

The Development Course, Research Hotspot and Prospect of Vocational Education Digitization

Han Xiuting

Emilio Aguinaldo College, Philippines,

Email: [xiuting.han.mnl\[at\]eac.edu.ph](mailto:xiuting.han.mnl@eac.edu.ph)

Abstract: *Digitization of vocational education is the only way to promote the inclusive and balanced development of vocational education and realize the modernization of vocational education. After combing the literature, it is found that the amount of literature shows an exponential growth trend, mainly focusing on "digital resources, digital libraries, digital campuses, talent training, teaching reform" and other contents, while digital transformation, digital talent, digital literacy are the research hotspot. In the new era, it will be a certain trend to strengthen the basic theoretical study of the digital transition period of vocational education, and expand the digitization of vocational education from the aspects of research perspective, research content, research methods, etc.*

Keywords: vocational education; Digitization; The course of development; Hot trend

With the rapid rise of information technology, intelligence, blockchain, cloud computing, big data and other digital technologies, society has fully entered the digital era. With unprecedented development speed, scope and depth of influence, digital economy is becoming a key force to change global resource factors, economic structure and competition pattern. ^[1]The World Digital Education Conference held in 2023 proposed that digital technology, as the leading force of the world's scientific and technological revolution and industrial transformation, is increasingly integrated into the whole process of economic and social development, and is profoundly changing the way of production, life and social governance. The integration of digital and education has become an inevitable trend in the development of education. The Second 10th National Congress of the Communist Party of China clearly pointed out that it is necessary to strengthen the construction of vocational education system, promote the digitization of education, and build a learning society and a learning country with lifelong learning for the whole people. ^[2]The Ministry of Education takes "Implementing the Strategic Action of Education Digitization", and the Department of Vocational and Career Development of the Ministry of Education takes "promoting the digital upgrading of vocational education and continuing education" as the stage goal to accelerate the construction of school digital transformation.

How to realize the high quality development of vocational education by taking the digital transformation construction as an opportunity has become a hot and focused issue. This article presents the knowledge structure and time context of digitizing research of vocational education by reviewing the literature of 30 years of digitizing research of vocational education. It provides the observation perspective for digitizing construction and digitizing transformation of vocational schools, as well as school - enterprise cooperation and the integration of industry and education, and promotes the deep thinking of digitizing theory and practice in vocational schools. It helps our vocational education achieve high quality and modern development in the new era.

First, the development of digital vocational education

In the past 30 years, the digital research content and attention of vocational education have closely followed the development theme of The Times, and the number of publications presents the time distribution characteristics of "gentle growth - slow growth - rapid and sudden increase", which is mainly reflected in three development periods.

The first period is the starting stage of digital research and exploration of vocational education (1993 to 2012). The first literature appeared in 1993, was in a vacancy period in 1994 and 1997, and from 1998 to 2011, it showed a relatively gentle development pattern of "increase, decrease, increase and decrease". The research content and theme of this period is relatively simple. It mainly focuses on the digital course teaching of vocational schools to meet the needs of professional construction and talent training of vocational schools brought by the rise of digital electronic technology in the 1990s. During this period, it focuses on the construction of digital libraries and digital (media) resources of vocational schools. It laid the foundation for the professional setting, subject teaching, digital resources construction and digital media technical personnel training that vocational education adapted to the development of digital electronic technology at that time.

The second period is the comprehensive exploration period of digital research of vocational education in China (2013 to 2018). In this stage, the annual number of research literature increased significantly compared with the previous stage, with more than 81 articles per year, showing a steady growth in stages. There was a significant increase from 37 articles in 2012 to 98 in 2015. From 2016 to 2018, there was a decline, but the annual total number of articles was more than 70. At this stage, the research content and themes are relatively rich. The overall focus is on the modernization of vocational education, such as informatization and digitization construction. Internally, the research is carried out from the

digitization construction and development, personnel training and teaching reform of vocational colleges. Externally, it explores the relevance of vocational education in the digital age, and explores the innovative practice and transformative exploration of vocational education in the cultivation of innovative, technical and skilled talents by means of school - enterprise cooperation and the integration of industry and education. Its abundant research content lays the theoretical foundation for constructing the modern vocational education system and promoting the high - quality development of vocational education in the new era.

