### DIGITAL LITERACY DEVELOPMENT MODEL FOR HIGHER VOCATIONAL COLLEGE TEACHERS IN GUANGXI

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A thesis submitted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy Digital Technology Management for Education Academic Year 2024 Copyright of Bansomdejchaopraya Rajabhat University **Thesis Title** Digital Literacy Development Model for Higher Vocational College Teachers in Guangxi

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#### ABSTRACT

This thesis present digital literacy development model for higher vocational college teachers in guangxi.

The objectives of this research were: 1) To study the current situation of digital literacy for higher vocational college teachers. 2) To develop the model for improving the digital literacy for higher vocational college teachers. 3) To evaluate the model for improving the digital literacy for higher vocational college teachers. The sample consists of 21 experts from the Delphi method and 9 experts from vocational colleges and focus groups from universities or businesses. Research instruments include: 1) design questionnaire, 2) structured interview, and 3) evaluation form. The data were statistic analysis by using percentage, Median, Mode, Inter-Quartile Range and Text Statistics.

The research results show that:

1. The level of digital literacy for higher vocational colleges teachers in Guangxi in overall was at medium-high level (21 experts account for about 70%).

2. For the digital literacy development model for higher vocational colleges teachers in Guangxi, the researcher proposes: There are a total of 9 dimensions and 90 development modes.

3. Through the evaluation and expansion of focus groups, 9 dimensions and 105 development models were ultimately developed, including digital perception with 10 development modes, digital knowledge and skills with 9 development modes, digital application with 12 development modes, digital responsibility with 12 development modes, professional development with 11 development modes, digital communication with 10 development modes, digital instructional design with 15 development modes, digital teacher implementation with 17 development models, digital leadership with 9 development models.

> **Keywords:** Digital Literacy, Digital Literacy for Teacher, Higher Vocational College

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### Contents

Abs	stract
Ack	nowledgements
Cor	ntents
List	of Figures
List	of Tables
Cha	apter
1	Introduction
	Rationale
	Research Questions
	Objective(s)
	Scope of the Research
	Advantages
	Definition of Terms
	Research Framework
2	Literature Review
	Current situation and problems of teachers' digital literacy
	Concept and theory of digital literacy
	Concept and theory of teacher digital literacy for Higher
	Vocational College Teachers
	Context of higher vocational colleges in Guangxi
	Delphi Method
	Focus Group
	Related Research
3	Research Methodology
	Phase 1
	The Population
	Research Instruments
	Data Collection
	Data Analysis

# Contents (Continued)

	Page
Phase 2	50
The Population	52
Research Instruments	52
Data Collection	52
Data Analysis	53
4 Results of Analysis	54
Symbol and Abbreviations	54
Presentation of Data Analysis	54
Result of Data Analysis	55
5 Conclusion Discussion and Recommendations	93
Conclusion	93
Discussion	99
Recommendations	112
References	116
Appendixes	131
A List of Specialists and Letters of Specialists Invitation for IOC	
Verification	132
B Official Letter	137
C Research Instrument	139
D The Results of the Quality Analysis of Research Instruments	164
E Certificate of English	174
F The Document for Accept Research	176
Research Profile	178

# List of Figures

Figure		Page
1.1	Research framework	6
3.1	Implementation steps for the phase 1	47
3.2	Implementation steps for the phase 2	51
4.1	The digital literacy development model for higher vocational	
	college teachers (Version 1)	76
4.2	The digital literacy development model for higher vocational	
	college teachers (Version 2)	88

### List of Tables

Table		Page
2.1	Literature on factors influencing the Digital Literacy of Teachers	
	in Higher Vocational Schools	13
3.1	Median evaluation value	50
3.2	IQR evaluation value	50
4.1	Personal information of the survey respondents	55
4.2	Results for Round 1: Current situation problems	56
4.3	Results for Round 1: Digital perception	57
4.4	Results for Round 1: Digital knowledge and skills	58
4.5	Results for Round 1: Digital application	59
4.6	Results for Round 1: Digital duty	60
4.7	Results for Round 1: Professional development	61
4.8	Results for Round 1: Digital communication	62
4.9	Results for Round 1: Digital teaching design	63
4.10	Results for Round 1: Digital teaching implementation	64
4.11	Results for Round 1: Digital leadership	65
4.12	Results for Round 3: Digital perception	66
4.13	Results for Round 3: Digital knowledge and skills	67
4.14	Results for Round 3: Digital application	68
4.15	Results for Round 3: Digital duty	69
4.16	Results for Round 3: Professional development	70
4.17	Results for Round 3: Digital communication	71
4.18	Results for Round 3: Digital teaching design	72
4.19	Results for Round 3: Digital teaching implementation	73
4.20	Results for Round 3: Digital leadership	75
4.21	Result for discussion: Digital perception	80
4.22	Result for discussion: Digital knowledge and skills	81
4.23	Result for discussion: Digital application	82
4.24	Result for discussion: Digital duty	83
4.25	Result for discussion: Professional development	84
4.26	Result for discussion: Digital communication	84
4.27	Result for discussion: Digital teaching design	85

## List of Tables (Continued)

Table		Page
4.28	Result for discussion: Digital teaching implementation	86
4.29	Result for discussion: Digital leadership	87

# Chapter 1 Introduction

### Rationale

In the 21st century, with the development of information technology, applications such as big data, 5G, Internet of Things and artificial intelligence have matured. In the field of education, transform ordinary classrooms into intelligent classrooms that incorporate these technologies. Teachers are equipped with mobile devices and smart platforms, collect a large amount of educational data, analyze data in multiple dimensions, and enhance teaching decision-making. This requires data control skills and higher teacher digital literacy for optimal educational application (Li Hua, 2023).

In 2022, China's Ministry of Education issued an industry standard for "Digital Literacy for Teachers." This is the key point to deepen the implementation of China's education digitization strategy, which mainly lies in improving the standard system of education informatization, empowering teachers to use digital technology to innovate and optimize educational practices, and strengthening their sense of responsibility and ability in the digital era. This initiative demonstrates China's great importance to the integration of digital education, and strives to inspire teachers to update their teaching thinking, transform their management mode, drive the reform of the education system, and jointly build a future-oriented new education ecology (Ministry of Education, 2023).

Teachers' digital literacy and higher vocational education complement each other. By improving their own digital technology application ability, such as mastering online teaching tools and data analysis skills, teachers can not only innovate teaching methods and improve teaching quality, but also better guide students to master modern information technology and promote the improvement of students' comprehensive ability. In order to cultivate high-quality skilled talents that meet the market demand, help the modernization of higher vocational education and support students' lifelong learning and personal development (Wang Yongzhao, 2023, Feng Siyuan, 2023)

Guangxi Province is located in the west of China. Affected by factors such as regional economic development level, allocation of educational resources and investment in teacher training, there is a certain gap between digital literacy of higher vocational teachers in Guangxi and the national standard, which is mainly reflected in the following aspects:

1. Many teachers do not have a strong sense of digital application, are still accustomed to the traditional teaching mode, and lack the awareness and motivation to integrate digital technology into teaching.

2. Teachers lack the ability and experience to integrate digital resources.

3. Teachers lack digital responsibility and do not pay attention to personal privacy protection.

4. Teachers lack the use of digital technology to carry out teaching and research activities.

This research is carried out in order to make the digital literacy level of teachers in higher vocational colleges in Guangxi reach the national standard. Through research methods such as Delphi method and Focus group, the current situation and reasons of digital literacy of teachers in higher vocational colleges in Guangxi are analyzed, and the digital literacy improvement model for teachers in higher vocational colleges in Guangxi is developed to meet the level required by national standards.

#### **Research Question**

How to develop the digital literacy development model for higher vocational college teachers in Guangxi.

#### Objective(s)

1. To study the current situation of digital literacy for higher vocational college teachers.

2. To develop the digital literacy development model for higher vocational college teachers in Guangxi.

3. To evaluate the digital literacy development model for higher vocational college teachers in Guangxi.

#### Scope of the Research

#### Population

The sample consists of 21 experts from higher vocational college and 9 experts from universities or businesses

#### The Variable

According to the analysis of relevant theories and research, the digital literacy characteristics of higher vocational college teachers are as follows:

- 1. Digital perception
- 2. Digital knowledge and skills
- 3. Digital application
- 4. Digital duty
- 5. Professional development
- 6. Digital communication
- 7. Digital teaching design
- 8. Digital teaching implementation
- 9. Digital leadership

10. Digital literacy for higher vocational college teachers

#### Time

The research period of this study is from August 2023 to September 2024.

#### Location

Guangxi, China

#### Advantages

1. Provide reference for improving the digital literacy of teachers in higher vocational colleges in Guangxi.

2. Provide reference for improving the teaching methods of teachers in Guangxi higher vocational schools.

3. Provide reference for improving the digital application ability of teachers in Guangxi higher vocational schools.

#### Definition of Terms

**1. Higher vocational colleges** refer to a class of schools in China's higher education system, which mainly carry out higher vocational education. The school and the industry carry out practical education to cultivate students' applied knowledge and skills, meet the needs of enterprises and industries for talents, and provide students with employment positions and career development.

2. Teachers' digital literacy refers to the indispensable competence set of teachers in the field of education, which covers multiple dimensions such as digital awareness, digital knowledge and skills, digital application, digital responsibility, professional development, digital communication, digital teaching design, digital teaching implementation and digital leadership. These comprehensive qualities enable teachers to skillfully integrate and use digital technology in daily teaching activities and promote the improvement of educational results.

**3. Digital perception** refers to hat teachers are sensitive to data in the field of education. Have the awareness of discovering data in the teaching process, have the awareness of discovering the value of data, have the awareness of using digital technology to improve teaching methods and improve teaching quality, and have the awareness of using digital technology to enhance their professional development.

4. Digital knowledge and skills refers to the knowledge and skills that teachers need to master in the field of education. The update and iteration of educational technology requires teachers to master and constantly learn new digital knowledge and skills, and understand a variety of digital teaching tools, including online teaching platforms, digital teaching resources, teaching software, etc. Teachers can use digital means to improve the richness of teaching content.

5. Digital application refers to the ability of teachers to use digital means to carry out teaching activities in the field of education. Teachers must be familiar with various teaching applications, including online information retrieval, evaluation of digital teaching resources, selection of high-quality teaching resources, the whole variety of teaching resources, the use of digital application tools to develop digital teaching resources that adapt to students, and the use of digital tools to analyze student learning. At the same time, teachers use digital application to carry out innovative teaching research and implementation, and improve their own teaching level.

6. Digital duty refers to the duty of teachers to abide by laws and regulations, have high moral cultivation and regulate personal behavior in digital activities. Teachers must demonstrate, strictly adhere to legal provisions regarding copyright and intellectual property rights, ensure that the personal privacy and information of teachers and students are protected, maintain the security of data in teaching work, and pay attention to cybersecurity precautions. Teachers are also responsible for teaching students to follow online norms of behavior, promoting polite language, promoting a fair and inclusive online environment, and giving students guidance and feedback when appropriate.

7. Professional development refers to teachers' use of digital technology to improve their own digital level in the field of education, including sharing digital resources, learning digital technology, using digital means to reflect on and improve in the field of education, using digital technology to conduct innovative research, using digital technology to conduct teaching research and learning methods, and so on. When improving their own digital level, they also improve their own disciplinary professional level, and integrate digital technology into disciplinary research. 8. Digital communication refers to the use of digital technology and electronic communication tools in the field of teacher education for information exchange, knowledge sharing, collaboration and interaction and education management process. This process covers communication between teachers and students, parents, peers and educational institutions through multiple digital channels such as email, online learning platforms, social media and instant messaging apps. At the same time, teachers need to master communication skills and communication language, and teachers need to be patient in communication and master personal emotion management skills.

