

# Digital Textbooks and Their Development Trends

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**Abstract:** Digitization represents a more advanced stage in the integration of information technology, reshaping human production and lifestyles. The digital transformation entails reconstructing the digital education ecosystem. Textbooks are the most important carriers of teaching content and ideas and serve as crucial blueprints for instruction. They present several disadvantages, such as high costs, inconvenience in portability, monotonous content presentation, slow updates, difficulty in taking notes, challenges in tracking learners' behaviors, and achieving personalized and targeted teaching. International Chinese language education involves students from various countries, spanning different time zones and spaces, with significant variations in study times, learning differences, economic levels, and developmental stages, making the drawbacks of traditional textbooks even more pronounced. Digital textbooks, with their convenience, interactivity, and personalization, can address many of these issues, thereby better facilitating the digital transformation of education. This is also a pressing issue to be addressed in the digital transformation process of international Chinese education. However, despite being around for many years, digital textbooks are still relatively new. People's understanding of their concepts and standards remains limited. This paper reviews the development of digital textbooks to clarify their advantages and challenges and concludes with strategic recommendations to aid the construction of digital textbooks for international Chinese language education.

**Keywords:** Digital textbooks; Educational reform; Learning methods; Development trends

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## 1. Introduction

In today's world, information technology has infiltrated every aspect of people's production and lifestyles, altering and reshaping the ways people live and work. Digitization marks a more advanced stage in the integration and reshaping of human production and life through information technology. This digital transformation involves reconstructing the digital educational ecosystem, encompassing teaching environments, methods and modes, content, philosophies, and management. Through human-computer collaboration, education is liberated from simple, repetitive, and cumbersome tasks, helping educators and learners break through the constraints of time and space, continually enhancing teaching efficiency and learners' creativity, and refreshing educational ideologies. Textbooks, as the most important carriers of teaching content and ideologies,

serve as crucial instructional blueprints. They exhibit numerous disadvantages such as high costs, inconvenience in portability, monotonous content presentation, slow updates, difficulty in note-taking, challenges in tracking learning behaviors, and implementing personalized and targeted teaching approaches. International Chinese language education, aimed at non-native Chinese speakers, involves students from various countries, spanning vast temporal and spatial differences, with significant disparities in study times, learning differences, economic levels, and development stages, where the drawbacks of traditional textbooks are even more pronounced. The digitization of textbooks in international Chinese language education is a pressing issue needing resolution in the transformation process <sup>[1]</sup>.

The emergence of digital textbooks is undoubtedly a revolutionary development in the education sector, altering not only the modes of knowledge dissemination but also significantly affecting students' learning methods and teachers' teaching styles. Digital textbooks, by integrating multimedia resources, provide richer, dynamic content that makes learning more efficient and engaging <sup>[2]</sup>. Nonetheless, as interest in digital textbooks grows, many still have only a vague understanding of what they entail. Therefore, this paper discusses the definition, essence, and historical development of digital textbooks, analyzes their advantages and challenges, and predicts future trends to enhance understanding of digital textbooks and to aid in the development of digital materials for international Chinese language education.

## **2. Definition of digital textbooks**

Digital textbooks, or e-textbooks, involve using information technology to digitize traditional paper content, transforming it into interactive materials suitable for various electronic devices. This creates a new “textbook content—teaching management platform—mobile digital terminal” integrated system. Digital textbooks are characterized by the richness and customization of textbook presentation, the relevance and openness of content, the interactivity and autonomy of textbook teaching, and the diversity and mobility of the textbook medium. Compared to traditional paper-based textbooks, digital textbooks usually include text, images, audio, video, and animations, providing a richer and more interactive learning experience. Digital textbooks can be stored on computers, tablets, and phones, or accessed online via the internet <sup>[3]</sup>.

## **3. Development history of digital textbooks**

The development of digital textbooks dates back to the 1980s with the advent of Computer-Assisted Instruction (CAI), which served as the precursor to today's digital materials. With the proliferation of the internet and multimedia technologies, digital textbooks gradually evolved from solely text-based formats to multimedia materials integrating text, images, audio, and video. Entering the 21st century, with the rise of mobile internet and smart devices, digital textbooks began to develop towards mobility and personalization, allowing learners to access content anytime, anywhere via mobile phones, tablets, and other devices.

## **4. Advantages of digital textbooks**

As technology advances rapidly, the application of digital textbooks in education is becoming increasingly widespread. These resources are gradually replacing traditional paper textbooks and becoming an indispensable part of the modern educational system, with benefits including enhanced learning efficiency, improved interactive experiences, support for personalized learning, and facilitation of lifelong learning.

(1) Enhanced learning efficiency: Traditional textbooks often rely on static texts and images, whereas

digital textbooks fully utilize multimedia technologies, such as text, images, audio, video, and animations, to present information more vividly. Learners can quickly access required information through clicks and swipes, saving time that would otherwise be spent flipping through numerous pages. Additionally, digital textbooks often feature search capabilities, allowing students to quickly locate specific knowledge points and thus enhancing learning efficiency<sup>[4]</sup>.

