "Great Wall Chinese" that truly integrate new technological media and establish a certain scale of digital resource apps or online learning platforms. Although some textbooks have built digital platforms, their interactive functions and intelligent service levels are very limited, making it difficult to organically integrate diverse resource models with teaching, Resulting in low application efficiency of digital international Chinese education textbooks.

3. The Morphological Characteristics of Digital International Chinese Education Textbooks at Different Levels

With the development and transformation of technology, the form of digital textbooks has gone through several stages of development: static, dynamic, interactive, and integrated. The morphological characteristics of digital international Chinese textbooks follow the development laws of digital textbooks. The following will analyze and elaborate on different levels of digital international Chinese textbooks in the order of development.

(1) Digitalization of paper textbooks

The digitization of paper textbooks, also known as static electronic textbooks, is the most fundamental aspect of digital textbooks. Based on two articles by Hu Pan, Wang Dongqing, Xu Jun, and Han Hou, titled "Morphological Characteristics and Functional Models of Digital Textbooks" and Chen Zhuo's "From" Paper Textbooks "to" Digital Textbooks ", it can be seen that digitization of paper textbooks only involves scanning and processing traditional paper textbooks, and storing them on a server terminal. It emphasizes the digital restoration of the original format, font, layout, and other elements of paper textbooks. Compared with the traditional paper teaching materials, the static electronic teaching materials can provide learners with more extensive reading and Learning space in terms of organization. They are searchable, easy to carry, and efficient in dissemination. However, the digitization of paper textbooks still does not break away from the framework of paper textbooks in essence. Due to the simple form of media, the content presentation is still static and closed, which cannot reflect the interactive characteristics. In school education and classroom teaching, the teaching form of static electronic textbooks is not significantly different from traditional paper textbooks. Traditional teaching media such as cards, flip charts, test manuals, audio and video CDs are still needed to assist, and there is no advantage in teaching effectiveness compared to traditional paper textbooks.

（2）Multimedia digital textbooks

Multimedia digital textbooks, including both multimedia electronic textbooks and paper digital integrated multimedia textbooks, combine traditional paper textbooks or static electronic textbooks with multimedia technology. Hu Pan, Wang Dongqing, Xu Jun, and Han Hou pointed out in their article "The Morphological Characteristics and Functional Model of Digital Textbooks" that multimedia digital textbooks are no longer simply copying the content of paper textbooks, but effectively integrating relevant media resources according to teaching needs. Multimedia digital textbooks embed multimedia resources into the textbooks, which have features such as images, audio, videos, animations, and more vivid and vivid presentation of knowledge content. In the teaching process, multimedia digital textbooks usually use mobile devices such as electronic screens, computers, tablets, and mobile phones as hardware facilities, which can complete teaching activities that are difficult to achieve in static electronic textbooks. By three-dimensional knowledge content, the teaching content becomes more intuitive and clearer. However, although multimedia digital textbook resources have become abundant, learners still adopt a passive approach to learning, which cannot achieve two-way interaction between learners and textbooks. In school education and classroom teaching, the use of multimedia digital textbooks only stimulates learners' enthusiasm and initiative to a certain extent, but does not have the function of improving classroom interaction between teachers and students. In terms of creating teaching scenarios, the content of the textbooks is still difficult to integrate into the corresponding teaching scenarios.

(3) Interactive digital textbooks

Interactive digital textbooks, also known as interactive digital textbooks, are data-driven textbooks that achieve interaction based on internet platforms. The article "Interactive Digital Textbooks: A New Form of Digital Teaching Resources" by Lin Junfen, Li Huiqin, and Huang Haihui summarizes interactive digital textbooks. Interactive digital textbooks are open courses that include textbooks, resources, tools, and platforms, and have flexible and real-time human-computer interaction functions. They can support

the interaction between teachers and digital textbooks, learners and digital textbooks, teachers and students, and students The interaction between parents and schools, interactive digital textbooks adopt a teaching method of guided dialogue, real-time communication, and result sharing, integrating resources such as question bank evaluation, video micro lessons, teaching preparation, and course tools, providing strong support for students' learning, teacher guidance, parent supervision, and other processes. Interactive digital textbooks provide listening, speaking, reading, and writing exercises for all knowledge elements in the textbook through fragmented and elemental technology processing. For example, the interactive modules of interactive digital textbooks such as Singapore's "Primary School Chinese", "Zebra AI Class", and "Hong En Literacy" allow students to practice by engaging in human-machine dialogue with computers. Interactive digital textbooks provide convenient conditions for teachers and students to create and carry out classroom teaching activities, and create a friendly interactive environment for the design of teacher teaching activity scenarios and the implementation of student teaching activities, achieving an organic combination of teaching materials and classroom scenarios.

