Research on the Construction of Digital Development Model for Higher Vocational Education and Influencing Factors

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Abstract: Nowadays digital transformation has become the focus of vocational education reform and development. Starting from the background of the digitalization situation in higher vocational education and the analysis of the "1+5" system connotation elements, the paper attempts to construct an evaluation model for the digitalization development of higher vocational education based on research on the current situation and interpretation of the digitalization development process of several vocational colleges in the Yangtze River Delta region. It includes dimensions such as the connotation and characteristics of digital transformation, the meaning and direction of digital transformation, digital application, technology and digital strategies and paths, etc. It explores the main influencing factors of the digitalization development of higher vocational education from five dimensions: educational and teaching concepts, teaching resource construction, intelligent evaluation intelligent technology, teaching environment, and digital service capabilities. It proposes strategies to promote the digitalization development of higher vocational education, such as reshaping digital concepts, strengthening hardware infrastructure construction, and upgrading digital software.

Keywords: Digital Development Model; Vocational Education; Digital Development Process; Influencing Factor; Promoting Strategy

1. Introduction

With the development of Internet, big data, artificial intelligence (AI) and other technologies, the digital economy has become a new driving force for global economic growth, which has put forward new requirements for technical talents. Governments around the world have introduced policies to promote the integration of vocational education and digital technology, in order to cultivate high-quality technical and skilled talents who can adapt to the digital era. In China, "Digital China" has become a national strategy, and the Internet, big data, cloud computing, Internet of Things, AI, 5G, VR/AR. Blockchain and other new information technologies have been comprehensively applied to the construction of various fields in China. Digital transformation has become the focus of vocational education reform and development. The Ministry of Education has proposed to strengthen the construction and application of infrastructure, digital resources, and information platforms in principle accordance with of the "demand-driven. application-centred, and service-oriented", and effectively promote educational informatization. Deeply promote the digital awareness, thinking, and application of vocational education in all fields, elements, processes, and businesses through ubiquitous interconnection, data resources, platform cloudification, and integrated innovation, so as to build a new ecosystem of smart education and promote high-quality development of education.

2. Elements of the Digital "1+5" System for Higher Vocational Education

In vocational education, the digital "1+5" system refers to the vocational education decision-making brain system and decision support center, professional teaching resource center, boutique online open course center, virtual simulation internship training center, and vocational school governance ability enhancement center that drive the overall transformation of teaching modes and governance methods through digital transformation (Table 1. Digital "1+5" System for Higher Vocational Education). 3. Current Status and Progress of Digital Development in Vocational Education

3.1 Research on the Current Status of Digital Development in Vocational Education

The Yangtze River Delta region is one of the most active regions in China's economic development, and its higher vocational education plays a demonstrative and leading role in the current situation and trend of digital construction. The degree of digital development in vocational colleges shows certain differences (Table 2. Vocational Colleges' Differences in Digital Teaching Management and Teaching Practice). Overall, in terms of infrastructure construction, vocational colleges in the Yangtze River Delta region generally attach importance to the construction of digital infrastructure, including network high-speed coverage. smart classrooms, cloud platforms, etc., providing good hardware support for digital teaching. In terms of digitalization of teaching resources, most colleges have established relatively complete digital teaching resource libraries, Ta

including electronic textbooks, online courses, virtual laboratories, etc., enriching teaching content and forms. In terms of innovative teaching models, driven by digitization, new teaching models such as blended learning and flipped classrooms have been widely applied in vocational colleges in the Yangtze River Delta region, improving the interactivity and personalization of teaching. In terms of educational management informatization. have optimized educational colleges management processes through digital means, such as student management systems, teaching evaluation systems, etc., improving management efficiency scientific and decision-making. In terms of teacher training and professional development, vocational colleges have strengthened the digital ability training of teachers and improved their ability to use information technology for teaching and research. In terms of student information literacy, students generally have a high ability to apply information technology and can adapt to digital learning environments, effectively utilizing digital resources for self-directed learning [1].

