

# Research on the Development and Construction of Digital Textbooks for Vocational Education from the Perspective of Digital China

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## ABSTRACT

In 2015, General Secretary Xi Jinping officially proposed the initiative to promote the construction of "Digital China" for the first time. Over the past seven years, China's digital economy construction has flourished. Education digitalization is a strategic choice to implement the priority development requirements of education in the construction of the "Digital China" initiative, and is an indispensable and important component of the "Digital China" strategy. With the deepening implementation of the national digital strategy for vocational education, the construction of teaching resources in vocational education is also facing new standards and requirements. The construction of digital textbooks is a guarantee project for the digital transformation of education. Although certain results have been achieved, there is still an urgent need to strengthen standardized construction. This article conducts research and analysis on the practical significance and current development status of the development and construction of digital textbooks for vocational education from the perspective of digital China, as well as the construction ideas of digital textbooks based on integrated teaching platforms, in order to promote the process of digital textbooks development and construction in vocational colleges.

**Keywords:** *Digital China, Vocational education, Digital textbooks, Integrative digital textbooks, Convergent integrated teaching platform.*

## 1. INTRODUCTION

In December 2015, General Secretary Xi Jinping officially proposed the initiative to promote the construction of "Digital China" for the first time at the opening ceremony of the Second World Internet Conference, launching a new journey of "Digital China" construction. [1] [2] In October 2017, General Secretary Xi Jinping further proposed in the report of the 19th National Congress of the Communist Party of China "building a strong country in science and technology, quality, aerospace, network, transportation, digital China, and smart society", clarifying the grand concept of building a "Digital China". [2] [3] In February 2023, the CPC Central Committee and the State Council issued the "Overall Layout Plan for the Construction of Digital China" (hereinafter referred to as the "Plan"), clearly accelerating the construction of "Digital China", promoting the process of Chinese

path to modernization in the digital era, and building new national competitive advantages. The "Plan" pointed out to "promote the deep integration of digital technology and the real economy, and accelerate the innovative application of digital technology in key areas such as agriculture, industry, finance, education, health care, transportation, and energy." [4] [5] The "Plan" also pointed out that building a "Digital China" is an important engine to promote Chinese path to modernization in the digital era, and emphasized that "Digital China" should match the popularization of digital literacy skills in the entire society and the cultivation of composite digital talents at the same time.

Developing digital education is an important part of bridging the digital divide and building a "Digital China". It is also a strategic decision to practice high-quality education development and promote the shaping of a Chinese style digital civilization. [6] The report of the 20th National

Congress of the Communist Party of China proposed "promoting the digitization of education, building a learning society and a learning country with lifelong learning for all", clarifying the action plan for the future development of digital education in China. [7] Deepening the digitization of education is of great strategic significance for accelerating the modernization of education, building a strong education country, and ensuring satisfactory education for the people. [8] [9]

As a guarantee project for the digital transformation of education, the construction of digital textbooks is receiving increasing attention, becoming increasingly standardized and perfect. National industry standards for the construction of digital textbooks are emerging.

In 2019, the "Notice of the State Council on Issuing the Implementation Plan for National Vocational Education Reform" (referred to as the "20 Articles of Vocational Education") proposed to "build a large number of national planning textbooks developed through cooperation between schools and enterprises, advocate the use of new loose leaf and work manual style textbooks, and support the development of information resources, and revise textbooks every three years, with professional textbooks updated in a timely and dynamic manner with the development of information technology and industrial upgrading." [10] In 2021, the General Office of the Ministry of Education issued the "Implementation Plan for the Construction of Textbooks for the 14th Five-Year Plan for Vocational Education", which specifies "accelerating the construction of new forms of textbooks", "promoting the construction of supporting resources and digital textbooks, exploring the digital transformation of paper textbooks, and forming more audible, visual, practical, and interactive digital textbooks. as well as building a batch of integrated media textbooks with scientific layout, rich supporting resources, flexible presentation forms, and appropriate application of information technology." [11] In June 2023, the General Office of the Ministry of Education emphasized in the notice announcing the first batch of national planning textbooks for vocational education during the "14th Five-Year Plan" period to "strengthen the development and construction of new forms of vocational education, digitization and other textbooks, and accelerate the construction of provincial-level planning textbooks." [12]