**9. Digital teaching design** refers to teachers' digital instructional design in the field of education according to teaching standards, teaching plans, learning objectives, etc. Teachers not only need to be proficient in the application of digital technology, but also need to have innovative thinking, be able to skillfully integrate video, audio, interactive software and cloud platforms and other resources, and integrate digital resources into teaching design, so that the presentation of teaching content is more structured and digital.

**10. Digital teaching implementation** refers to teachers using digital means to carry out teaching implementation in the field of education. According to the digital teaching design scheme, teachers use rich digital teaching resources (including multimedia courseware, online teaching platform, virtual laboratory, etc.) to carry out teaching activities. At the same time, in teaching activities, digital technology is used to conduct data analysis on students' learning situation, accurately identify learning difficulties and individual differences, and constantly adjust teaching implementation methods to meet students' personalized teaching needs.

**11. Digital leadership** refers to refers to teachers' ability to form a positive and comprehensive two-way influence in the field of education in the digital learning environment, including teachers' high-level digital teaching ability, high level of digital literacy and personal digital charm.

12. Delphi method refers to a qualitative research method that reduces individual biases and limitations and reaches a consensus or at least a clear distribution of views through multiple rounds of anonymous surveys, the collection and integration of multiple expert opinions. This study will interview 21 teachers' digital literacy experts, collect and integrate expert opinions, and form the current situation and development model of teachers' digital literacy in higher vocational colleges.

**13.** Focus group method refers to the research method of collecting and analyzing the group's views and opinions on a specific topic. The focus group of this study will be composed of nine experts who jointly evaluate the digital literacy development model of teachers in higher vocational colleges.

### Research Framework

Based on the theory of teacher digital literacy, integrating national policy documents, relevant literature, expert guidance, and industry standards, this research framework has been developed with 9 research variables, including digital perception, digital knowledge and skills, digital application, digital duty, professional development, digital communication, digital teaching design, digital teaching implementation and digital leadership, the research framework of this paper is show in Figure 1.1.



Figure 1.1 Research Framework

### Chapter 2 Literature Review

This research focuses on improve the digital literacy of teachers in higher vocational colleges in Guangxi Province. the researcher was analyzed documents, concepts, theories, and researches related to the digital literacy of teachers in higher vocational colleges. The details are as follows.

1. Current situation and problems of teachers' digital literacy

2. Concept and theory of digital literacy

3. Concept and theory of teacher digital literacy for Higher Vocational College Teachers

- 4. Context of higher vocational colleges in Guangxi
- 5. Delphi Method
- 6. Focus Group
- 7. Related Research

### Current Situation and Problems of Teachers' Digital Literacy Situation

The age of data is driving education from experiential to empirical demonstration, which puts a new requirement on teachers: enhance digital literacy. Many states in the United States have incorporated it into teacher certification standards, emphasizing the use of digital technology to understand student needs and realize personalized teaching. The Ministry of Education encourages teachers to use digital tools to assess learning progress and ensure that education is more relevant to individual student differences. This indicates that education is moving towards the direction of technology integration and data-driven intelligence, and reflects the important position of digital skills in the professional development of modern teachers. (Mandinach, et al., 2011). Teachers' digital literacy is the embodiment of teachers' digital level in the field of education, which directly affects the quality of teaching. In foreign countries, teachers' digital literacy training was carried out (Garrison & Monson, 2012; Schifter, et al., 2014) has improved the level of teachers' digital literacy. In China, the importance of teachers' digital literacy is also realized in the process of teaching team construction. Chinese scholars discuss teachers' digital literacy Zhang Jinliang et al., 2015; Ruan Shigui et al., 2016; Yang Wenjian et al., 2017), and also on the ability of teachers' digital literacy (Teng Lijun et

al., 2018) and level evaluation (Long Qian, 2015; Li Qing et al., 2018) conducted research and obtained rich research results.

#### Problems

At present, the development status of teachers' digital literacy, the advantages and disadvantages they face, and the training path planning all need to be reflected and supported through specific evaluation. Teachers play an indispensable role in the generation of digital value in the field of education, and their digital ability level directly affects the display of educational digital results. At the same time as the rapid growth of education data, the improvement of digital literacy of teachers as a whole has not been synchronized, showing a gap. Domestic research and practical training on teachers' digital literacy are in the initial stage: research is being explored, training has just started, although the goal has been established, but there is a lack of systematic practice and clear improvement plan.

In conclusion, scholars at home and abroad have studied the definition, evolution, reality and challenges of teachers' digital literacy and achieved initial results. At present, the promotion model of digital literacy of teachers in higher vocational colleges is lacking. Therefore, it is of great significance to construct the model of digital literacy promotion for higher vocational teachers.

#### Concept and Theory of Digital Literacy

Digital literacy refers to an individual's ability to effectively access, critically evaluate, appropriately use and creatively use information in a digital environment. This not only requires the mastery of technical tools and their operation, but also emphasizes the deep understanding, accurate judgment and effective use of information. Its connotation is extensive, covering information search skills, information authenticity identification, digital content creation, network cooperation ability, personal privacy maintenance and ensure the security of cyberspace and other dimensions of knowledge and skills.

Prado & Marzal (2013) proposed that digital literacy means the core ability of individuals to acquire data resources quickly and efficiently, conduct in-depth analysis, accurately evaluate the value of information, implement effective management and fine processing, and be able to intelligently transform data into practical knowledge and innovative applications.

Meyers et al. (2013) proposed that digital literacy means confirming the authenticity of information, protecting security and privacy, inspiring personal creativity, adhering to ethical principles, and using and creating digital media content.

With the rapid development of technology and media, they transform the communication, learning, labor organization and management of individuals, collectives and even societies. In order to adapt to the new technological ecology, participants are required to have both abilities: first, to master the use of technological tools; The second is in-depth understanding of technology, standardized use of technology and technology practice strategy.

Zhao Chuxin (2020) Digital literacy is a broader comprehensive quality and ability applicable to today's digital network environment. It includes not only the information processing ability of information literacy, but also the mastery and application of digital technology and the use of these technical means to achieve the purpose of solving problems and innovating. , and at the same time, the communication skills and moral qualities have been sublimated.

Wang Shengmei (2022) Digital literacy is defined as an individual's knowledge of digital tools and basic cognition of numbers, as well as the digital application capabilities demonstrated in the process of social life. The basic abilities required for the process of digital information activities, and digital literacy is generally defined from two dimensions: theoretical knowledge and operational skills.

Li Tian (2023) Digital literacy mainly refers to the basic abilities that individuals should have in the digital society to adapt to the continuous development of productivity in the information and digital era and the continuous adjustment of production relations. The improvement of personal digital knowledge and information also covers the improvement of digital culture, digital ecology and other digital awareness levels involving culture and values, as well as the improvement of digital skills at the practical level. It is a comprehensive and diverse, rich in connotation and advancing with the times. conceptual system.

Liu Shuang (2023) Digital literacy is defined as the sum of explicit literacy such as knowledge and skills that individuals possess in using digital tools and facilities to meet work and life needs, as well as implicit literacy such as awareness, motivation and responsibility, and personal development in the digital environment.

Zhou Rujun (2023) proposed that digital literacy means is a combination of key skills for individuals to survive, learn, work and thrive in the digital age, encompassing understanding, applying, evaluating and innovating digital technologies to adapt to the evolution of the economy and society. The core competencies include information processing, communication and sharing, collaboration, content and knowledge creation, ethical responsibility, effective evaluation of problems and solutions, and proficiency with technical tools. Liu Yaxin et al. (2018) proposed that digital literacy means is a kind of complex and systematic comprehensive ability, which involves many disciplines. The key elements of data literacy are mainly concentrated in the fields of mathematics, statistics and computing. Data analysis and related tools determine whether data can be used effectively and critical thinking runs through the entire process of data processing.

Wang Youmei et al. (2013) proposed that digital literacy means is the integration and development of media literacy, computer literacy, information literacy and network literacy, and is a comprehensive, dynamic and open conceptual framework. Through the in-depth analysis of the correlation between digital literacy and other related concepts, a series of common components can be extracted, which lays the foundation for the construction of a theoretical model of digital competence.

In conclusion, digital literacy is an essential capability in the digital age, covering information acquisition, creation, application, evaluation, communication, sharing, innovation and security ethics. Enhance digital literacy so that individuals can confidently navigate digital tools, ensure safety, take responsibility, and promote the overall development of individuals and society.

### Concept and Theory of Teacher Digital Literacy for Higher Vocational College Teachers

Mandinach (2012) proposed that teachers' digital literacy means is the practice of integrating digital technology into the field of education, requiring teachers to integrate subject content, teaching methods, professional insights and educational resources to improve students' learning results.

Deahl (2013) proposed that teachers' digital literacy means is the use of data for educational insight, that is, the use of quantitative and qualitative data in teaching analysis, collection, interpretation and display, aimed at assisting decisionmaking and improving teaching quality.

Athanase et al. (2013) proposed that teachers' digital literacy means is embodied in actively collecting and analyzing students' homework and performance data, processing the learning information reflectively, continuously optimizing teaching strategies, and driving students' academic performance.

Zhang Jinliang et al. (2015) proposed that teachers' digital literacy means is an advanced skill that emphasizes teachers' ability to control data under the background of information technology, including efficient collection, orderly organization and management, in-depth processing and analysis of data, and promotion of data sharing and collaborative innovation. At the same time, teachers should demonstrate high standards of professional ethics and conduct in the whole process of data generation, maintenance and release to ensure the accurate, safe and legal use of information, and set the right example for students to behave in the digital age.

Cao Fengyue (2019) On the premise of abiding by data ethics and morality, teachers have the ability to effectively acquire and process data generated in teaching work on the basis of digital awareness, and at the same time be able to deeply mine data for teaching improvement, student learning effectiveness, and comprehensive professional skills to improve their own teaching effects.

Zhang Xin (2019) Teachers collect learners' test scores, learning behaviors and other data individually or in groups, and provide data-based strategies for schools and learners. Accurately observe, analyze and process changing data, effectively use data to promote the ability of teaching decision-making, transform data into information, and finally transform into the basis for guiding actions, and continuously promote teaching and learning.

Chen Xiuwen (2020) believes that teachers' digital literacy refers to teachers' comprehensive core literacy that under the background of big data-driven education and teaching, teachers should maintain high sensitivity to big educational data at all times, have digital awareness, and be able to scientifically understand, reasonably acquire, and accurately organize and analyze educational data based on educational and teaching needs, and be able to make scientific decisions based on data analysis and improve teaching practice.

He Jian (2021) proposed that teachers' digital literacy means a comprehensive ability and knowledge system that teachers need to be self-driven, keep up with the pace of The Times, and flexibly use the most suitable digital tools, especially information and communication technology (ICT), in the multi-dimensional work of educational practice, teaching and research activities and social services in the modern digital higher education environment.

Li Yuting et al. (2022) proposed that teachers' digital literacy means the ability of teachers to tap the potential of digital technology for effective teaching, which involves understanding the core values of digital teaching, designing inclusive and innovative teaching plans, guiding students to use digital tools creatively and critically, and using these technologies to achieve learner goals and enhance their ability to learn independently. Zhong Yu (2022) Teachers' digital literacy is the ability of teachers to improve students' academic performance and teachers' teaching quality, and to help teachers implement precise policies through data collection and processing, analysis and application, sharing and innovation, management and evaluation on the basis of conforming to data ethics norms.