Vocational education decision-making brain system	Connotation	Element	
Decision support center	data interconnection, data empowerment, and scientific decision-making, and data application	collection, cleaning, transformation, loading, and refreshing of full data	
Premium online open course center	creating high-quality online course, and assist schools in all-round education education	excellent online course, moral education, standard guidance	
Virtual simulation internship training center	creating a comprehensive training base that integrate many functions	innovative application, empowering industry, creating value, training environment	
Professional teaching resource center	integrating the resource advantages of both schools and enterprises, supporting the functional positioning of the resource library	integrated design, structured courses, granular resources, and multi scenario applications	
Vocational school governance capability enhancement center	establishing a diagnosis and improvement mechanism	service governance, result oriented, quality improvement and optimization	

ble 1. Digital	"1+5" System	m for Higher V	ocational Education
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However, there are significant differences in digital teaching management and teaching practice among vocational colleges with different levels of development. This difference reflects the uneven distribution of educational resources. To narrow these differences, policy makers, educational institutions, and industry enterprises need to work together to increase investment in digital education, optimize resource allocation, improve the quality of teacher training, promote educational equity, and ensure that all students can enjoy high-quality digital education. At the same time, through cooperation and sharing, technological exchange and other means, promote the overall development of digital education, and improve the quality and efficiency of education [2].

3.2 Digital Development Process of Vocational Education

Informatization, digitization, and intelligence are three consecutive key development stages in the process of educational modernization in vocational colleges, each of which has a profound impact on the quality and efficiency of vocational education (Table 3. Digital Development Process of Vocational Colleges). With the continuous progress of technology, vocational colleges need to constantly adapt to the new educational environment, actively embrace technological changes, and cultivate technical and skilled talents who can meet the needs of future social development. At the same time, colleges should pay attention to balancing the application of technology with the essence of education, ensuring that technology serves educational goals, and promoting the comprehensive development of students.

Classification of		ion of	National "dauble high"		Provincial high lovel construction			
colleges		ion oi es	construction colleges		colleges		Other colleges	
Infrastructure construction		ture tion	having advanced digital infrastructure, such as high-sj networks, smart classrooms, centers, etc.	peed data	basic digital teaching facilities are available, but there may be a gap I compared with "double high" colleges		in the early stages of digital infrastructure construction	
Digital teaching resources		ching es	having abundant digital teaching resources		certain digital teaching resources available, but the quantity and quality may not be as good as those of "double high" colleges		digital teaching resources are relatively scarce	
Innovation in teaching mode		n in node	adopting new teaching modes such as blended learning and flipped classroom		attempting or partially implementing new teaching models		traditional teaching methods are still being used	
Education management informatization		on 1ent ation	highly informationized, utilizing intelligent systems		most educational management processes have been digitized		the level of informatization in education management is relatively low	
	Teacher train professio developm	refersional evelopment teachers proficiently use lack of a systematic training system and research and research		digital teaching ability of teachers needs improving				
	Student information literacy		having high information literacy and can effectively utilize digital resources and tools for learning		requiring more training and guidance to enhance digital learning abilities		necessary to cultivate their ability to use digital tools from the basics	
	Table 3. Digital Development Process of Vocational Colleges							
Stage utiliz			Informatization		Digitization		Intelligence	
		utiliz	zing computer and network		It refers to transforming rmation resources into digital	Data	a-driven and intelligent	

 Table 2. Vocational Colleges' Differences in Digital Teaching Management and Teaching Practice

Table 5. Digital Development 1 rocess of vocational Coneges							
Stage	Info	rmatization	D	igitization	Intelligence		
Definition and characteristic s	utilizing con technologies to network infor improve the ef processing	mputer and network o digitize, integrate, and mation resources, and ficiency of information g and transmission	It refers information format and st spreading Internet to	to transforming resources into digital toring, processing and g them through the maximize the use of resources.	Data-driven and intelligent management of educational decision-making can be achieved through technologies such as big data and artificial intelligence.		
Main	(1) Campus network construction	building a campus intranet to achieve rapid transmission and sharing of information resources	(4) Online teaching resources	developing electronic textbooks, online courses, etc.	(7) Intelligent teaching system	applying intelligent recommendation algorithms to provide personalized learning resources and paths	
observation points for application in vocational colleges	(2) Teaching management system	developing student information systems, academic management systems, etc.	(5) Virtual laboratory	creating simulated experimental environment to enhance the effectiveness of practical teaching	(8) Data analysis and decision-makin g	using learning analytics, educational big data to evaluate the teaching process and results	
	(3) Digital library	establishing e-book resources and online search systems	(6) Digital teaching platform	building an online teaching platform	(9) Smart campus construction	integrating technologies to achieve intelligent management	