The third period is the period of rapid growth of digital research of vocational education (2013 to 2018). The third period is divided roughly from the introduction and implementation of the rural revitalization strategy. From 2019, the number of research documents increased from 82 in 2019 to 262 in 2022. The number of research documents on the digitization of vocational education has increased rapidly. The key words highlighted in this period are "integration of industry and education", "modern apprenticeship" and "digital media application technology". The research content begins to focus on the construction of professional groups in vocational colleges from the perspective of overall modernization and systematization of vocational education, so as to improve the competitiveness of vocational education in the process of digital transformation.

Second, the hot spot of vocational education digitization research

Based on the literature review of the digitization of vocational education in the past 30 years, it is found that the hot topics of the digitization of vocational education research contents mainly focus on three aspects: vocational education digitization personnel training, vocational education digital literacy research and digital transformation of vocational education.

1) Research on Vocational Education Digital Talent Training

The integration of digital and education has put forward new demands for talent training. In 2022, the "Key Points for Improving Digital Literacy and Skills of the whole People" jointly issued by multiple departments put forward the goal of cultivating high - level craftsmen and digital talents in major countries in the digital field. Therefore, vocational education is the main position of technical talent training. How to train and what kind of digital technical talent will become the mainstream direction of vocational education talent training in the new era. The academic circle mainly focuses on the needs, concepts and training approaches of digital talents. The first is the demand for digital talents. Social demand is the direction and driving force for the cultivation of digital talents. The academic circle mainly studies from the aspects of "the rapid growth of the demand for digital talents caused by the development of digital economy and digital technology". The second is the concept of digital talents. The definition of the concept of digital talents helps to understand the essential attributes

of digital talents more clearly. Based on the needs and adaptation, the academic circle focuses on the research of digital talents such as composite, applied and skilled. Third, in terms of the cultivation of digital talents, the academic circle focuses on the combination of person - teaching - technology through school - enterprise cooperation, integration of industry and education, modern apprenticeship and teachers' digital competence.

2) Study on Digital Literacy of teachers and students in Vocational Education

Digital literacy has been highly valued in the research field at home and abroad. The academic circle mainly explores the connotation, framework, path and measurement of digital literacy. First, the academic circle has not reached a consensus on the connotation of digital literacy, but it mainly includes the cognition of digital literacy, data information, information literacy, digital security and other elements. The second is the research on the construction of digital literacy framework, which mainly draws on the 21 digital literacy indicators of the European Union^[3]、International digital framework^[4], Based on the reality of China's digital literacy, this paper proposes a digital literacy structure framework with Chinese characteristics from the aspects of cognition, emotion and practice. The third is the research on the cultivation path of teachers and students' digital literacy. Some scholars mainly explore through big data, the information age, cultivation goals, curriculum system, digital resources, digital media, teachers and other ways. Fourth, research on measurement and evaluation of digital literacy. The difficulty of digital literacy lies in the setting of measurement scale and evaluation index. Scholars mainly construct and explore the evaluation index system of digital literacy, the application of digital technology, the management of digital information, digital security protection, the development of digital literacy evaluation scale, evaluation mode and other aspects.

3) Research on the transformation of vocational education digitization

The digital transformation of vocational education is a hot topic in the academic circle. The academic circle mainly focuses on the concept, what to turn and how to turn the digital transformation of vocational education.

Research on the concept of Digital Transformation of vocational education

Exploring the concept of digital transformation of vocational education is the premise and foundation of deepening the research of digital vocational education. It mainly includes: first, the theory of factor transformation. For example, Zhang Qingshan believes that the concept of digital transformation of vocational education is the transformation of educational content, learning mode and other elements.^[5]Second, the integration of technology and education. For example, CAI Lianyu believes that the digital transformation of vocational education experiences "integration of things and technologies [6], Yuan Zhenguo proposed "integration of human and technical Skills" [7]. Third, the theory of new ecology of education, the main

point of view is that the digital transformation of education is a process of new ecology of education which promotes the growth of teachers and students [8], The collective action and continuous process of promoting the formation of good education ecology and reshaping vocational education ecology.