Zhou Qing (2022) On the basis of complying with the corresponding laws and regulations and moral ethics, teachers can acquire, collect, process and analyze multi-dimensional educational data from different sources and types, and use the analysis results to make teaching evaluation and decision-making in a complex teaching environment, so as to improve their professional skills and the comprehensive ability of students' learning effects.

Ministry of Education (2023) proposed that teachers' digital literacy means covers teachers' skills in acquiring, processing, applying, managing and evaluating digital information resources with appropriate use of digital technology, and emphasizes the awareness, ability and responsibility of innovating, optimizing and transforming educational and teaching activities in the process of discovering, analyzing and solving educational and teaching exercises.

	Digital perception	Digital knowledge and skills	Digital application	Digital duty	Professional development	Digital communication	Digital teaching design	Digital teaching	Digital leadership	Learner Digital Skills
Ministry of Education (2023)	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$			
Li Qing et al. (2018)		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			$\checkmark$		
Lin Xiuqing et al. (2020)	$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$			
Liu Yaxin et al.(2018)	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$					
Pan Zhongxiang et al. (2023)		$\checkmark$	$\checkmark$	$\checkmark$			$\checkmark$			
Wu Di et al. (2023)	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$				
He Chang et al. (2023)	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$						$\checkmark$
Liu Yuhang (2022)	$\checkmark$	$\checkmark$	$\checkmark$			$\checkmark$	$\checkmark$			
But Wu Gang et al. (2022)		$\checkmark$	$\checkmark$		$\checkmark$	$\checkmark$				
Zhou Liangfa et al. (2022)	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$						
He Jian (2021)		$\checkmark$	$\checkmark$	$\checkmark$		$\checkmark$		$\checkmark$	$\checkmark$	
Li Yuting et al. (2022)		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$					
Total	7	12	12	9	7	6	4	2	1	1

Table 2.1Literature on factors influencing the Digital Literacy of Teachers in HigherVocational Schools

According to Table 2.1, the researchers analyzed and refined the relevant documents, concepts, theories and related research on digital literacy of teachers in higher vocational colleges, including the Ministry of Education (2023); Li Qing et al. (2018); Lin Xiuqing et al. (2020); Liu Yaxin et al. (2018); Pan Zhongxiang et al. (2023); 022); Dan Wugang et al. (2022); Zhou Liangfa et al. (2022); He Jian (2021); Li Yuting et al. (2022). The researchers selected the corresponding characteristics according to the standard as the research framework.

The researchers selected 9 characteristics as follows:

- 1. Digital perception
- 2. Digital knowledge and skills
- 3. Digital applications
- 4. Digital duty
- 5. Professional development
- 6. Digital communication
- 7. Digital teaching design
- 8. Digital teaching implementation
- 9. Digital leadership

#### Digital Perception

Yang Wenjian (2017) proposed that digital perception means is a core goal in the process of digital literacy education for teachers. It enables teachers to more clearly understand the use of data resources and target groups; In the process of data acquisition and conversion, teachers can integrate data sources and environments, reveal the relevance and practicability of data, and are willing to share data, so as to deepen their understanding of teaching situations and activities. Excellent digital awareness ensures that teachers can accurately evaluate the value of data when they are faced with the collection, processing, transformation and application of teaching data, make clear the direction, and improve the effectiveness of data-driven teaching.

Wang Zhengqing et al. (2018) proposed that digital perception means teachers' keen insight when encountering valuable data in the process of teaching practice. It emphasizes the basic cognitive state of perceptive perception, in-depth understanding and reasonable evaluation of teaching activities from the perspective of data, which constitutes the prerequisite for teachers' digital literacy.

Liu Yaxin et al. (2018) proposed that digital perception means the prerequisite concept and internal motivation of teachers to use data resources to improve teaching quality under the background of big data era. This is an expanded cognition oriented to education data, covering the set of feelings induced by teachers when performing tasks related to education data, and the deep understanding of education data established on the accumulation of these experiences. It specifically covers the sensitivity to data, the recognition of the value of data, the ability to archive and identify data, the willingness to update and share data in a timely manner, and the vigilance to maintain data security and personal privacy. Fu Chao (2020) proposed that digital perception means that teachers have a unique perspective and keen data insight, and can quickly identify valuable information in data. They demonstrate a high degree of data sensitivity and innovation, and the ability to help organizations or individuals make accurate decisions by deeply exploring the value of data.

Li Baoqing et al. (2020) proposed that digital perception means the need for teachers to be highly alert to all kinds of structured and unstructured data generated in learning activities, emphasize the use of data to guide educational practice and respond to challenges, and have a deep understanding of the key role of data in promoting students' learning effectiveness and teachers' educational research work.

Li Xin et al. (2020) proposed that digital perception means teachers' positive cognitive response to objective educational data. It is specifically manifested in teachers' high sensitivity, precise judgment and profound insight to the data related to the education and teaching process, and their firm belief in using data to improve the effectiveness of education.

Liu Jie (2022) Teachers' awareness of the use of data, views on data value, and demand for data in the teaching process. The teacher's digital awareness is divided into two aspects: data use awareness and data value. The stronger the teacher's digital awareness, the faster he can discover the hidden data in teaching, and the more proactive he can analyze the data to maximize its value and improve his classroom efficiency.

Yin Xiyuan's (2022) "Digital Awareness" mainly emphasizes the knowledge and understanding of "data" by normal students at the level of consciousness, and requires normal students to be sensitive to data, aware of the key role of data, able to clarify their own data problems and needs, and apply critical thinking throughout the data application. Have certain insight, sensitivity and judgment on data. Actively understand data-related document policies, dynamics and development trends. Recognize that data has an important role and value in learning research and future teaching. Clarify your own data problems and needs in learning and life and work. Critical thinking runs through the application of data.

Zhang Xin (2022) Conscious attitude is the focus of domestic scholars. Conscious attitude consists of two parts: digital awareness and data ethics. Digital awareness requires teachers to have a keen sense of data perception and independent data-driven problem-solving awareness; data ethics aims to emphasize the legality and ethical issues of data use, and teachers need to grasp the balance between personal privacy protection and data sharing. They seldom think about how to improve the overall teaching quality with the help of data, and more carry out teaching activities based on their own teaching experience and intuition. This phenomenon is particularly obvious for experienced teachers.

Liu Jialing (2022) clearly recognizes the value of educational data, is sensitive to data, and has the awareness of actively analyzing and utilizing educational data. Teachers' digital awareness is a prerequisite for data operation ability, and the practice of data operation in teaching can feed back to digital awareness, and promote the continuous improvement of digital awareness.

Liu Yuhang (2022) Digital awareness includes being able to have a high sensitivity to the data generated in education and teaching, and treat the data generated in education and teaching with a rigorous attitude. Digital awareness can reflect the importance that college teachers attach to data, and it is the basis for reflecting the digital literacy ability of college teachers.

Ministry of Education (2023) proposed that digital perception means teachers' inner recognition of the value of digital technology in promoting economic, social and educational development, and insight into emerging challenges in teaching, including the recognition of its positive influence and the prediction of potential changes. Digital willingness emphasizes teachers' enthusiasm for active learning and the use of digital resources in educational practice, as well as their positive attitude to explore innovation in the process of digital education. The digital will reflects the spirit of teachers to overcome obstacles and solve problems when facing the challenges of digital education.

In conclusion, digital perception means the keen awareness of data, the emphasis on the authenticity and value of data, the initiative to discover and use accurate data, in the team learning and work to share real, reliable, scientific and effective information, and actively committed to the maintenance of data security.

#### Digital Knowledge and Skills

Ministry of Education (2023) proposed that digital knowledge and skills means the combination of abilities that teachers should have in their daily teaching and learning activities, covering the basic theoretical cognition and practical operation skills of digital technology. This includes the basic concepts and operational principles of mainstream digital technologies, as well as the effective selection strategies and application techniques of digital educational resources. Wang Jie (2015) has traditional cultural literacy, basic knowledge of information and modern information technology knowledge such as basic computer knowledge, office automation series software, basic network knowledge and Internet applications, etc.

Hao Yuanling et al. (2016) proposed that digital knowledge and skills means the core competence of teachers in educational practice. Digital knowledge covers data characteristics analysis, efficiency evaluation, retrieval and transformation, information dissemination and display, citation norms and other contents, which helps teachers deepen data value mining and broaden the breadth and depth of education and scientific research. Data skills, as the key component of teachers' digital literacy, involve multiple dimensions such as data collection, processing, application, visualization, evaluation, archiving and innovative reuse, and are a direct manifestation of their informatization ability.

Guo Yunjia et al. (2019) proposed that digital knowledge and skills means teachers need to understand the basic attributes, classification and sources of data and identify the structure of educational data. Master the concept, characteristics and educational application of big data; Understand databases and data acquisition, distinguish sample populations, understand errors and variables; Familiar with sampling and correlation regression analysis; Understanding data acquisition and analysis software; Ability to evaluate educational data scientifically and understand metadata creation; Proficient in chart application, solve data manipulation problems.

Yang Xianmin et al. (2021) proposed that digital knowledge and skills means the basic steps for teachers to master the application of various data management platforms and tools and to master data processing and analysis. As teachers are faced with endless educational big data products, it is essential to strengthen these skills, so as to better operate various teaching platforms and effectively use educational big data products to empower teaching activities.

Yuanyuan Ma et al. (2021) proposed that digital knowledge and skills means teachers who are proficient in the classification, application theory and technology of educational big data, covering the whole chain of professional skills from data collection, storage to analysis, visualization, communication and practical application.

Wang Yifei et al. (2021) proposed that digital knowledge and skills means that teachers are familiar with data types, attributes, sources and manifestations, master the operation of basic data tools, and are good at data collection, processing and analysis. Teachers should wisely select data types and appropriate presentation forms according to the teaching content, proficiently use EXCEL, SPSS and other software for data management, upload teaching resources to the platform, and use the platform to collect learning process data to ensure that the data application meets the needs of educational practice.

Han Mingli (2022) proposed that digital knowledge and skills means the data generated by teachers in all aspects of teaching implementation and daily class management, which must undergo strict quality control to ensure its authenticity, accuracy and scientificness, which is the cornerstone of building an effective digital knowledge system. Digital knowledge includes not only how to use appropriate methods and technologies to effectively collect all kinds of data in the education field, but also how to rationally plan the storage architecture of data to ensure the security, accessibility and long-term preservation of data, as well as how to design efficient data processing processes for subsequent data analysis and insight extraction.

Lin Xiuqing et al. (2020) proposed that digital knowledge and skills means teachers' cognition of the policy orientation, latest progress and future trend of big data in education; Master the basic concepts, value realization and application strategies of educational big data; Distinguish the analysis techniques and application scenarios of different data types; Be familiar with ways to collect student data from multiple learning platforms; And skills in using basic data processing tools.