- (2) Enhanced interactive experience: Digital textbooks provide rich interactive elements, such as online quizzes, virtual experiments, and interactive maps. These interactive features make the learning process more engaging, allowing students to learn through practice, which enhances their understanding and retention. For example, chemistry experiments can be conducted via virtual software, and the anatomical structures in biology can be visualized through 3D models, significantly increasing students' interest and engagement.
- (3) Personalized learning: Each student has different learning paces and levels of comprehension. Digital textbooks can offer personalized learning pathways and resource recommendations based on individual student performance. Through learning analytics, the system can adjust the difficulty and depth of the content in real time, ensuring that each student can learn at their own pace, thus achieving optimal learning outcomes. Moreover, students can choose to explore further readings or delve deeper into subjects based on their interests, catering to personalized needs.
- (4) Cross-geographical and time-independent learning: Digital textbooks are not limited by geographical boundaries. Students can access the content anywhere as long as there is an internet connection, providing equal learning opportunities, especially for students in remote areas. Furthermore, digital textbooks break the constraints of time, allowing students to study anytime and anywhere, which enhances the flexibility of learning.
- (5) Support for lifelong learning: With the rapid pace of knowledge updates, digital textbooks can easily accommodate content updates and expansions. Teachers and students can download the latest supplementary materials or course updates at any time, ensuring the timeliness of the knowledge. This is a significant convenience for lifelong learners, who can continually acquire new knowledge and maintain their enthusiasm and ability to learn.
- (6) Environmental sustainability: Compared to paper textbooks, the production and distribution process of digital textbooks significantly reduces environmental impact. Paperless teaching not only saves paper resources but also reduces carbon emissions from printing and transportation. As education undergoes digital transformation, we are moving towards a greener and more sustainable direction.

In summary, the advantages of digital textbooks are manifested in their efficiency, interactivity, personalization, convenience, and environmental friendliness. These features not only enhance teaching outcomes but also align with modern educational goals of personalization, lifelong learning, and sustainability. However, the development of digital textbooks also faces challenges that need to be addressed to achieve comprehensive educational progress.

## 5. Challenges and strategies for digital textbooks

Digital resources have been a hot topic in the field of education research for over two decades, with the ongoing development of new concepts and technologies that continue to refine the related theories and practices. Nevertheless, digital textbooks face numerous challenges that hinder their sustainable development<sup>[5]</sup>.

- (1) Rapid technological changes: The development of digital textbooks relies on advanced technologies

such as artificial intelligence, virtual reality, and big data. Even so, the rapid pace of technological updates can quickly render digital textbooks obsolete. Educational institutions and teachers need to continually keep pace with technological developments, updating both the content and technological applications of textbooks to maintain their effectiveness and relevance.

- (2) Copyright protection issues: Digital textbooks are easily copied and distributed, posing significant risks of copyright infringement. Some educational institutions and teachers might use digital textbooks without proper authorization, violating intellectual property rights.
- (3) Educational equity issues: The use of digital textbooks depends on electronic devices and internet access, which can be prohibitive for students in economically disadvantaged regions or families, leading to unequal distribution of digital educational resources and exacerbating educational inequities.
- (4) Insufficient teacher training and support: Digital education requires teachers to have certain technical skills and teaching capabilities. Currently, many teachers lack the necessary training and support to effectively use digital textbooks in teaching.
- (5) Inequality in content quality: During the development and production of digital textbooks, there are inconsistencies in quality. Some materials lack scientific rigor and authority, affecting students' learning outcomes.
- (6) Need for enhanced development and practice in digital textbook construction: The construction of digital textbooks includes two aspects, content development and platform construction. This involves readers, reading support functions, teaching support functions, and teaching management functions. Zhou points out that the current design of digital textbook functions is not well-developed, often simplistic and flat, merely digitizing traditional textbooks without including high-quality digital teaching resources <sup>[6]</sup>. Creating quality digital textbooks that play a significant role in classroom teaching requires a professional development team that understands content, technology, and interaction. For instance, publishers like Higher Education Press and People's Medical Publishing House have developed digital textbooks, involving product planning, layout design, functionality design, content review, and platform construction, all completed by specialized teams. Yet, most digital textbook development institutions in China have not formed professional teams dedicated to this task.

## 6. Strategies for addressing challenges with digital textbooks

Digital textbooks offer many benefits, such as accessibility and interactivity, but they also present several obstacles. To effectively leverage the potential of digital textbooks, it is essential to develop and implement strategies that address these challenges. Below are some key strategies for overcoming common issues associated with digital textbooks:

(1) Establishment of digital education technology development teams: Collaborate with technology companies to research and develop new technologies in the field of education. In addition, teachers need regular technical training to enhance their digital education skills and keep the teaching content up-to-date and engaging.

(2) Development of comprehensive digital textbook copyright protection mechanisms: Strengthen the enforcement of copyright laws and encourage teachers and educational institutions to purchase licensed digital textbooks. Support the creation and sharing of original content. Educational authorities should also establish mechanisms to review digital textbooks to ensure that the content complies with educational standards and intellectual property laws.