(4) Aggregated digital textbooks

Clustered digital textbooks are data-driven textbooks that gather digital resources. They integrate and enhance the digitization of paper textbooks, multimedia digital textbooks, and interactive digital textbooks at three levels. Yang Zhaojian pointed out in his article "Digital Textbooks Lead the Way of the Future Classroom" that the teaching method of clustered digital textbook teachers is to use learning terminals as carriers and learning cloud platforms as support, using new technological means to deeply and tightly integrate multimedia technology, mobile internet technology, intelligent learning terminals with knowledge content and platform services, expanding and transforming the functions and application methods of digital textbooks. Clustered digital textbooks have the characteristics of multiple subjects, dimensions, and levels, achieving cross regional interaction between teachers and students, updating the form of classroom teaching, and are the highest form of digital textbooks. In the future, more new technologies will be applied to the field of digital textbooks, which will develop towards higher intelligence, stronger integration, and more realistic scenarios.

4. Application of New Technical Means in Digital International Chinese Education Textbooks

Considering the application characteristics of digital international Chinese education textbooks, as well as the unique interactive, intelligent, and highly integrated features of digital international Chinese education textbooks, the new technological means studied in this study are all based on the background of internet technology. The application of new technological means in digital international Chinese education textbooks can be broadly divided into the following three directions.

(1) Integration of QR code or webpage links with mobile terminal technology

Given the long-term and profound impact of traditional paper textbooks, although digital textbooks have many advantages, they cannot completely replace paper textbooks for a certain period of time. So multimedia international Chinese education digital textbooks using embedded QR codes or web links will be the main development subject for a long time in the future. Applying QR codes or web links in textbooks to expand knowledge, videos, animations, question banks, reference answers, and other related content, and presenting knowledge through scanning codes on mobile devices such as laptops, tablets, or smartphones, providing readers with more choices in reading and enriching the textbook experience. Learners can preview their knowledge by scanning or clicking on links, consult relevant references for extended reading, and watch videos and animated audio and dynamic materials through scanning or clicking on links. Even in the after-school practice session, you can scan the code or click on the link to view the evaluation content of relevant assignments, and learn about different problem-solving ideas and styles. At the same time, you can also use QR codes or web pages to connect with the platform client, and comment, share, and forward your reading experience and insights through the platform's comments in a timely and effective manner, achieving interaction with teachers or other readers.

(2) The Application of VR Technology and AR Technology

The future development of international Chinese language education and teaching activities must be based on real and real-life scenarios, and the development of digital international Chinese language education textbooks must also meet the needs of situational and situational teaching. The combination of digital teaching materials with VR (virtual reality technology) and AR (augmented reality technology) can enable learners to have an immersive learning experience. Whether it is using VR technology to simulate the real world through computer technology, creating a real three-dimensional dynamic scene, or using AR technology to seamlessly integrate real world information with virtual world information, so that learners can perceive a world that blends real and virtual, the ultimate goal is to make the knowledge content more three-dimensional, in order to achieve a comprehensive and dynamic form of knowledge expression. The use of VR and AR technology in digital international Chinese education textbooks not only allows for seeing, listening, and thinking, but also enables hands-on learning, enhancing learners' interest in learning. The use of VR and AR technology in digital international Chinese education textbooks breaks the boundaries of time and space. By creating work and life scenarios, work, life and knowledge are closely linked, improving learners' understanding of knowledge and achieving better teaching.

(3) The combination of human-computer interaction and artificial intelligence technology

Human-computer interaction, also known as HCI, is a way for people to interact with machines and a platform for technology to play a role. Artificial intelligence, abbreviated as AI, is an ability that enables machines to have similar human behavior and thinking functions. The digital international Chinese education textbooks that use human-computer interaction and artificial intelligence technology have visual human-computer interaction interfaces, provide input and output channels based on human-computer interaction modules, and use artificial intelligence algorithms with speech recognition technology, speech synthesis and Handwriting recognition technology to enable textbooks to communicate like people and achieve interaction with learners. The digital international Chinese textbook, which

adopts AI and HCI technology, can receive the operational signals input by learners in multiple dimensions, identify learners' intentions and emotions, and quickly provide correct feedback. Through a wider interaction range, learners can obtain a more comprehensive sensory experience. The digital international Chinese textbooks using AI and HCI technologies have improved the depth of machine service for humans, providing learners with more choice space, enabling them to selectively learn knowledge. At the same time, learners can also accept new knowledge anytime and anywhere without being limited by time and location, simply using intelligent terminals to open learning platforms or learning apps in the network environment, greatly improving learning efficiency.

In the future, with the continuous integration of 5G, artificial intelligence, Internet of Things, cloud computing, big data, virtual reality, human-computer interaction and other technologies with digital textbooks, digital textbooks will be more diversified and deepened. The development of digital international Chinese education textbooks should not only consider the application of new technological means, but also comprehensively evaluate various technologies carried, ensure the rationality of digital international Chinese education textbooks according to actual needs, and better promote innovation and development of international Chinese education.

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