For industry-specific textbooks, taking civil aviation as an example, the Civil Aviation Administration has proposed to "strengthen the construction of specialized textbooks for civil aviation, and build a three-dimensional teaching material system that integrates paper textbooks, electronic resources, and online courses", with clear requirements of "creating first-class core teaching resources" and "improving the quality standard system for civil aviation specialized industries". [13]

## **2. THE DEFINITION AND DEVELOPMENT STATUS OF DIGITAL TEXTBOOKS**

The definition and development status of digital textbooks are discussed as follows:

### ***2.1 The Definition and Characteristics of Digital Textbooks***

Digital textbooks refer to modern network multimedia dynamic textbooks that fully leverage the advantages of digital technology to support textbook reform. Based on digital technology, they integrate textbooks, media, resources, activities, practical training, and networks, and can carry digital, intelligent, and intelligent teaching activities. They fully meet the needs of teaching assistants, learning assistants, training assistants, evaluation assistants, and research assistants, and are fully presented and applied in a digital environment.

Digital textbooks are the expansion and development of electronic textbooks in various educational fields [14], and some scholars refer to them as "cloud textbooks" [15].

The construction of digital textbooks requires "taking strengthening moral education and cultivating people as the target requirements, taking curriculum standards as the basis, and considering the characteristics of learners", making full use of the Internet, digital media, big data and other technical means to achieve an all-round and integrated integration of textbooks, digital resources, subject tools and applied data "[16], which reflects the concept of deep integration of education content, resources and modern information technology in the context of "Internet +" and "smart education +", and is characterized by integration, rich media, interactivity, intelligence, personalization, etc. (See "Figure 1")

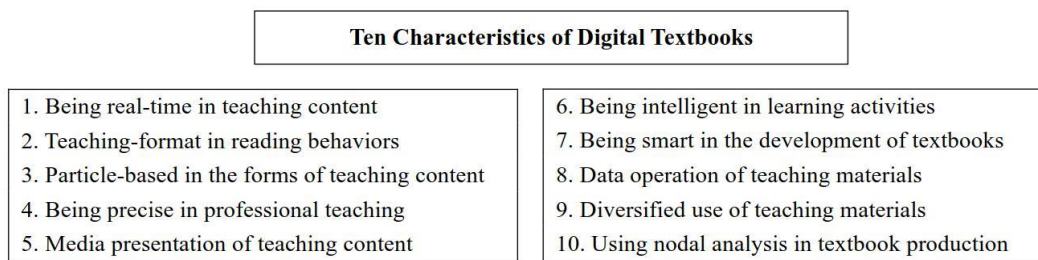


Figure 1 Ten characteristics of digital textbooks.

## 2.2 The Development History of Digital Textbooks

The development of digital textbooks in China has roughly gone through five stages (as shown in "Figure 2"). What should be pointed out is that paper textbooks, electronic versions of paper

textbooks, electronic textbooks (e-books), online multimedia textbooks (convergence media textbooks), and digital textbooks are still complementary to each other in the present and future, and no textbook form can completely replace another.

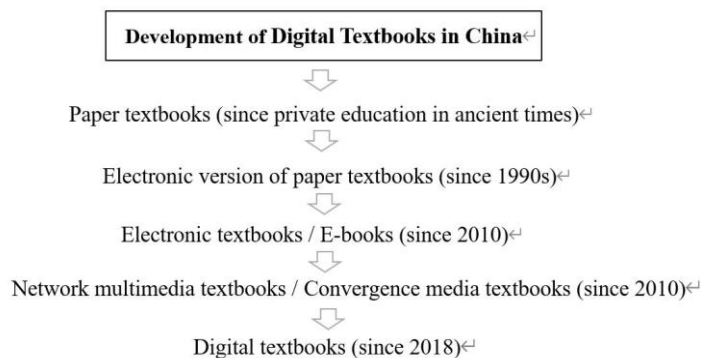


Figure 2 Development history of digital textbooks in China.