4. Construction of a Digital Development Model for Higher Vocational Education

Digitalization of education has become a necessary environment to support higher vocational education teaching, communicate school-enterprise cooperation, and promote the development of teachers and students [3]. From the perspective of the "Digital Campus Standards for Vocational Colleges", the evaluation index system of vocational colleges has 7 primary indicators, namely teacher and resources. student development, digital education and teaching, management services, support conditions, network security, and organizational system. There are 20 secondary indicators and 34 tertiary indicators, aiming to transformation promote the of digital campuses from construction to application services, from application operations to focus on teacher and student experience, and from investment to performance. Based on the research on the construction of vocational education infrastructure, digitalization of teaching resources, innovation of teaching models, informatization of education management, teacher training and professional development, and student information literacy, as well as the main observation points of vocational education in the three development stages of informatization, digitization, and intelligence, a digital development evaluation model for vocational education is constructed (Table 4. Digital Development Evaluation Model for Vocational Education). It includes the connotation and characteristics of digital transformation, the meaning and direction of digital transformation, digital technology and application, digital strategies and paths, and other dimensions.

Table 4. Digital Development Evaluation Model for Vocational Education					
Dimension	Subdivision index				
Connotation and	technology empowerment, digital awareness, digital thinking, digital literacy,				
characteristics of	digital capabilities, deep integration, educational innovation, smart education				
digital transformation	ecology, governance system, and collaborative mechanism				
Meaning and direction of digital transformation	national strategy, policy promotion, high-quality development, modernization of governance capacity, digital economy, industry (chain) drive, digital				
	cognition, education reform, teaching transformation, education (teaching) orientation, development trends				
Digital technology and applications	digital "new infrastructure", digital twin, digital platform, public service platform, digital campus, learning space, education big data warehouse, information technology, education publishing				
Digital strategy and path	digital resources, digital libraries, curriculum and textbook forms, digital upgrades, digital skills, digital governance, digital learning, digital publishing, digital management, "three education" reforms, capacity enhancement, development models, community education, mechanism innovation, and evaluation transformation				

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able 4. Digital	Development	Evaluation	Model for V	Vocational Educa	ation

5. The Main Influencing Factors of Digital Development in Higher Vocational Education

5.1 Education and Teaching Philosophy: Recognition of the Value of Digital Transformation in Education

The digital transformation of education needs to go through the process of starting, applying and integrating digital technology, establishing digital awareness and thinking, cultivating digital capabilities and methods, and then stimulating resources and data elements, building a smart education development ecosystem, and forming a digital governance system and mechanism. The essence of the systematic transformation of vocational education is the digital transformation of all elements, processes, businesses, and fields of education. Its core path is digital capacity building, which enhances the digital literacy and skills of students, teachers, managers, and parents. The optimization, innovation, and reconstruction of values in the digital age are prerequisites for the digital transformation and development of vocational education [4].

5.2 Teaching Resource Construction: the Support of Digitalization in the Whole Teaching Process

Classroom teaching is the core of digital transformation, and teaching content is the foundation of digital applications and services.

The construction of digital teaching resources is an important path to explore new teaching modes, improve classroom teaching efficiency. reduce the burden on teachers and students. and cultivate new abilities of students [5]. Digital textbooks, namely new learning materials that exist in digital form, can be loaded on digital terminals for reading, can dynamically update content, and can record interaction trajectories in a timely manner, are the foundation for promoting the digital transformation of classroom teaching, achieving high-quality educational resource sharing, and implementing new digital teaching models based on various application scenarios.