(3) Government support policies for disadvantaged regions: Provide digital devices and internet support to impoverished areas and families to ensure equal access to digital educational resources. Schools and educational institutions can also initiate charitable projects to offer free or discounted digital educational resources to needy students, promoting educational equity <sup>[6]</sup>.

(4) Teacher training organized by educational authorities: Enhance teachers' digital teaching skills and pedagogical approaches through targeted training programs. Schools can establish digital education research and development teams to provide technical support and teaching guidance to teachers, fostering a collaborative exploration of best practices in digital education.

(5) Establishment of digital textbook evaluation mechanisms: Conduct scientific assessments and reviews of textbook content to ensure it meets educational and disciplinary standards. Encourage teachers and students to participate in the evaluation and feedback processes of digital textbooks, fostering continual improvement and enhancement of the material.

(6) Platform development challenges: Some institutions have developed their digital textbook platforms, while others use professional production tools like Apple's iBooks Author, Peking University Founder's Feixiang tools, and Blueink's digital textbook production tools. These platforms have their proprietary systems to support the construction, management, and distribution of digital textbooks. Conversely, the platform development process can be challenging. Modern intelligent digital textbook systems require high technical content and are complex and costly to develop, making it difficult to create ideal digital textbook platforms. This restricts the development of digital textbooks to some extent.

In summary, the development of digital textbooks faces multiple challenges, including technological updates, copyright protection, educational equity, teacher training, and the quality of instructional content. To address these challenges, it is necessary to establish comprehensive policies and mechanisms, enhance teacher training, protect intellectual property, promote educational equity, and improve instructional quality. This approach will foster the healthy development of digital education and inject new vitality into the modernization and intelligent transformation of education.

## 7. Prospects for digital textbooks

As cutting-edge technologies like Artificial Intelligence (AI) continue to evolve and integrate with the educational publishing field, digital textbooks are poised for a rapid development phase, becoming a crucial breakthrough in the in-depth integration of publishing.

- (1) Integration of intelligence and personalized learning: Future digital textbooks will become more intelligent, using AI and big data to conduct in-depth learning analyses based on each student's habits, abilities, and interests. Textbooks will transform from mere carriers of knowledge to personalized learning partners, offering tailored learning pathways and resources for each student. For example, AI-driven textbooks might adjust content difficulty and depth in real time based on a student's progress and understanding, providing instant feedback and answers to significantly enhance learning efficiency.
- (2) Expansion of blended learning: Blended learning seamlessly combines traditional classrooms with digital textbooks to create a student-centered, hybrid teaching model that integrates online and offline elements. Teachers transition from being the sole disseminators of knowledge to facilitators and mentors, enabling students to engage in in-depth discussions and practical activities in class, while using digital textbooks for further learning and consolidation after class. This model offers greater flexibility to accommodate the varied learning paces and needs of different students.

- (3) Innovative applications of virtual and augmented reality: The incorporation of Virtual Reality (VR) and Augmented Reality (AR) will bring a new dimension of immersive learning experiences to digital textbooks. Students could use VR headsets to step into virtual classrooms and experience historical events or scientific experiments firsthand, enhancing the intuitiveness and enjoyment of learning. AR technology can integrate textbook concepts with the real world, making abstract knowledge vivid and tangible.
- (4) Cross-platform compatibility and accessible learning: Future digital textbooks will be compatible across multiple platforms, allowing students seamless access to learning materials whether on computers, tablets, phones, or smart TVs. Additionally, these textbooks will accommodate the special needs of various users, such as voice reading features for the visually impaired and text-to-speech options for the hearing impaired, further promoting educational equity <sup>[7]</sup>.
- (5) Sharing and cooperation of open educational resources: The development of digital textbooks will facilitate the openness and sharing of educational resources, breaking the barriers of geography and time and enabling broader dissemination of high-quality educational materials. Teachers and students worldwide could collaboratively participate in the development and improvement of textbooks, creating a global educational cooperation network to enhance educational quality.
- (6) Precision in educational assessment and feedback: Digital textbooks will be closely integrated with educational assessment systems, collecting real-time data on student learning to generate detailed reports that help teachers understand students' learning status and adjust teaching strategies accordingly. Moreover, textbooks will be able to provide instant feedback, helping students understand their progress and areas for improvement, and facilitating self-adjustment and enhancement.
- (7) Sustainable development and environmental friendliness: With increasing awareness of environmental protection, future digital textbooks will emphasize eco-friendliness, reducing the use of paper and minimizing the educational impact on the environment. Updates and upgrades of textbooks will be carried out digitally, reducing resource waste.

In conclusion, the future development of digital textbooks represents a new era in education that combines intelligence, personalization, innovation, equity, and environmental sustainability. This will reshape the educational ecosystem, advance educational progress, and provide every student with a higher quality and more personalized learning experience, laying a solid foundation for the future development of global education.

## 8. Conclusion

As an integral part of educational informatization, the development of digital textbooks is crucial for enhancing educational quality and efficiency. Although the promotion of digital textbooks faces challenges related to technology, copyright, and teacher training, these can be overcome through the combined efforts of governments, educational institutions, and teachers. Moving forward, digital textbooks will continue to evolve towards greater intelligence and personalization, offering learners richer and more efficient learning experiences.

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