## 2.3 Achievements and Existing Problems in the Construction of Vocational Education Textbooks

This paper attempts to explore the achievements and existing problems in the construction of vocational education textbooks from the following three aspects:

### 2.3.1 Current Presentation of Digital Textbooks for Vocational Education

With the deep integration of digital publishing and educational informatization, the construction of digital textbooks has achieved certain results in recent years. In the first batch of "14th Five-Year Plan" vocational education national planning textbooks published by the Ministry of Education in June 2023, there digital textbooks been selected [12], and the selection of planned textbooks in

various provinces has also begun to pay attention to the form of digital textbooks. However, overall, due to the lack of top-level design in the standardization and management of digital textbooks for vocational and higher education, and the incomplete and inconsistent construction of new educational infrastructure supporting the complete presentation of digital textbooks, the development and construction of digital textbooks are still in the exploratory stage, and the existing digital textbooks for vocational education are mainly presented in a mixed digital and paper format, mainly based on paper-based presentation (see "Figure 3").

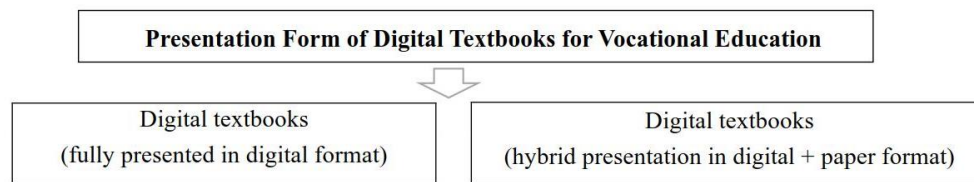


Figure 3 Current presentation of digital textbooks for vocational education.

### 2.3.2 Achievements in the Construction of Vocational Education Textbooks

Since the 13th Five Year Plan, the achievements of vocational education textbooks have mainly been reflected in the following aspects:

The first is to pay attention to the integration of the spirit of craftsmanship, implement the socialist core values, strengthening moral education and cultivating people, labor model spirit, craftsmanship spirit, and labor spirit organically integrated into the content of the textbook, and pay attention to the cultivation of professional ethics and professional literacy.

The second is to highlight the cultivation of practical abilities, weaken the disciplinary and theoretical systems, emphasize the ability based approach, focus on students, and prioritize practice and application, as well as design textbooks based on skills as the basic logical unit, pay attention to the granulation of content construction, and reflect new knowledge, new technologies, new processes, and new methods.

The third is the rich variety of textbooks. Currently, there are over 70,000 types of vocational education textbooks, with a total of 3,973 selected as national planning textbooks for vocational education during the 13th Five-Year Plan period [17], and 7,251 selected as the first batch of national planning textbooks for vocational education during the 14th Five-Year Plan period [12]. The integration of textbooks such as "simultaneous education and training" and "on-the-job course competition certification" is increasing.

The fourth is the diverse forms of textbooks. There are thousands of planned textbooks that exhibit partial digital features in the form of QR codes, with hundreds of new loose leaf or workbook style textbooks and convergence media textbooks.

### 2.3.3 Shortcomings in the Construction of Vocational Education Textbooks

There are currently five main problems in the construction of vocational education textbooks:

Firstly, there is a lack of professional attributes, and the traditional arrangement of subject knowledge system still dominates, resulting in a lack of professionalism; The update of new knowledge and technology lacks timeliness, the integration of production and education is not deep enough, and the teaching content is not closely aligned with the actual position.

Secondly, the main service is not prominent, the compatibility between the content of the textbook and the learning situation is not sufficient, and the overall form of the textbook is relatively single, failing to fully meet the personalized and diversified differentiated teaching needs; The dependence of students on textbooks is relatively low, and the function of students participating in textbook creation has not yet been realized.

Thirdly, the educational function is insufficient, emphasizing knowledge and skill impartation while neglecting the cultivation of quality or inadequate means of cultivation; The update of textbook content is slow and out of sync with the requirements of the times; Single cycle learning does not pay enough attention to students' mental improvement.