Research on the digital transformation of vocational education

Figuring out what to change is the key to the digital transformation of vocational education. First, strengthen the reform of teaching and learning mode elements. Promote the teaching courseware, teaching design, teaching mode, learning mode, teaching management, teaching evaluation to digitized resources, personalized learning, digital management, digital evaluation and other aspects. Second, strengthen the sustainable development of digital resources. Further develop digital electronic technology, digital media application technology and other resources to provide rich resource support for digital transformation, continue to stimulate the upgrade and quality of digital resources, to meet the challenges and changes brought by technological innovation. Third, strengthen the iterative upgrading of digital infrastructure. To enhance the coverage of 5G network in vocational schools, further improve the national vocational education smart education platform, innovate integrated digital service platform, etc., and realize the platform's supporting role in the digital transformation of vocational education.

A study on how to transform vocational education digitalization

First, the change of thought and understanding. The change of understanding of education digitization ideology is the primary condition of vocational education digitization transformation. Leaders, teachers and students should improve their understanding and position from the ideological perspective. Second, the transformation of governance mode. We will build a digital governance system featuring openness, sharing, interconnection, mutual recognition, and interaction. Provide financial guarantee, fully coordinate social resources, form the joint efforts of the government, schools and enterprises, and provide financial support for the digital transformation of vocational education. Third, the optimization and upgrading of safeguard measures. Formulate a scientific and forward-looking digital transformation plan and implementation plan, build a digital strategic framework for vocational education, develop a digital education maturity model, enhance the ability of digital transformation, create transformation pilot, introduce incentive systems related to digital transformation, optimize the construction of digital infrastructure, etc.

Third, research trend of digitization of vocational education

Over the past 30 years, the academic circles have paid increasing attention to the digitization of vocational education, and achieved fruitful results gradually. The research topics have gradually expanded from digital concept, digital resources, infrastructure construction to

digital transformation, and the number of papers has increased year by year, and the quality of journals has become higher and higher. From the perspective of time evolution, context relationship and change trend of the research topic, with the development of the research in the direction of depth, the future digital research of vocational education will show a long-term and normal trend.

Strengthen the digital ontological research of vocational education

From the perspective of theoretical system, ontology is in the core position, which is the foundation for the survival of vocational education digitalization.

Strengthen the basic research of vocational college digitization theory

It comprehensively examines the ontological basis for the existence and development of the digitization of vocational education, expounds the theoretical support for the digitization of vocational education provided by relevant theories of Marxist philosophy, constructivism theory and transformation theory, explores the correlation between the theoretical basis and the digitization of vocational education, and analyzes the theoretical logical starting point, development context and research paradigm of the digitization development of vocational colleges. Pursue the origin construction and vision orientation of digitized vocational education, deeply discuss the essential attributes of digitized vocational education, strengthen the strategic design of the major issues of the overall, pioneering and pertinence of digitized vocational education, transition the existence level of the ontology of digitized vocational education to the transcendental level, and promote the digital innovation research of vocational education into a deep and high realm.

Further clarify the conceptual connotation of digital vocational education

Concept can effectively reveal the essential attributes of things and help people grasp the core meaning of things from the source. However, at present, the academic circle has not formed a consensus on the concept of digitalization of vocational education, and there is a lack of in-depth discrimination of the concepts related to digitalization of vocational education. As a result, problems such as "what is digitalization of vocational education and what content belongs to the category of digitalization of vocational education" are generated. As a result, the digital concepts of vocational education can be misunderstood, fuzzy and even mishap. Therefore, the academic circle should clarify the connotation and extension of the concept of digitization of vocational education, define the research object of digitization of vocational education, grasp the essential attributes of digitization of vocational education, and explore the common characteristics of digitization of vocational education in different horizons and different disciplines, which are the prerequisite for further explaining the scientific rationality of digitization of vocational education.