Liu Yaxin et al. (2018) proposed that digital knowledge and skills means that teachers need to have a deep understanding of educational big data at the theoretical level, not only master its basic concepts and characteristics, but also keep up with relevant policy orientation and development trends, and master data collection, mining and application skills. Teachers should learn the core content of data science, such as data classification, structural analysis, statistical methods and classification techniques. Through the accumulation of this series of basic knowledge, teachers can be familiar with the collection and processing strategies of educational big data, identify data types, distinguish structured and unstructured data, clarify data sources and access channels, and initially evaluate data quality and value. In addition, teachers should be familiar with the diversity of data visualization, be able to choose the most appropriate form of presentation according to the needs, and have a deep understanding of the concept, theoretical framework and implementation path of data-driven education to provide solid support for digital teaching.

Liu Yuhang (2022) proposed that digital knowledge and skills means three aspects of teachers' data base, tool mastery and choice ability. First of all, data foundation requires teachers to be familiar with data-related policy trends, cuttingedge developments and future trends, and be able to explain different attributes of data, such as numerical, nominal, discrete, etc. Secondly, the knowledge of data tools involves mastering the application of basic data analysis tools such as EXCEL, SPSS, BI, SAS, SQL, R and PYTHON, and understanding the basic functions, characteristics and differences of each tool. Finally, the ability of data selection emphasizes that teachers select appropriate data resources according to actual needs to ensure the effectiveness and pertinency of data.

In conclusion, digital knowledge and skills means the knowledge system and practical ability set that teachers must possess in the context of digital education, which is closely connected with digital technology. Teachers should master and flexibly apply these skills, aiming at efficient use of digital tools and platforms to optimize teaching design, enrich resource development, strengthen student management and other multi-dimensional educational activities.

#### **Digital Application**

Wang Jie (2015) proposed that digital application means that teachers should be good at using Internet browsers and online downloading tools to achieve efficient downloading of graphics and teaching resources, as well as installation and configuration of application software; Have the skills of using search engines or references to quickly and accurately obtain the required information, and combine effective search strategies to conduct in-depth literature research. At the same time, it emphasizes the ability to analyze and integrate diverse information (text, audio, video) in multiple dimensions to ensure deep understanding. On this basis, it involves advanced skills such as refined screening, authenticity identification, orderly sorting, scientific statistics, logical reasoning, in-depth analysis, comprehensive induction and signal conversion in the vast and complex information. Combined with the flexible use of office software, it realizes efficient management and processing of information and facilitates retrieval and reuse. Such as arranging scientific research papers, making multimedia courseware, operating blogs or building personalized web pages, it shows the comprehensive ability of teachers to process information in the digital age.

Liu Yuhang (2022) proposed that digital application means the set of key competencies that teachers need to possess, including the accurate selection of data that meets their needs (data selection ability), and the systematic induction and collation of existing data to ensure the immediate availability and maximum utilization of data (data processing ability). At the same time, emphasis is placed on the rapid organization, continuous updating and maintenance of newly generated educational data and proper archiving to maintain data timeliness, accuracy and integrity (data retention capability). In addition, it is required to deeply understand the generation logic and structure behind the data, guide the proper selection of data (data understanding ability), and use appropriate strategies and tools to analyze the data, explore its correlation and difference, and deepen the dimension of data analysis (data analysis ability). Teachers also need to have the ability to critically evaluate data, clearly evaluate the comprehensiveness, accuracy, timeliness and inherent defects of the obtained data (data evaluation ability), and further extend this assessment to the application level, identify the specific challenges and shortcomings encountered by learners and educators in the teaching and learning process through personalized data analysis, and implement a detailed, problemoriented assessment. Drive the iterative optimization of teaching strategies (ability to evaluate data application).

Jia Jingyi (2021) Data application is mainly reflected in data communication ability and data decision-making ability. Data communication ability requires teachers to be able to communicate data research results through an appropriate platform, and at the same time requires the ability of teachers to communicate with colleagues, students and their parents; data decision-making ability refers to the ability of teachers to use the information expressed by data to make teaching decisions, including the ability to use data to find problems, make plans, monitor and diagnose the teaching process in teaching.

Wu Gang (2018) proposed that digital application means specifically to teachers' expertise in using data to optimize teaching in educational contexts, involving the use of data analysis to identify potential problems in education and teaching, make teaching strategy decisions based on data, and continuously monitor the progress of teaching activities. In the context of the current data-driven teaching mode, college teachers need to be good at analyzing students' learning data, accurately insight into students' learning status, and take this as a guide, flexibly improve teaching techniques and adjust course content, which is the core of realizing efficient data-driven teaching decisions and ensuring teaching effectiveness.

Feng Yanhua (2023) proposed that digital application means the effective use of digital technology resources by teachers through classroom teaching and extracurricular tutoring, covering multiple dimensions of teaching design, practice, evaluation and cooperative education. In the digital teaching design and practice, teachers should be able to collect, select and even create teaching materials from multiple channels, integrate digital resources to carefully plan teaching activities, build online and offline integration of education scenes, use digital tools to optimize resource allocation and teaching process, and implement personalized guidance for students' individual differences. As for digital assessment and collaborative teaching, it is emphasized that teachers should be able to accurately select data collection tools for academic analysis, and at the same time, provide moral and mental health training for students through digital media, so as to gather resources from all sectors of society and strengthen the educational linkage effect between families and schools.

Wu Di (2021) proposed that digital application means a comprehensive ability of teachers to integrate digital technology resources in the whole process of educational practice, so as to improve the innovation of teaching design, the effectiveness of teaching implementation, the scientific nature of academic evaluation and the synergy of collaborative education. This ability is not only a key indicator to measure teachers' digital literacy, but also the basis for teachers to practice digital teaching. In response to the Ministry of Education's emphasis on improving teachers' information technology application ability, a number of policy documents and special tasks have been issued to accelerate the application of teachers' information technology resources and the improvement of information-based teaching skills. In today's ever-changing educational ecology, intelligent classroom, open educational resources and flexible teaching method together constitute a new educational landscape, which urges teachers to enhance the level of their digital teaching application. This requires teachers to closely follow the teaching practice, deeply explore and efficiently use high-quality digital education resources, and make them deeply integrated with teaching design, learning environment creation and student evaluation mechanism, so as to activate the teaching process, stimulate the vitality of the classroom, and promote the development of students' independent exploration and collaborative learning ability. At the same time, teachers should also pay attention to the impact of digital technology on the growth of students, ensure that while improving students' digital literacy, they can promote the healthy development of students' physical and mental health, and truly realize the organic combination of educational technology and the education concept of all-round development of "morality, intelligence, physical beauty and labor".

Jiang Zhaoyou (2023) proposed that digital application means the comprehensive skills that teachers must master, involving the use of digital technology for learning analysis, activity design, environment construction and teaching implementation. Teachers need to be able to select and manage a variety of digital resources, design instruction based on educational goals, integrate online and offline Spaces, and use intelligent tools to assess student learning status and style. In addition, teachers should be able to organize teaching activities in an orderly manner, enhance interaction with digital means, adjust teaching strategies individually, and optimize the process based on student feedback. In terms of academic evaluation, teachers should make good use of digital tools to collect multi-source data, and provide accurate feedback to students through data analysis and visualization. Teachers also need to make use of the bridge of digital technology to promote the collaboration between family, school and community, guide students to correctly use technological resources, cultivate computational thinking and digital responsibility, innovate the educational methods of moral and mental health education, broaden educational resources and education paths, and jointly build an education ecology for all-round development.

Zhou Liangfa (2022) proposed that digital application means teachers' precise selection of digital equipment, identification of the most suitable high-tech teaching tools and equipment according to the teaching content and target student groups, and enabling the education process with science and technology. Secondly, it involves the skillful control of digital teaching materials, using two-dimensional code, hyperlink and other technologies to seamlessly integrate the latest academic achievements, broaden the knowledge horizon, and deepen the theoretical learning of disciplines. Moreover, it emphasizes the high adaptability of teachers in the new mode of "man-machine collaboration", conforming to the development trend of information technology, tacit cooperation with digital teaching facilities, jointly playing the role of "double teachers", innovating teaching mode, efficiently achieving educational goals, and opening a new chapter of smart education.

Zhou Rujun (2023) proposed that digital application means a necessary comprehensive quality for teachers, covering two core areas of teaching design and implementation. In terms of teaching design, teachers should have the ability to use digital technology to deeply analyze learning situation, efficiently acquire teaching resources, creatively design and manage digital activities, and build the skills to integrate online and offline teaching environment. In terms of teaching implementation, it emphasizes the use of digital resources to optimize teaching organization and management, refine the teaching process, and give personalized teaching guidance according to the characteristics of students. At the same time, it focuses on promoting the deep integration of industry, university and research through health education strategies, and jointly cultivating high-quality talents with both digital technology ability and application practice in collaboration with the government, industry, enterprises and schools. Ma Ji (2023) proposed that digital application means the practice of teachers using advanced technology to optimize teaching in the field of education. This includes using data visualization to make classroom content intuitive, using intelligent systems to help analyze textbooks and design data-rich inquiry activities, and using intelligent big data to monitor teaching and identify and solve problems in a timely manner. Through digital technology analysis, teachers can build scientific learning organization models, reproduce experiment scenes in virtual laboratories with threedimensional simulation technology, make scientific experiments vividly visible with holographic imaging technology, and at the same time, digital simulation helps personalized score analysis to achieve precise teaching guidance. In addition, the intelligent analysis system integrates experiments and activities, carries out simulation calculations, and builds models to feedback, integrate and optimize the teaching process, ultimately achieving a high degree of collaboration and visualization between teachers, technology, students and data, and improving teaching interaction and results.

Chen Min (2023) proposed that digital application means is the key to teachers' teaching innovation. While teachers continue to advance the development of digital technologies, there is still room for improvement in using these tools to deeply analyze student learning differences, customize teaching programs, create a learning atmosphere, and provide personalized tutoring. Intelligent technologies such as ChatGPT provide a powerful impetus for personalized learning and education model innovation. Therefore, it is urgent for teachers to embrace intelligent technology, have the courage to practice, constantly improve their application ability in digital teaching activities, strive for fine optimization of teaching links and model innovation, and comprehensively promote the development of education to a higher quality and innovation direction.

Ministry of Education (2023) proposed that digital application means teachers' teaching design, implementation, academic evaluation and collaborative education. Teachers need to use digital technology for teaching design, including situation analysis, resource selection and creation, activity planning and construction of mixed learning environment. In terms of teaching implementation, it emphasizes the use of digital tools to optimize teaching organization, process management and personalized teaching. In academic evaluation, teachers should make good use of digital means to collect and analyze data, and realize the visual presentation and interpretation of evaluation results. Collaborative education requires teachers to use digital technology to promote home-school-community cooperation, cultivate students' sense of digital citizenship, and conduct moral and mental health education through digital platforms to jointly promote the comprehensive development of education.

In conclusion, digital application means a series of positive actions taken by teachers to achieve teaching objectives and improve teaching quality by integrating digital technology and tools in educational practice. These actions cover the application of proficient digital tools and platforms, the digital creation and maintenance of teaching resources, the improvement of network information literacy, as well as data analysis and scientific evaluation of teaching effects.

#### Digital Duty

Liu Yuhang (2022) proposed that digital duty means the ethics and security awareness that teachers should uphold when processing data. The core lies in proper management and collection of data, ensuring that all information processing activities comply with the principle of privacy protection, preventing data leakage, maintaining information security, and respecting the privacy rights and interests of students and all data subjects, which reflects the professional ethics and legal responsibilities of teachers in the digital era.