Fourthly, it is not synchronized with the reform of majors and courses. Currently, textbooks still emphasize the completeness of knowledge and are not suitable for fragmented learning, emphasizes input based learning, which is not compatible with active learning, cooperative learning, and exploratory learning; The presentation method is single, the level of digitization is not high, and the integration of convergence media resources is relatively low.

Fifthly, the information resources are insufficient, and the types of digital teaching media

resources carried by digital textbooks are not rich enough, and the granular media material resources as key projects are insufficient; The information based teaching platform, online courses, and textbook construction are disconnected, and the "trinity" cannot be effectively achieved; The construction of new infrastructure equipped with digital textbooks is not complete enough, and the construction of convergent integrated teaching platforms is still in the initial stage.

### **3. CONSTRUCTION OF DIGITAL TEXTBOOKS BASED ON CONVERGENT INTEGRATED TEACHING PLATFORMS**

The construction of digital textbooks based on convergent integrated teaching platforms is presented from the following three perspectives:

#### *3.1.1 The Importance and Necessity of Building an Convergent integrated Teaching Platform*

With the in-depth promotion of the "National Education Digital Strategic Action", it is urgent to actively develop "Internet + education" and accelerate the digital transformation and intelligent upgrading of education [18] [19]. In the process of digital transformation and upgrading of vocational education, the construction of teaching resources also faces new standards and requirements. Previously, due to various reasons, many vocational colleges' high-quality online open courses, virtual simulation training rooms, electronic textbooks, and other commonly used supporting information education teaching resources were scattered across different teaching platforms, failing to achieve good integration and interoperability. The "teaching" of teachers and the "learning" of students, as well as teaching management and evaluation, need to be completed on different teaching platforms. The software and hardware of multiple platforms are isolated from each other, and data is not interconnected, which leads to problems such as high marginal costs and low scale effects, greatly affecting the user experience and application effectiveness of information based teaching resources.

Building an integrated teaching platform is an important means to solve the pain points and difficulties of educational informatization mentioned above, upgrade the digital base for high-

quality development of education, promote the construction of "new educational infrastructure with informatization and digitization as the core, build a high-quality education support system", and help achieve modernization of education and teaching. [20]

The construction of convergent integrated digital courses and the development of integrated digital textbooks are two important contents carried by the convergent integrated teaching platform, and they are the key points to break through the current digital transformation of education. On the convergent integrated teaching platform, platform construction, course construction, and textbook construction need to truly achieve the "trinity", ensure the implementation of educational digitalization strategy actions, and effectively promote the construction and development of a new ecological environment for smart education in the new era.

It is not difficult to see that the convergent integrated teaching platform can truly achieve the deep integration of digital technology and educational teaching in multiple levels and modalities, which is completely consistent with the strategic goal of "education, technology, and talent" coordinated development proposed by the country. It is an inevitable choice to promote the integration of science and education. As an innovative infrastructure for the integration of information technology and education, the convergent integrated teaching platform will effectively promote comprehensive innovation and transformation in teaching paradigms, organizational structures, teaching processes, evaluation methods, and educational governance [21], and fully support the integrated innovation and development of "teaching, learning, practice, training, examination, evaluation, management, and research". The convergent integrated digital curriculum and convergent integrated digital textbooks carried on the convergent integrated teaching platform need to support various types of project teaching, situational teaching, and modular teaching, achieving informationization of the entire teaching process, integration of theory and practice, and digitization of practical teaching, in order to promote educational fairness, support the concept of lifelong learning, and help shape a more people-oriented, open, fair, sustainable, and intelligent new education ecosystem, building a networked, digital, intelligent, personalized, and lifelong education system" [22] (see "Figure 4").