Strengthen the vocational education digital governance system research

Governance system is the internal demand and important measure of the high quality development of digital vocational education. However, the academic circle's research on the digital governance system of vocational education is still insufficient. The digital governance system of vocational education in the later period should be based on the national conditions, facts and social conditions, and explore the "multi - collaborative" governance system with Chinese characteristics. To construct the governance framework of the "multi - party collaborative" governance system, determine the governance objectives, reconstruct the basic logical principles and measures of the governance system, frame the scope and content of governance, and improve the organizational structure of the governance system, which mainly includes the governance concept, governance system, governance principle, governance organization, governance mode and other relatively independent and organically linked complete structures. To achieve the school, society, government, enterprises and other multi - party coordination of co - governance ecology.

2. Expand the digital research topics of vocational education

To further promote the deep extension of vocational education digitization is the goal direction that vocational education digitization research always pursues. The digitization of vocational education should be based on the new era and new stage, according to the new situation, new characteristics and new requirements presented by the digitization of vocational education, stimulate the new growth point of research in this field, expand the research content, broaden the new perspective of research, and enrich the research methods. Then, the following aspects need to be further explored and studied.

In terms of research content, expand the scope of research. Promote the in - depth study of digital vocational education, strengthen the connotation and value of digital transformation of vocational education; Further clarify the specific transformation of vocational education digital transformation, how to transform, transformation effect and how to evaluate; Strengthening the mechanism and strategy of vocational education digital transformation; Strengthen the study of vocational education digital transformation mode; Further strengthen the research on teachers' digital competence in the digital transformation of vocational education; Strengthening the research on the cultivation of middle school students' digital Literacy in the digital transformation of Vocational Education; Strengthen the study of digital transformation system of vocational education and reconstruct high level vocational education ecology; Further strengthen the practical exploration of digital transformation of vocational education.

In terms of research perspective, expand international vision. The World Conference on Digital Education stressed that digital technologies "urgently need to strengthen dialogue and exchanges and deepen practical cooperation.

The follow - up research should be based on China's local, look to the world, adopt the method of comparative research, learn from the advanced experience, advanced practice and successful experience of foreign vocational education digitization, explore the local mode of vocational education digitization; In addition, the follow - up research can rely on the Belt and Road Initiative to encourage and support Chinese - foreign cooperation in running schools, introduce cutting - edge courses in the digital field, build a benign operating mechanism of cooperation, exchange and win - win, explore a digitalized vocational education model with Chinese characteristics, and promote the integration and innovative development of digitalized research and practice.

In terms of research methods, the research on the integration of multiple methods is carried out. In the academic circle, the concepts, characteristics and strategies of digitization of vocational colleges are often described at the theoretical level. This interpretive analysis paradigm of studying digitization of vocational colleges through logical reasoning is characterized by heavy descriptive analysis and simple argumentation. Later research should improve innovative research methods, add comparative research, in - depth interview, case study, etc., and adopt a combination of quantitative and qualitative research to further deepen the digital research of vocational education. It is also necessary to strengthen interdisciplinary integration research, strengthen the cooperative research of different disciplines, different types of schools and institutions at different levels, build an academic community of vocational education digitization research, and constantly expand the breadth of vocational college digitization research.

In short, the digital development of vocational education, a series of practical exploration and transformation from infrastructure construction to education and teaching mode change, has gone through the stages of starting, development, integration and transformation. It is a long - term process of gradual, sustainable development and gradual iteration, which requires further exploration and research under the guidance of multi - party collaborative governance concept. To enable and promote the connotative, modern and high - quality development of vocational education.

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Author Profile

Han Xiuting, female born in 1977, from Liaocheng, Shandong, China, Ph. D. in Education management from Emilio Aguinaldo College. Contact information: 13963556359. Email: xiuting. han. mnl[at]eac.edu.ph
Address: No.133 Huayuan North Road, Liaocheng, Shandong