Zhang Hongyan (2023) proposed that digital duty means that teachers have the freedom to socialize online and the opportunity to demonstrate their digital skills, while keeping in mind the health of the online ecosystem. Although digital life brings convenience to the daily life of the public, it may also lead to security risks such as privacy disclosure, rumor spreading and cybercrime, threatening social stability, hindering the steady progress of the digital economy, and even affecting the long-term development of the digital society. Therefore, in digital practice activities, vocational teachers should not only lead the application of technology, but also adhere to laws, regulations and ethics, actively practice digital security protection, and set a model for building a safe and sustainable digital environment.

Feng Yanhua (2023) proposed that digital duty means the moral standards and responsibilities of teachers in digital teaching practice, the core of which covers the compliance with legal ethics and the maintenance of digital security. Qualified teachers should be strict with themselves, ensure the proper use of the Internet and digital tools, and protect the security of personal and student data; In daily teaching, they should also become a mentor of information screening, cultivate students' critical thinking, distinguish the authenticity of information, actively inherit the concept of digital responsibility, and jointly build a healthy digital learning ecology. Wu Di (2023) proposed that digital duty means teachers' moral cultivation and behavior norms in cyberspace, which is the key to ensuring that the digital education process is fair, inclusive, green and cooperative. At present, the society has been deeply rooted in the digital network, information and resources are rich, and education technology is changing rapidly, but at the same time, it is also accompanied by improper information dissemination and network security threats, such as network violence and fraud incidents. In this context, teachers play the role of guardians in shaping a civilized and safe educational environment, and have great responsibilities. Teachers should abide by the legal and ethical bottom line, strengthen digital security awareness, prevent risks, pay attention to students' physical and mental health, cultivate their social responsibility in the digital era, and jointly promote a benign and healthy digital education ecology.

Hui Tiangang (2023) proposed that digital duty means the need for teachers to have digital security awareness, strictly abide by digital laws and relevant norms, and use digital technology to assist teaching. Ensure the privacy and safety of students, use digital tools to understand student information and learning through legal means, and be responsible for the confidentiality of student data obtained on the teaching platform. In addition, we will promote respect for intellectual property rights, implement strict copyright protection for teaching materials and student works, both protect originality and teach students to respect creativity, and jointly create a healthy and compliant digital teaching environment.

Jiang Zhaoyou (2023) proposed that digital duty means that teachers should adhere to the dual guidance of laws and regulations and high ethics in digital practice activities, and carry out network operations legally and lawfully. While enjoying the convenience of digital products and services, we should strengthen the awareness of intellectual property rights, maintain the clean network, transmit positive energy, and pay special attention to the physical and mental health of students. In addition, improve data and network security protection capabilities, strictly protect personal information, privacy and educational data, vigilant and effectively resist negative phenomena such as online rumors, violence, fraud, and information theft, to ensure the harmony and security of the digital environment.

Guo Xiaolin (2022) proposed that digital duty means the need for teachers to have a deep understanding and practice of data ethics and ethics in the context of integrating digital technology into educational practice. This requires teachers not only to recognize the ethical and moral challenges in data processing, but also to ensure the legal compliance of data collection and application, maintain the authenticity, integrity and standardization of data, which reflects the reshaping of teachers' self-moral boundaries and the positive guidance and demonstration of students' digital moral education.

Zou Fang (2023) proposed that digital duty means teachers' high standards for lawful and reasonable use of data in intelligent teaching. Faced with the conflict of interest in the collection and application of smart teaching data, which is the core challenge of education data ethics, teachers must deeply understand and adhere to the principle of rationality and legitimacy of data processing, ensure the protection of the privacy of students, peers, administrators and all data stakeholders, and promote the virtuous cycle of smart education ecology and the maximum utilization of the value of education data. This is the embodiment of digital age literacy that every vocational teacher must have.

Zhou Liangfa (2022) proposed that digital duty means that teachers should adhere to the principles of digital ethics, not only to maintain digital security, but also to establish positive digital values, and effectively defend the rights and interests of students in digital learning. This includes proficiency in the protection of digital teaching resources and equipment, in-depth knowledge of data security regulations and protection techniques, and identification and avoidance of potential risks in online teaching. In the face of cybersecurity threats, teachers should be able to effectively ensure data confidentiality and personal privacy. Resolutely resist the phenomenon of digital alienation, adhere to the value orientation of justice, and ensure the security of state secrets, business secrets and personal privacy data in the application of technology, so that every learner can benefit from digital learning in an equal and safe environment. At the same time, teachers need to be vigilant and prevent algorithmic bias to ensure that technological advances promote educational equity and that no student is deprived of fair learning opportunities due to technology embedment issues.

Ma Ji (2023) proposed that digital duty means that teachers strictly abide by laws, regulations and ethical norms in the design, application and evaluation of educational technology, strengthen the awareness of information security, actively guard teaching materials and students' personal information, avoid the misuse of technical means, do not disclose course data without authorization, and strictly prohibit the disclosure of students' intelligent analysis data. At the same time, teachers should take on the responsibility of guiding students to properly maintain personal privacy in the digital age and train them to become responsible digital citizens. Chen Min (2023) proposed that digital duty means teachers' adherence to laws, regulations and ethics in digital practice activities to create a positive network culture. Teachers should handle personal information and work data carefully to ensure its security. With the rise of intelligent technologies such as ChatGPT, technology ethics and privacy protection are facing new challenges. It is emphasized that when technology is integrated into education, teachers should not only be good at guiding students to establish correct values, but also pay attention to cultivating their sense of digital social responsibility and enhancing network security awareness, so as to jointly build a line of responsibility in the digital age.

Ministry of Education (2023) proposed that digital duty means teachers' moral cultivation and practice of code of conduct in the digital field, including compliance with legal ethics and maintenance of digital security. This means that teachers must strictly abide by the legal provisions and ethical guidelines related to digital activities, and legally and appropriately use Internet resources and digital tools to promote the construction of a positive network ecology. At the same time, teachers should have the professional ability to ensure data and network security, which includes properly protecting personal and other private information, maintaining the confidentiality of teaching and work data, and always be vigilant and implement effective network security measures.

In conclusion, digital duty means the moral, legal and social responsibilities that teachers should fulfill in the digital field. It specifically involves ensuring the legitimacy, fairness, transparency and responsibility of actions in the adoption of digital technologies and resources, while taking into account the far-reaching impact on students' personal development, social well-being and environmental protection, and promoting the healthy and sustainable development of digital education.

#### Professional Development

Zhao Huanhuan (2018) used data resources to discover teaching problems, analyze problems and solve problems, make decisions and solve problems, use data to identify problems, convert data into information, be able to exchange data information with collaborators, cooperate around data, and be able to participate in the teaching process of data-driven and circular inquiry. Critically use information and solve problems, share information, actively innovate and solve practical problems, express ideas, exchange ideas, collaborate and solve practical problems in learning and life, use information to create and exchange knowledge, and use information technology to communicate with others.
Liu Yaxin et al. (2018) proposed that professional development means teachers' continuous cultivation of data-supported innovative and transformative thinking patterns in teaching practice. Faced with educational problems, teachers should be able to use scientific data analysis methods to explore solutions from massive information, take the initiative to explore new data-driven teaching models, and verify their effectiveness through practice, so as to become the forerunner of educational innovation. At the same time, teachers should have dialectical critical thinking, treat students' data prudently, avoid data worship, and be alert to wrong data that is not in line with the actual situation, so as to ensure that the data is an important reference without losing objectivity and accuracy, and promote the scientific and rational educational decision-making.

Su Yunfeng (2018) Educational data communication ability is the value embodiment of teachers' digital literacy. Educational data communication ability refers to the ability of teachers to use data related to the subject and the educationrelated community to communicate, and the ability to use data to speak, mainly including five aspects of data communication with students, parents, colleagues, leaders and themselves. First, teachers should use data to inform students about their own learning progress, learning level, etc. so that students can have an objective and comprehensive understanding of their learning status, so that they can carry out next-step learning plans; second, teachers should use the language of data to provide professional descriptions of students learning growth, strengthen parents understanding of students learning conditions, and suggest that parents carry out personalized home education for children based on the information reflected in the data; third, teachers should be able to use data to form their own teaching logs or reports. Communicate and share with colleagues, and exchange biology teaching status, teaching ideas and teaching methods in the form of data, so that teachers can learn from each other's excellent experience and optimize teaching models; fourth, report to leaders based on data, so that leaders can understand the current situation of teachers' work more clearly.

Zheng Xudong (2019) proposed that professional development means the process in which teachers uphold the spirit of lifelong learning and make use of the power of science and technology to continuously improve themselves and grow. This includes the innovative integration of technology into personal learning and training and continuous self-optimization to meet the evolving needs of the education sector; It is also reflected in the effective use of digital technology, as a qualified educator in the digital age, to solve new problems in educational practice. Teachers should have analytical, critical and innovative thinking, propose novel insights and solutions to digital teaching challenges, or independently develop teaching content and innovative teaching models to promote the progress and innovation of educational practice.

Lin Xiuqing et al. (2020) proposed that professional development means the process of teachers' in-depth reflection and effectiveness evaluation of data application, promoting common growth through mutual data exchange, and sharing data insights with all parties within the framework of respecting privacy and law. According to the results of data analysis, teachers should be able to innovate teaching strategies and methods, further use data to reshape educational concepts and evaluation systems, and promote the continuous optimization and modernization of educational practice.

Jia Jingyi (2021) This dimension is mainly reflected in data communication ability and data decision-making ability. Data communication ability requires teachers to be able to communicate data research results through an appropriate platform, and at the same time requires the ability of teachers to communicate with colleagues, students and their parents; data decision-making ability refers to the ability of teachers to use the information expressed by data to make teaching decisions, including the ability to use data to find problems, make plans, monitor and diagnose the teaching process in teaching.

Zhang Li (2022) Teacher data collaboration mainly includes the sharing of educational data resources, the acquisition of data usage knowledge and related tool operation skills, the use of educational data to optimize educational and teaching decisions, and the improvement of teaching effects based on data analysis results.

Liu Yuhang (2022) proposed that professional development means the enhancement of teachers' ability in data application and communication, which covers the three core areas of data innovation, data-driven teaching and data interaction. Data innovation ability involves the deep exploration and innovative use of existing data, aiming at discovering new value of data and improving the efficiency of teaching resources. Data-driven teaching ability is a comprehensive index to measure teachers' use of statistical analysis to guide educational practice, optimize teaching decisions, and solve practical teaching problems, demonstrating the integration of teachers' statistical literacy and practical wisdom. The ability of data interaction emphasizes that teachers should be able to effectively use network platforms to share data research results, strengthen communication and collaboration with colleagues, students and parents, and jointly promote the flow of educational information and the improvement of education quality.

Tong Manman (2022) digital collaboration ability mainly includes three parts, namely information communication ability, information sharing ability and social network etiquette. Ability to use different digital social tools to enhance effective communication with parents, colleagues and other personnel, to actively reflect and formulate communication strategies, etc. The ability to exchange teaching experiences and opinions, share teaching content and teaching materials with colleagues or others, and promote students' digital communication and collaboration skills through appropriate digital technology. The ability to regulate one's own words and deeds in the process of using digital technology to communicate and interact, and to be aware of the cultural diversity in the digital environment. Be able to actively discover problems in the teaching process, choose appropriate digital tools, equipment, software, etc. to solve problems, and at the same time be able to analyze problems from different perspectives, innovate teaching methods, use digital literacy to improve teaching design, optimize classroom teaching models, update digital skills, and innovate digital teaching activities.