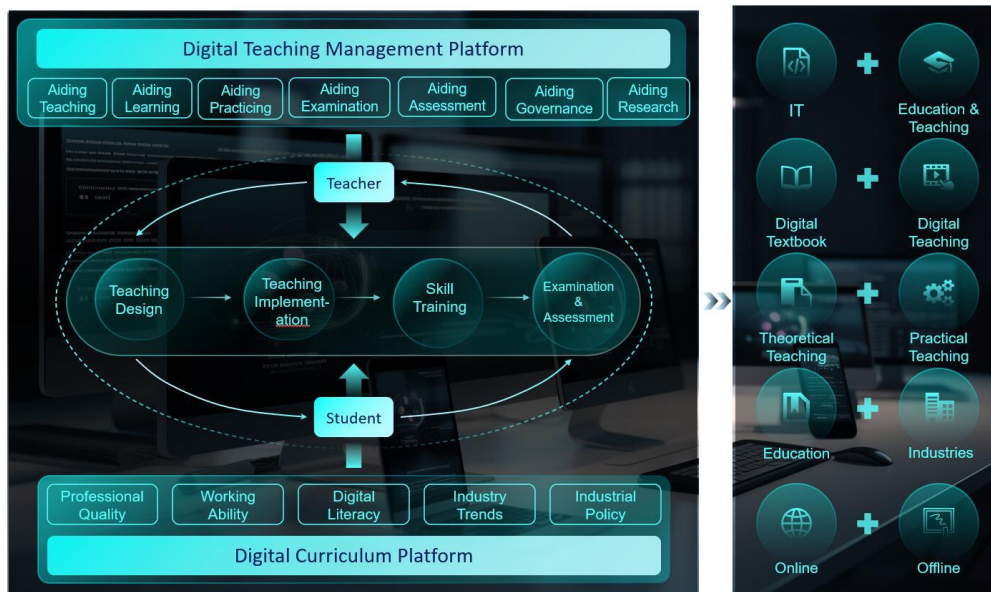


Figure 4 Digital empowerment and diversified fusion.

### 3.1.2 Construction Thoughts of Convergent integrated Teaching Platform

The convergent integrated teaching platform with informatization and digitization as the core is the key new education infrastructure. There is a necessity to strengthen the digital foundation support of the high-quality development system of vocational education empowered by technology, construct a digital curriculum system that integrates integrated digital courses, integrated digital textbooks, and technical training platforms, and create a closed-loop education ecosystem that integrates "teaching, learning, practice, training, examination, evaluation, and management". There is also a necessity to promote data-driven panoramic and immersive modern vocational education, achieve precise teaching by teachers and independent learning by students, and assist in the upgrading of vocational education informatization and digital intelligence.

Taking the "Yunzhi class" developed by Guangzhou Ranye Education Technology Co., Ltd. as an example, Yunzhi class has been built into an integrated intelligent education and teaching platform that integrates teacher preparation, classroom teaching, practical training teaching, assessment and evaluation, data analysis, teaching research and management, and industry resource co construction and sharing. The Yunzhi class is supported by modern information technologies such as cloud computing, blockchain, big data, and

artificial intelligence, with integrated digital courses as the core, and convergent integrated digital textbooks and training cloud platforms as value-added points. It has achieved the digitalization, visualization, scenarization, and ubiquity of the entire process of "teaching, learning, training, examination, evaluation, management, and research", and diversified media presentation forms. Yunzhi class refers to the construction of a bridge between teachers and students, as well as the joint construction of schools and enterprises, in the classroom under the concept of integration of production and education. It adheres to the use of technology to empower the entire elements and process of education and teaching, and helps to create an integrated closed-loop education ecosystem of "teaching, learning, practice, training, examination, evaluation, management, and research" (see "Figure 5").