5.3 Intelligent Evaluation Technology: the Coupling of Education and Teaching Evaluation Reform

Educational evaluation greatly affects the way conducting teaching and learning. of Deepening the reform of education evaluation in the new era requires innovative evaluation tools and the use of modern information technologies such as artificial intelligence and big data to explore new ways of conducting longitudinal evaluations of the entire process of student learning and horizontal evaluations of all elements of morality, intelligence, physical fitness, aesthetics, and labor. Innovation in education and teaching evaluation requires large-scale education evaluation methods and technologies, optimization of evaluation systems and data collection standards, application of big data perception, interconnection, storage, computing, and analysis technologies, building intelligent evaluation system platforms and tools across regions and scenarios, and forming an education evaluation system based on evidence and big data. The trend of digital education evaluation reform is to promote process evaluation and value-added evaluation through big data based evaluation methods, support large-scale education and personalized training [6].

5.4 Intelligent Teaching Environment: Satisfaction with Digital Teaching Scenarios in Schools

In the era of intelligence, learning time and space are rapidly evolving, and the learning environment is moving from closed to open. Traditional learning environments are transforming towards scenarios of new digitization, networking, and intelligence, achieving data sharing, device collaboration, group knowledge interconnection, and intelligence integration. This enables the learning environment to operate adaptively and optimize, making learning easier, more immersive, and more effective. Promote the application of new generation information technologies such as 5G, Internet of Things, big data, cloud computing, and artificial intelligence, optimize and upgrade basic facilities, hardware equipment, network conditions, intelligent tools, learning platforms, etc., continue to build smart campuses, smart classrooms, and smart living spaces, create intelligent learning spaces that deeply integrate time and space with teaching, and integrate virtual and real offline and online, promote scenario based, experiential, and immersive teaching, and comprehensively optimize the quality and efficiency of teaching services. It is a powerful means for schools to break through data and information barriers and improve the supply of teaching services.

5.5 Digital Service Capability: Assurance of Teaching Monitor and Data Security

The big data rights confirmation, openness, integration and protection, data integration, information knowledge, and resource exchange of the smart education public service platform all require efficient collaboration between educational digital organizations and grassroots educational institutions. The smart education platform is built and used simultaneously, continuously enhancing its functions, expanding resources, and improving service levels, which can play an important role in promoting student self-directed learning and improving classroom teaching for teachers. Schools also need to accelerate the formation of new strategies and capabilities for digital governance in education, optimize the supply channels of digital education resources both inside and outside the school, and meet diverse educational needs: Timelv use intelligent technology to perceive, predict, and warn about the safe operation of the campus, timely grasp the cognitive and physical and mental changes of teachers and students, and make proactive, timely. and accurate decisions.

6. Promotion Strategies for Digital Development of Higher Vocational Education

Digitalization of vocational education is the deep integration of digital technology and the field of vocational education, with the ultimate goal of promoting transformation and innovation in the field of vocational education. The digital development of higher vocational education is a multi-dimensional and interdisciplinary complex process that requires joint efforts and coordination from all parties to achieve modernization and high-quality development of education [7].

digital development of vocational The education is an important way to meet the demand for technical and skilled talents in modern society. Scholar Everett M. Rogers' Diffusion of Innovations Theory suggests that innovation diffusion includes five stages: understanding, interest. evaluation. experimentation, and adoption. At present, the digital transformation of higher vocational education has generally gone through the stages of understanding and interest, and is currently undergoing a transition from evaluation to experimentation across different domains. Overall, the digital transformation of higher vocational education should continue to focus on the construction of concepts, hardware, and software [8].