Wu et al. (2023) proposed that professional development means the dynamic process in which teachers promote themselves and their peers with the help of digital technology resources. This promotion strategy not only promotes the long-term growth of teachers and communities, serves the vision of lifelong learning, but also provides solid support for digital teaching innovation and practice. Digital tools are all-encompassing, opening up broad learning resources and advanced training environment for teachers, and promoting the deep integration of theory and practice. Teachers should make active use of these resources to deepen their professional knowledge and reflect on teaching. At the same time, they should strengthen the interaction of teachers' communities, such as online master studios and virtual learning communities, to deepen learning, broaden communication and expand influence. Continuous exploration and practice of new digital teaching strategies and models is the key path for teachers to achieve professional leap.

Ministry of Education (2023) proposed that professional development means the practice of teachers using digital technology resources to improve themselves and their communities. This includes deepening educational theories and skills through digital learning and training, using digital platforms for continuous selfimprovement, reflecting on and optimizing teaching with the help of technology, and participating in and hosting online training activities. At the same time, teachers should devote themselves to the research and innovation of digital teaching, that is, carry out research on the cutting-edge issues of digital teaching, explore new teaching models and learning strategies, promote the innovation and change of educational practice, and reflect the dynamic and forward-looking characteristics of professional development.

In conclusion, professional development means the process in which teachers constantly improve their professional knowledge and skills and adapt and innovate their digital teaching practices in the context of the digital age. The core includes skills in the efficient use of digital tools and platforms, the creative development and effective management of digital educational resources, the ability to use data analysis to optimize teaching effectiveness, and strategies for fine management and effective communication of students through digital technology.

#### Digital Communication

Liao Xifeng et al. (2019) proposed that digital communication means that teachers need to have the core skills to accurately report data analysis conclusions in an appropriate format, and effectively communicate information with colleagues and other education researchers through multimedia forms such as visual charts. This not only requires teachers to be proficient in the art of data expression, but also covers deep communication practices that use modern information technology means to promote knowledge sharing and thinking collision, and enhance cross-field cooperation and understanding.

Su Yunfeng (2018) proposed that digital communication means teachers using subject data to communicate effectively with colleagues in the education field. This covers five dimensions: sharing data with students, identifying their learning progress and level, and promoting independent planning; Using data as the medium, show students' growth trajectory to parents professionally and guide personalized family counseling; Develop data-driven teaching logs or reports to share with colleagues to facilitate mutual learning and iteration of teaching strategies; Reporting data to management to enhance transparency and understanding of work; And use data to record personal teaching diary, objective reflection, improve teaching quality, reduce subjective assumptions. Digital communication emphasizes on data as the basis to achieve accurate and efficient educational communication.

Tong Manman (2022) proposed that digital communication means teachers' information dissemination, information sharing and online etiquette. This is reflected in the use of various digital platforms to enhance the efficiency of communication with parents and colleagues, and take the initiative to strategically reflect on

communication methods. Through the active exchange of teaching experience, resource sharing, and the use of appropriate scientific and technological means, not only to enhance the exchange of knowledge among peers, but also to cultivate students' communication and collaboration ability in the digital era, to build an interactive and cooperative education ecology.

Jia Jingyi (2021) Data communication ability refers to teachers' ability to communicate data research results through appropriate platforms, and also requires teachers to communicate with colleagues, students and their parents; data decisionmaking ability refers to teachers' ability to use the information expressed in data to improve teaching. Decision-making ability, including the ability to use data to identify problems, make plans, monitor and diagnose the teaching process in teaching.

In conclusion, digital communication means the ability of teachers to use various digital tools and platforms to communicate with students, parents, colleagues and all relevant parties under the digital scenario. Such communication emphasizes the effective and efficient transmission of information, as well as the cultivation of relationship building, problem solving and collaborative spirit.

#### Digital Teaching Design

Zheng Xiaojun et al. (2024) proposed that digital teaching design means teachers' focus on the application of educational technology and innovative strategies, including flipped classroom, integration of online and offline, intelligent teaching, immersive learning combined with virtual and real, as well as customized learning plan design using artificial intelligence to generate content, which constitutes the focus of teachers' exploration and practice of digital teaching reform.

Duan Mengyun (2024) proposed that digital teaching design means the digital educational model that teachers carefully construct and adapt according to the characteristics of practical training courses and the actual situation of students. The process involves collecting and producing teaching materials, designing interactive teaching sessions embedded with digital tools, and building an integrated learning ecosystem using smart classrooms and cloud service platforms. At the same time, digital evaluation means are adopted to strengthen teaching quality and learning effectiveness, and promote the simultaneous improvement of education personalization and efficiency.

Yu-Tep (2023) proposed that digital teaching design means teachers' ingenious conception of teaching schemes based on pedagogical principles and students' cognitive characteristics, combined with digital technology, which covers the planning of teaching content, the organization of teaching structure, the planning of

implementation steps and the selection of teaching strategies, in order to efficiently achieve established educational objectives.

Wu Hong Liu (2023) proposed that digital teaching design means the process in which teachers use advanced digital technology to reconstruct teaching interaction when preparing for teaching content. The key steps include the understanding of technology basis, the analysis of learner characteristics, the definition of educational objectives, the selection of teaching mode, the collection and integration of teaching resources and the evaluation strategy of teaching effect.

Hu Yingqian (2023) proposed that digital teaching design means the use of information technology means for teachers to scientifically integrate teaching links, analyze teaching elements in an all-round way, and carefully plan teaching processes in order to improve teaching effect and problem-solving ability, and realize innovation and optimization of educational activities.

In conclusion, digital teaching design means the use of digital technology tools by teachers to accurately assess learning needs, efficiently collect, manage and develop educational materials, carefully plan digital teaching interaction, and build innovative learning scenarios integrating online and offline, in order to improve teaching quality and learning experience.

#### Digital Teaching Implementation

Zheng Xiaojun et al. (2024) proposed that digital teaching implementation means that teachers carry out digital teaching methods, such as online teaching, offline practice, blended learning, immersive virtual reality education and innovative learning mode using AIGC. The process runs through the three stages of "preparation before class, interaction in class and feedback after class", and each stage is linked together to form a progressive teaching process. Teachers need to deepen research on teaching theories, models, strategies, methods, application of technological tools, process control and activity design to empower educational practice with technology and optimize students' learning journey.

Duan Mengyun (2024) proposed that digital teaching implementation means that teachers upgrade teaching interaction through novel methods such as flipped classroom. It focuses on the precise planning of activities and the deep integration of digital technologies to strengthen the continuity and integrity of each teaching phase. This model recognizes the individual learning needs of students, provides customized support, and is committed to teaching model innovation to promote the seamless connection between education and industry. Establish a common digital training platform to ensure sufficient training resources, accurately connect with students' practical demands, and promote the modernization of practical training education.

Khotan (2023) proposed that digital teaching implementation means the process and ability of teachers to rely on digital technology tools, integrate innovative teaching methods, effectively organize and manage teaching activities, ensure the standardization and flexibility of teaching processes, timely adapt to changes in the teaching scene, and efficiently achieve established educational goals.

Shen Shu (2022) proposed that digital teaching implementation means the comprehensive teaching practice implemented by teachers in the digital learning scene, according to advanced education concepts and teaching rules, combined with the characteristics of students and course content, and with rich digital education resources and modern teaching mode, aiming at cultivating innovative talents who can adapt to the needs of the information age.

Chen Xueru (2023) proposed that digital teaching implementation means that teachers integrate personal digital skills and subject teaching wisdom in real teaching scenes, skillfully use information technology and digital environment, and effectively achieve educational goals, which not only promotes the growth of students' digital ability, but also drives the continuous evolution of teachers' professional ability. It is a highly interactive and integrated practical ability.

In conclusion, digital teaching implementation means the process of teachers' effective use of digital technology tools and resources to innovate teaching practice activities. This includes the skillful use of digital resources by teachers to organize and optimize teaching processes, improve teaching effectiveness, and implement precise personalized guidance based on students' specific differences to promote the overall improvement of students' overall quality.

#### Digital Leadership

Liu Baocun et al. (2024) proposed that digital leadership means the ability of university teachers to lead teaching and collaboration in the field of digital, involving guiding students to learn, motivating teams to explore the innovation of digital resources and tools, and collaborating with various educational forces to jointly promote the process of digital change at the school and even the social level.

Zhao Leilei et al. (2019) proposed that digital leadership means teachers' ability to skillfully integrate a variety of digital tools and concepts in teaching and student management activities, and closely integrate them with traditional classroom and extracurricular guidance practices, so as to facilitate the seamless docking of

digital technology and educational content, and promote the innovation and optimization of teaching models.

He Meixian et al. (2022) proposed that digital leadership means the ability and practice process of teachers to use digital concepts and skills to positively influence students' growth, peer development, leadership and decision-making in the fields of education, teaching management, teacher training and campus information culture construction, and lead the whole school to transform to digital education.

Sun Zhenxiang et al. (2015) proposed that digital leadership means that teachers rely on information technology to set and realize teaching vision, create and optimize information-based teaching content and curriculum, organize and guide information-based classrooms, conduct effective evaluation, communication and reflection, so as to unite teachers and students and improve their guiding power to peers and students. This ability focuses on promoting students to adapt to the growth of the information age, promoting the professional advancement of teachers, creating a positive campus information culture atmosphere, ensuring that the school moves forward steadily on the road of information technology, and achieving longterm development goals.

Yu Tianzhen et al. (2020) proposed that digital leadership means the process of integrating digital thinking and skills into teaching and curriculum design while continuously improving personal information technology capabilities, and playing a leading role in key management, implementation, communication and collaboration, thereby positively impacting student growth, peer collaboration, and other education stakeholders.

In conclusion, digital leadership means the core competence of professional educators to lead academic activities in the contemporary technological environment, which is not only reflected in guiding and building student learning systems, but also in driving teams to explore and apply innovative digital tools to optimize educational outcomes. In addition, this leadership enables it to work closely with education partners from all walks of life to advance the digital process of campus and society as a whole, and contribute to the modernization of the education sector.

## Context of Higher Vocational Colleges in Guangxi

Higher vocational colleges (referred to as higher vocational colleges) focus on providing higher level vocational education, aiming to respond to the needs of social and economic development, and integrate the dual characteristics of vocational education and higher education. Its educational purpose focuses on the market and the actual job needs of enterprises, focuses on improving students' practical skills and personal expertise, and aims to transport highly skilled talents for the production line, management and service positions of enterprises and enterprises. The higher vocational education system includes two academic levels: higher vocational college and higher vocational college. Funding sources constitute another dimension of its classification. There are both public higher vocational colleges funded by the state and private higher vocational colleges, forming a public-private education pattern(Chen Lu,2021).

Higher vocational education has undergone significant changes in the following core areas: personnel training model, curriculum structure, teaching method and evaluation system, which are embodied in:

1. Clear and specific standards are set for students' practical ability and application skills.

Higher vocational education aims to cultivate talents who can meet the needs of production, management and service, and set detailed training standards for each specialty according to the needs of practical ability and application skills unique to various positions (groups). In addition, it is integrated into the vocational qualification education system, taking it as the key yardstick to judge the standards of students' vocational skills, gradually aligning with international standards, adopting internationally common vocational qualification certificates, and enhancing the recognition of certificates. In a word, graduates of higher vocational education should not only successfully obtain a higher education degree, but also have a number of vocational qualifications.

2. It emphasizes the cultivation of students' practical operation and application ability, increases the proportion of practical courses, and carries out the "on-the-job learning" mode.