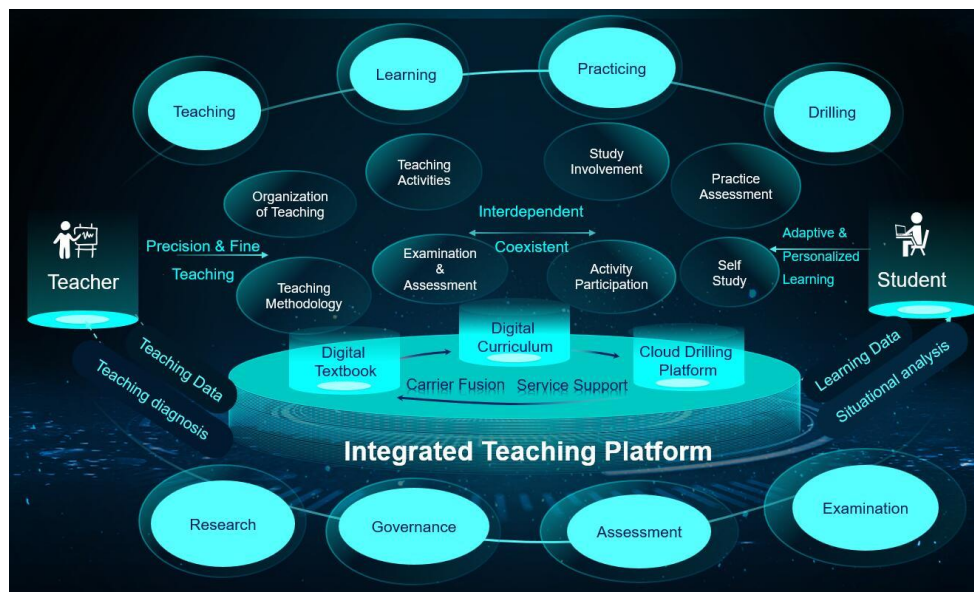


Figure 5 Digital education ecosystem - Yunzhi class.

### 3.1.3 Thoughts on the Construction of Convergent Integrated Digital Textbooks

Integrative digital textbooks refer to comprehensive and fully digital presentation convergence media publications that are based on teaching content that meets curriculum standards, targeting the new needs of teaching and learning in a digital environment, with the goal of improving teaching and learning effectiveness,[23] and developing students' core competencies, as well as integrating mobile learning, rich media resource presentation, interactive teaching learning practice, and recording of process big data [24]. It is based on the organic unity of "digital textbooks + digital courses" against the background of "Internet +" and "smart education +", breaking the shackles of traditional paper textbooks, integrating teaching content with audio, video, animation simulation resources, games and other resources, re-conducting layout design and interactive design suitable for various terminal browsing, and providing students with convenient, rich, interactive and traceable learning experience of new digital intelligent textbooks.

The content presentation of integrative digital textbooks is diverse, with high resource integration, and can support multiple navigation and indexing modes; it is rich in resource types, including numerous granular media resource forms such as images, audio, video, 3D, VR, AR, etc.; Digital resources can be directly browsed, read, or

interacted with, with a user-friendly interface; The textbooks include evaluation and interactive modules, which are easily connected to mainstream course teaching platforms and can achieve interoperability of resources, functions, etc. ("Figure 6")

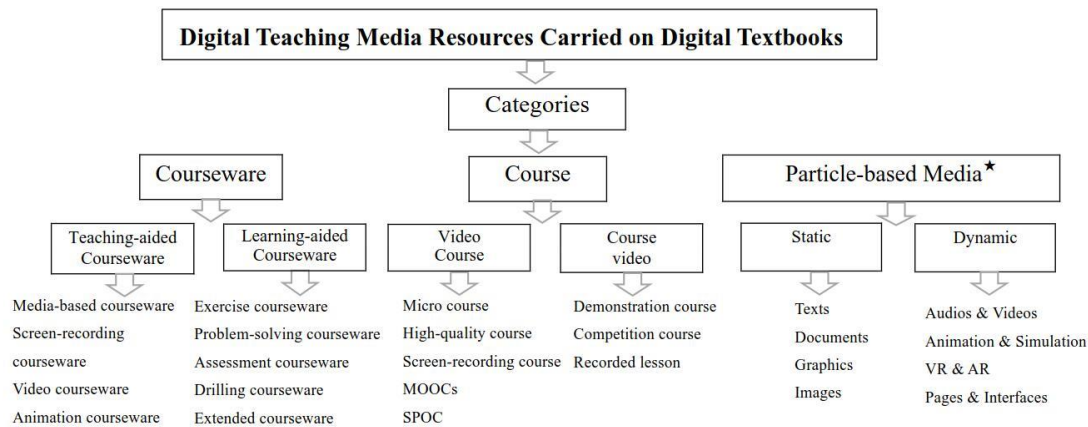


Figure 6 Digital teaching media resources carried by digital textbooks.