6.1 The Digital Concepts' New Breakthroughs: Adapting to the Trend and Reshaping the Core Concept

The development of informatization, digitization, and intelligence in vocational education has been progressing slowly, and to some extent. it has fallen into ล misunderstanding centered on technology. Firstly, the emphasis is on the practical function of technology over education, and more attention is paid to the application of technology in educational scenarios. neglecting the interaction and communication between people; Secondly, the emphasis is on technological application over the generation of digital literacy among teachers and students, with little targeted research on the particularity of vocational education; Thirdly, there is a lack of personalized and multi-dimensional small data mining and profiling for teachers and students, with a focus on big data analysis

The digitalization of vocational colleges should respond to the trend of digitalization, focus on conceptual innovation, enable leaders "learn" digitalization, enable teachers, to students, and technical backbone to "understand" digitalization, enhance the digital literacy of cadres, teachers, and students, and consolidate the foundation of "doing solid" digitalization in vocational colleges. Encourage students and teachers to establish the concept of lifelong learning, continuously learn new technologies, and adapt to the educational needs of the digital age [9].

6.2 Digital Hardware's New Enhancements: Taking Advantage of the Situation and Building Infrastructure

Hardware is the foundation and guarantee of informatization. educational The digital transformation of vocational education has very strict requirements for the overall level of personalized hardware conditions, customization, and security elements, which is an objective reality that cannot be ignored in the digital transformation of vocational education. The digitization of vocational colleges is a systematic project that involves various aspects such as systems, planning, academic technology, funding, affairs. academic work, management, evaluation, etc. It requires a systematic thinking approach to plan and promote. Vocational colleges should strengthen the construction of campus network infrastructure, ensure high-speed and stable network connections, and provide hardware support for digital teaching. Strengthening the construction of digital bases should be a key task for digital transformation. Promote the construction of new information infrastructure on campus, including continuously advancing the evolution and upgrading of information infrastructure, comprehensively upgrading the new generation campus network, building an intelligent three-dimensional campus security prevention and control system, comprehensively promoting the intelligent upgrading and transformation of classrooms and training rooms. enhancing data

capabilities, and further optimizing and upgrading the smart teaching cloud platform; Strengthen network security management, including building a network

security protection system that adapts to comprehensive digital transformation. strengthening the construction of network security guarantee mechanisms, and enhancing the construction of network security guarantee capabilities.

governance

6.3 Digital Software's New Upgrades: Following the Trend and being Driven by **Diverse Scenario Applications**

In the process of digital transformation in education, software is the key and soul. Without software involvement, hardware is just a bunch of solid-state modules. At present, both domestically and internationally, the digital transformation of vocational education is being promoted, with increasing emphasis on soft elements such as systems, standards, platforms, resources, and literacy [10]. In the digital transformation of vocational education and training, vocational colleges should attach establishing great importance to and improving software foundation such as standard specifications and organizational guarantees. Enhancing the digital capabilities of teachers and enhancing the digital literacy of students are also indispensable software elements for the digital transformation of vocational education. Vocational colleges should start from the six stages of teacher preparation, teaching, approval, assistance, practice, and testing, and use digital technology to build an effective model of online and offline blended teaching, supporting flexible and open teaching organization models such as course selection, inter school collaboration. and school collaboration. enterprise and serving collaborative personalized training and education of students. By utilizing new technologies such as virtual reality and artificial intelligence, vocational colleges should aim to explore new scenarios for networked, immersive, and intelligent skill learning applications. Vocational colleges will also develop new applications such as intelligent learning partners and intelligent teaching assistants to provide students with more matching resources and services for learning. The digitalization of vocational

colleges also requires the construction of a technical backbone team that has both good digital professional technical literacy and practical understanding of vocational college education and teaching business, effectively enhancing technical support and guarantee capabilities.

7. Conclusion

The digital transformation of vocational education needs to go through three stages of development: informatization, digitization, and Vocational intelligence. colleges should update their educational and teaching concepts, accelerate the construction of teaching resources, actively apply modern educational digital technology, create campus а environment, promote education and teaching evaluation reform, enhance the support for digitalization of the entire teaching process and the effectiveness of big data application, and promote the modernization of vocational education.

Acknowledgments

This paper is supported by 2023 Higher Education Scientific Research Planning (Key) Chinese Project of Higher Education Association, Research on Digital Transformation and Development of Higher Vocational Education from the Perspective of Chinese Path to Modernization (No. 23ZYJ0223).

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