In the curriculum arrangement of higher vocational education, in addition to compulsory public courses, basic theory and knowledge follow the principle of "essential and sufficient", ensuring that professional technology and skill training courses account for 30%-40%, and building a curriculum system focusing on practical ability and application orientation. This kind of technology and skills course teaching, through the "field teaching" model, the classroom is extended to the simulation laboratory, workshop and other real workplace scenes, so that students in a near real combat working environment practice, greatly improve their practical skills and application ability, has achieved remarkable results.

3. Establish an evaluation mechanism based on "social participation" and "market orientation".

Higher vocational education is closely connected with the needs of society and the market, and the authority to judge its educational effectiveness lies in the hands of society and the market. The core evaluation criteria are mainly reflected in the employment rate of graduates and the degree of acceptance of graduates by society. In particular, the high employment rate, the availability of courses in line with the needs of society, and the high reputation of graduates all indicate that educational outcomes and practical skills are well recognized by society. In view of this, most higher vocational colleges spontaneously set the above two indicators as the yardstick of educational effectiveness, and are committed to improving students' professional skills, broadening employment paths, and ensuring that graduates can enter the workplace at a high rate.

By 2023, Guangxi Zhuang Autonomous Region is expected to have 34 public vocational colleges. These include Guangxi Mechanical and Electrical Vocational and Technical College, Guangxi Sports College, Nanning Vocational and Technical College, Guangxi Water Conservancy and Electric Power Vocational and Technical College, Guilin Normal College, Guangxi Vocational and Technical College, Liuzhou Vocational and Technical College Guangxi, Guangxi Ecological Engineering Vocational and Technical College, Guangxi Communications Vocational and Technical College, Guangxi Industrial Vocational and Technical College, Guangxi International Business Vocational and Technical College, Liuzhou Railway Vocational and Technical College, Guangxi Construction Vocational and Technical College, Guangxi Modern Vocational and Technical College, Beihai Vocational College, Guangxi Economic and Trade Vocational and Technical College, Guangxi Industry and Commerce Vocational and Technical College , Guangxi Electric Power Vocational and Technical College, Liuzhou City Vocational College, etc.

#### Delphi Method

Delphi method, as a group communication technique, aims to solve complex problems by integrating individual wisdom through systematic processes. This approach ensures the flow of information and wisdom (Linstone et al., 1975, p. 3), including feedback of individual insights, collective evaluation of judgments, allowing for adjustment of views, and maintaining the anonymity of respondents, thereby creating a "structured" dialogue space. Applying this method to solicit expert opinions can not only eliminate the possibility of direct authority influence among experts, but also build an anonymous feedback mechanism to promote the consensus of expert groups on specific issues.

The Delphi process involves the following steps and precautions:

1. Clear question and scope delineation: First of all, clarify the research question, ensure that it is accurate and specific, and clarify the focus of discussion, because the accuracy of the question is directly related to the value of expert feedback.

2. Expert Team Selection: Carefully selected cross-field, experienced expert team, diversity ensures multiple perspectives, is the key to the success of the project.

3. Questionnaire preparation: The questionnaire was designed to collect expert opinions, including open questions to encourage free expression, and closed options such as multiple choice questions or scale assessment to comprehensively cover all aspects of the question.

4. Preliminary research: Distribute questionnaires to experts to complete independently and provide insights based on professional knowledge. Then summarize and analyze to prepare for subsequent feedback.

5. Data analysis: Statistical methods are used to quantify expert opinions (such as average and median), and qualitative analysis is carried out to refine consensus and disagreement, laying the foundation for the next round of research.

6. Secondary research and feedback: The first round of results will be fed back to the experts, prompting them to examine the views of other experts, and have the opportunity to adjust their own views and promote consensus formation.

7. Interactive exchange: Organize in-depth exchanges of experts through meetings or virtual platforms to promote understanding and convergence of opinions, possibly through E-mail, online forums or video conferences.

8. Iterative optimization: Based on the early feedback and discussion, decide whether to conduct more rounds of research, and adjust the strategy according to the trend of expert opinions to achieve a clearer consensus.

9. Consensus: As the process progresses, expert views tend to converge, focusing on consensus and remaining disputes, aiming to achieve or approach the consensus of all experts.

10. Summary Report: The whole research process and results are integrated into a report, covering an overview of the problem, a summary of expert opinions, a consensus formation process, a dispute analysis and potential recommendations to provide a basis for decision-making.

#### Focus Group

Focus group discussions take place in a relaxed, frank and informal environment, with the aim of organizing collective discussions around specific issues. This method combines the delicacy of in-depth interviews, aiming to explore the cognitive feelings of individuals and gain insight into the interaction mechanism within the group. In general, focus groups consist of 6 to 12 members with similar backgrounds and are led by an experienced facilitator. During the session, which lasts about two hours, the moderator guides the conversation with carefully crafted questions, encouraging members to share their personal insights and positions, while ensuring that the conversation stays on topic and delves into core issues without going off-center.

The process is as follows:

Establish a discussion agenda: Prior to the workshop, researchers should develop a list of open-ended questions designed to guide the conversation without limiting the answers, ensuring that the questions are closely related to the purpose of the research.

Invite participants: Select and contact suitable participants, briefly introduce the basic information of the workshop, explain its purpose and process.

Arrange a meeting: Gather participants at a predetermined time and place and have the researcher or designated moderator guide the conversation, maintain the direction of the discussion, and ensure that everyone can actively participate.

Free exchange session: Under the guidance of the moderator, participants freely share their personal experiences, opinions and feedback, while interacting with others' opinions.

Recording session: Record the discussion in detail, using notes, audio or video recordings, etc., to provide a basis for subsequent analysis.

Data analysis: In-depth analysis of discussion materials to refine themes, patterns, and consensus to deepen understanding of participants' attitudes and perceptions.

#### **Related Research**

#### Strategies for Improving Digital Literacy for Teachers

Liu Yuhang (2022) The government should actively promote digital literacy enhancement programs for college teachers and stimulate teachers' awareness of the value of data. At the national level, relevant policy guidance should be issued to strengthen teachers' education on data ethics and security awareness, and ensure the standardization of data collection and use. Colleges and universities, on the other hand, play a assisting role. They should not only assist teachers in collecting data generated in daily work and students' learning activities, but also scientifically plan training courses, clarify training objectives, rationally allocate resources, and implement differentiated training strategies according to the actual situation of teachers, so as to improve the digital literacy of teachers. At the same time, teachers are encouraged to improve their ability of data screening and utilization, actively analyze valuable data in educational practice, effectively integrate and summarize, and obtain important data information through multiple channels. Colleges and universities also need to build teachers' digital literacy assessment system, improve the assessment mechanism, achieve standardization of data management, and flexible and diversified assessment methods to accurately identify and solve the weaknesses of teachers' digital literacy.

He Jian (2021) It is strongly recommended that higher vocational colleges pay more attention to improving teachers' digital literacy, and set up specialized agencies to take charge of regular digital literacy management by integrating the resources of personnel, educational affairs and other departments. It is suggested that the publicity department of colleges and universities should join hands with the professional department of digital literacy to increase publicity efforts and continue to emphasize the urgency and importance of improving teachers' digital literacy. At the same time, multiple incentives should be adopted to encourage teachers to actively use digital technologies in teaching, student guidance, research projects, digital project development and social services, and adequate resources should be provided for them. Accelerate the pace of campus digital and intelligent transformation, realize the comprehensive digitization of resources, strengthen the construction of digital infrastructure, and constantly optimize the digital learning environment. It is proposed that the professional department of digital literacy regularly update the evaluation standards of teachers' digital literacy, conduct a comprehensive evaluation, formulate a personalized training plan for teachers who fail to meet the standards, match the corresponding training resources according to their professional and ability levels, implement precise training, and evaluate the training effects according to the training objectives. It is suggested to adopt hierarchical and classified training strategies, integrate basic and professional training, realize the modularization of training content, the combination of online and offline training, and the seamless connection between pre-service and post-service training. In addition, it is suggested that in the recruitment process of new teachers, the digital literacy testing link should be added by the digital literacy professional departments, giving priority to those with excellent test results, and promoting the joint training mode of both inside and outside schools and schools and enterprises to improve the digital literacy level of teachers in an all-round way.

Kong Lingshuai (2023) Promote the construction of an open source resource library for teachers' digital literacy, with the goal of comprehensively improving the quality of balanced education. China is not only committed to the promotion of domestic education digitization and the enhancement of teachers' digital capabilities, but also actively responds to the UNESCO initiative on open resources for teachers' digital literacy to help the digital transformation of education and build an open education resource system. On this basis, we will continue to strengthen the construction of digital technology facilities and platforms to provide solid support for the digital transformation of teachers' teaching. Accelerate the deployment of digital technologies in campus infrastructure to ensure that teachers can effectively carry out digital teaching activities. At the same time, we will build a national-level public service platform for teachers' education resources, further improve the national digital education resource service system, and promote the extensive sharing and effective application of high-quality education resources. Continue to integrate and develop online teacher education resources, and adopt various ways to promote the open sharing mechanism of digital resources. Create a digital learning community for teachers to provide a space for teachers to interact and accelerate their professional growth. Implement a systematic plan to improve teachers' digital literacy, strengthen teachers' ability to apply digital resources and educational data analysis, and help teachers' professional development. At the national level, the focus is on building communication platforms, introducing advanced educational concepts, providing policy guidance, and coordinating training programs with education departments; At the local level, it focuses on providing financial subsidies and technical support to assist local higher education institutions and other organizations to effectively implement teacher training.

Li Hua (2023) The hierarchical positioning of teachers' digital literacy should take into account the characteristics of the curriculum. Different courses have different demands on teachers' digital skills. Based on the difference of curriculum, it is particularly crucial to put forward the grading requirements for teachers' digital literacy. At the basic level, college teachers need to master the operation of the course platform to ensure the smooth progress of online teaching activities. For courses with abundant resources and strong teams, teachers should be encouraged to develop online courses and expand teaching boundaries. The construction of highquality online and offline integrated courses is not only the future trend of higher education, but also the standard to measure the high-level digital literacy of teachers, which has become the focus and challenge in the teacher evaluation system. Strengthening the efficient use of digital resources outside the school means that teachers need to be able to search for, apply and adapt external digital materials as teaching tools, and be good at guiding and motivating students to use these resources effectively and properly evaluate their use. Promote the deep integration of digital literacy and teachers' personal growth, create a positive environment for personal development, enhance teachers' recognition of the value of digitalization and informatization, and effectively promote each teacher to achieve personal career leap through digital means. To this end, colleges and universities should deepen teachers' understanding of the positive role of digital literacy in personal career development by holding various forms of activities such as expert lectures and guidance from senior teachers in combination with professional characteristics. At the same time, schools should provide sufficient hardware facilities and software tools to create favorable conditions for teachers to enhance digital literacy and ensure that they can steadily move forward in the tide of digital education.

Ma Liangu (2023) It is proposed to reform the training mechanism, improve the allocation of training resources, and advocate that the government should lead the construction of a digital hierarchical training system for teachers. According to the individual needs of teachers, a regional digital competence training resource database for primary and secondary school teachers should be established to enhance the accessibility of resources during training. In the training covering digital teaching techniques, teaching concepts, intelligent teaching tool operation, teaching platform application and other contents, attention should also be paid to improving teachers' ability to manage personal data, identify information sources and verify data authenticity, and strengthen teachers' active awareness in improving digital literacy.