The integrative digital textbooks and their application system have intelligent big data collection and analysis functions, which can "perceive learners' personalized needs, push dynamic textbook content and personalized learning resources for learners, automatically generate learning paths, and better support learners' personalized learning." [25] Integrative digital textbooks support different forms of teaching and learning needs such as blended learning and continuing education, and "are an important fulcrum for leveraging classroom teaching reform and educational reform, as well as an important lever for educational digital transformation." [26]

Compared to paper textbooks, integrative digital textbooks have several major digital advantages: they exist in digital form, can be loaded onto digital terminals for reading, can dynamically update content, and can record interaction trajectories in a timely manner [27]. They have the attributes of information technology products such as openness, personalization, and interactivity. Digital textbooks can help students better master relevant knowledge and skills through interactivity and multimedia functions, effectively improve their information literacy, and help them adapt to the digital society. Integrative digital textbooks are a new type of teaching carrier that puts forward higher requirements for teachers' subject knowledge, knowledge span, information literacy, and teaching integration ability [21], which helps to comprehensively enhance the digital literacy of five dimensional teachers, including "digital awareness, digital technology knowledge and skills, digital application, digital social responsibility, and professional development" [28]. Fully presented digital textbooks integrate AI and blockchain

technology to achieve free circulation and certification of teaching resources and data, maximize application value while protecting creative copyright and promote the "three cycles" of digital textbook use and re-creation between teachers who use this digital textbook on campus and off campus, between teachers who use this digital textbook on campus, and among relevant teachers in the teaching and research group. By participating in platform teaching, practical training and other activities, as well as writing learning manuals and notes, students complete the functional transformation from passive users of traditional textbooks to active builders of digital textbook content. The construction of textbooks truly achieves "open circulation" and "dynamic co-construction and sharing", thereby effectively promoting the realization of the goals of "digital collaborative education" and "three education reform".

Convergent integrated digital textbooks help teachers break free from a large number of low-level and repetitive teaching tasks, and instead focus on cultivating platform enabled students' adaptive abilities. Teachers can achieve the goal of teaching students according to their aptitude, from experiential teaching to data-driven "precision teaching". Through the self-construction and application of online learning space, students can break through the limitations of traditional textbook content and learning methods, and enhance their ability to learn independently based on the use of network information technology and high-quality online resources. Including social learners and the "digital disadvantaged group" among them, convergent integrated digital textbooks that highlight the development of professional skills and



knowledge help learners achieve a transformation from passive digital consumers to active digital controllers. While enhancing their awareness of digital ethics and digital literacy, they are deeply stimulated to apply digital intelligent means to achieve the linkage development of personal potential with the spiritual needs of others and society, thereby promoting educational equity, ensuring a continuous supply of digital talents in digital education, and providing impetus for the vigorous development of China's digital economy. [6]

#### 4. CONCLUSION

Vocational education bears the important mission of cultivating high-quality technical and skilled talents. Strengthening the construction of digital textbooks in vocational education is an important guarantee project for leveraging classroom revolution, promoting the digital transformation and upgrading of vocational education, and achieving the co construction and sharing of high-quality educational resources. The development and construction of integrated digital textbooks in line with the iterative development needs of the digital education ecosystem in the new era and new technology background, meet the comprehensive development needs of people, and have important value and significance for optimizing the higher education teaching system, improving the quality of education, building an educational power, and assisting in the construction of "Digital China".

#### ACKNOWLEDGMENTS

Fund Project: 2022 Vocational Education English Curriculum Standards and Foreign Language Majors Teaching Standards Special Project (General Project) "Research and Practice of Civil Aviation English 'Three Teachings' Reform Based on the New Curriculum Standards", Project No.: WYJZW-2022-19-0203; The special project of "Reading and Teacher Development" under the "14th Five-Year Plan" of the China Tao Xingzhi Research Association in 2023, "Research on the Construction of Civil Aviation English Innovation Resources Based on Artificial Intelligence Technology", Project No.: Zhongtaohui2023GD0006.

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