Song Jia (2023) In the face of the needs of the digital age, the key to improve the digital literacy of college teachers is to strengthen the digital teaching thinking and deepen the integration ability of digital technology and educational content. At the same time, colleges and universities need to continuously optimize the teacher growth system, actively promote the progress of digital literacy of teachers, and increase efforts to carry out digital skills education and training.

Feng Siyuan (2023) Strategies to improve digital literacy of university teachers should be integrated into the comprehensive ecosystem of higher education, and the specific implementation can focus on two pillars: industry-university-research cooperation and internal collaboration in the education sector. Through multilateral cooperation with leading international digital technology companies and organizations, universities can access cutting-edge ICT resources in the industry, as well as hardware and software support that exceeds the conventional budget scope. This cooperation not only introduces the latest trends and actual needs of the digital industry into the higher education system, but also promotes teachers' self-learning and ability upgrading in the process of digital talent training through internship cooperation and guest lecturing. Within the education system, the guidance and support of national policies, the digital education resource sharing mechanism across all levels of education, and the close cooperation and quality control among digital competence training institutions within colleges and universities have all built a solid foundation for the digital skills training of college teachers. Together, these measures have promoted the comprehensive improvement of teachers' digital literacy and accelerated the pace of digital transformation of education.

Hu Xiaoyong (2023) In the journey of educational progress in the new era, the digital transformation of education plays a crucial role. As the backbone of the implementation of digital education strategy, the cultivation of digital literacy of teachers has become the focus of attention in the educational circles at home and abroad. In order to effectively promote this process, the key measures include: designing a detailed micro-ability evaluation index system, strengthening the integration process from teacher preparatory education to in-service continuous development, and ensuring the continuity of knowledge and skills; Make full use of the rich resources of the national smart education platform to broaden the breadth and depth of the application of educational technology; Pioneering new models for rapid digital literacy improvement, with the aim of achieving large-scale quality enhancement; And adopt a non-invasive scenario-based evaluation method to guide and optimize teachers' digital ability training path with scientific and reasonable evaluation. Together, these strategies point to one goal: to fully accelerate the ability of teachers to adapt and lead in the digital transformation of education.

Hu Qihui (2023) The research on Chinese teachers' digital literacy needs to adopt a long-term planning perspective and select typical regions to conduct regular follow-up surveys, so as to build solid data support for the improvement of teachers' digital abilities. By refining survey scenarios, optimizing measurement tools, and rationally allocating evaluation dimensions and index weights, it can make the practice of information technology in activating classroom teaching and innovating learning mode more targeted and operational.

Zhang Ranni (2022) In today's booming digital education, teachers' digital skills and literacy have become the key indicators to measure the effectiveness of education. The deep integration of digital education technology and innovative teaching practice is not only the internal demand of cultivating talents with both digital skills and teaching art, but also the only way to meet the learning needs of students in the new era and successfully achieve the goal of education digitalization. However, in reality, the improvement of teachers' digital ability has not kept pace with the rapid progress of education digitization. In the face of uneven technology application, insufficient integration and practical obstacles restricting teachers' professional growth, the urgent task is to examine the precise positioning of teachers' information technology application, assess the suitability of combining technology with subject content, identify the potential improvement space of teachers' digital literacy, and explore how to effectively build a comprehensive strategy for teachers' digital ability cultivation from a multidimensional perspective of information awareness. This requires us to set scientific evaluation criteria and innovate training models, accurately harness the enabling role of digital technology in education, and fundamentally strengthen teachers' ability in digital thinking, reference standards and system construction, so as to actively respond to the new challenges and expectations of digital education for teachers.

Liu Wenkai (2023) To improve the digital literacy of teachers in higher vocational colleges is to comply with the call of the era of digital transformation of vocational education, related to the adaptation of technical education to the actual needs of the current society, and is also an inevitable trend of personal career development of teachers in higher vocational colleges. To this end, it is necessary to focus on stimulating the subjective initiative of teachers to improve their digital ability, build a practical digital literacy promotion platform, establish and improve the multi-angle digital literacy evaluation mechanism for teachers, and jointly promote the progress and improvement of digital literacy of teachers in higher vocational colleges by strengthening and innovating the on-campus management system.

Wang Yongzhao (2023) The digital literacy of teachers in higher vocational colleges involves digital cognitive literacy, digital participation literacy, digital interconnection literacy and digital collaboration literacy. Facing the challenges of the digital intelligence era, the implementation strategies to optimize the digital literacy training of higher vocational teachers should focus on: promoting the overall improvement of teachers' digital literacy, and implementing micro-certification system to verify their ability; Build a digital literacy education and training system for teachers with wide coverage, diverse forms and layers according to needs; Accelerate the building of an ecosystem that facilitates the digital transformation of education; It also refines and improves the evaluation mechanism of teachers' digital literacy to ensure the effectiveness of training measures and the continuous evolution of teachers' ability.

# Chapter 3 Research Methodology

In order to develop the development digital literacy model for higher vocational teachers, this research is divided into two phases.

# Phase 1:

Phase 1 was conducted to answer research objective 1 and objective 2:

**Objective 1:** To study the current situation of digital literacy for higher vocational college teachers.

**Objective 2:** To develop the digital literacy development model for higher vocational college teachers in Guangxi.

The flowchart of the phase 1 implementation is shown in Figure 3.1







Figure 3.1 Implementation steps for the phase 1

# The population

# The Population

The researcher uses Purposive Sampling and selects 21 experts with the following qualifications:

1. at least 6 years of working experience as a digital teaching administrator in the school

2. rich experience in digital teaching

3. a master's degree or above

4. The academic title is associate professor or above.

#### **Research Instruments**

#### Interview

In order to study the current situation and improvement mode of teachers' digital literacy, according to the results of research and analysis of relevant literature, based on the theme of teachers' digital literacy development model, the "Open Questionnaire for Teachers' Digital Literacy Development Model in Higher Vocational Colleges" was formulated.

#### **Open-ended Interview Formation Process**

Step 1: Analyze the relevant literature, relevant theories and national policies to obtain the characteristics of teachers' digital literacy in higher vocational colleges.

Step 2: According to the characteristics of teachers' digital literacy, an open interview form for teachers' digital literacy development model in higher vocational colleges is designed.

Step 3: Send Open-ended interview form to 5 experts for testing

Step 4: Collect Open-ended interview form data and revise the interview

form.

Step 5: Send Open-ended interview form to 21 experts

#### Likert Rating Scale

According to the results of relevant literature and interview table analysis, a Likert scale for the development strategies of teachers' digital literacy in higher vocational colleges is established.

The scoring criteria are as follows:

- 5 strongly agree
- 4 agree
- 3 neutral

2 disagree

1 strongly disagree

# The Likert Evaluation Form Formation Process

Step 1: According to the relevant literature and the results of the interview table analysis, build a teacher's digital literacy development strategy.

Step 2: Establish a Likert rating scale for teachers' digital literacy development strategies in higher vocational colleges.

Step 3: The consultant reviews the evaluation form and modifies the content according to the consultant's suggestion.

Step 4: Evaluation of the Objective Consistency Index (IOC (Rovinelli and Hambleton, 1977)) by 3 experts. Evaluation was performed according to the following criteria, and the index of agreement (IOC) was 0.67 to 1.00.

+1 = Make sure the content is relevant to the topic

0 = Not sure content is relevant to the topic

-1 = Content is off topic

Step 5: forming a Likert scale for teachers' digital literacy development strategies.

Step 6: Send the evaluation form to 21 experts to fill in, modify the Likert rating scale according to the experts' opinions, and repeat for 3 rounds.

#### Data Collection

1. Collect data from open-ended questionnaires during interviews

2. Collect data from the rating scale questionnaire in round 1,round 2,and

round 3

#### Data Analysis

The data of the scoring scale questionnaire were analyzed by median and interquartile range (IQR) to analyze the consistency of expert opinions, and evaluated according to the following criteria.

### 1. Median

The median is an index used in statistics to measure the central tendency of a set of data. It represents the intermediate value in ordered data. Evaluate according to the following criteria. Median evaluation value in shown Table 3.1

Table 3.1 Median evaluation value

Median	Content
5	Strongly agree
4	agree
3	neutral
2	disagree
1	Strongly disagree

## 2. Inter-Quartile Range (IQR)

Interquartile range (Inter-Quartile Range, IQR) is an indicator used in statistics to describe the degree of data dispersion. It measures the dispersion of data contained in the middle 70% of the data set. Evaluate according to the following criteria. IQR evaluation value in shown Table 3.2

# Table 3.2 IQR evaluation value

IQR	Content
0 <iqr≤1< td=""><td>Experts agree</td></iqr≤1<>	Experts agree
1 <iqr≤2< td=""><td>Expert opinion is basically unanimous</td></iqr≤2<>	Expert opinion is basically unanimous
2 <iqr< td=""><td>Experts disagree</td></iqr<>	Experts disagree

# Phase 2:

Phase 2 was conducted to answer research objective 3: To evaluate the digital literacy development model for higher vocational college teachers in Guangxi. The flowchart of the phase 2 implementation is shown in Figure 3.2



Figure 3.2 Implementation steps for the phase 2

# The population

# The Population

The researcher uses Purposive Sampling and selects 9 experts with the following qualifications:

1. at least 10 years of working experience in school or business

2. enrich teachers' digital literacy management experience

3. a doctorate degree

4. an academic title of professor

#### **Research Instruments**

# Focus Group Form

It is a form of collective interview that adopts a semi-structured approach and is led by the moderator to discuss the research topic and obtain information. The purpose of this table is to evaluate effective strategies for improving teachers' digital literacy.

# Construction Process of the Focus Group Form

Step 1. Develop the topic and process of the focus group meeting

Step 2: Convene a focus group meeting, with the moderator leading the discussion on the topic, and record the discussion content of the meeting, including video, audio and text records

Step 3: Collect the final results of expert discussions through focus groups.

# **Evaluation Form**

Evaluation form of focus group experts discussing strategies to improve digital literacy among teachers in higher vocational colleges.

#### Construction Process of the Evaluation Form

Step 1. Develop the contents of the evaluation form based on the research results of Phase 1

Step 2. Focus group experts discuss and suggest to the digital literacy development model for higher vocational college teachers in Guangxi.

Step 3. Send evaluation form to Focus group experts. Ask for expert opinion on whether to " pass" or " modify" or " add" or " delete".

Step 4. Collect the final results of expert discussions by Evaluation Form.

# Data Collection

Step 1. Distribute evaluation forms to experts in focus groups

Step 2. Collect data for the evaluation form in focus groups

# Data Analysis

Qualitative analysis methods were used to classify the focus group discussion results, and expert opinions were analyzed and summarized to form effective strategies for improving teachers' digital literacy.

# Chapter 4 Data Analysis Results

This research was to study: 1) To study the current situation of digital literacy for higher vocational college teachers. 2) To develop the digital literacy development model for higher vocational college teachers in Guangxi. 3) To evaluate the digital literacy development model for higher vocational college teachers in Guangxi.

The data analysis result can be presented as follows:

- 1. Symbol and abbreviations
- 2. Presentation of data analysis
- 3. Results of data analysis
- The details are as follows.

# Symbol and Abbreviations

- N refers to the Sample
- Md refers to the Median
- Mo refers to the Mode
- IQR refers to the Inter-Quartile Range

### Presentation of Data Analysis

Part 1: The analysis results of the personal information of the respondents, classified by gender and educational background. The researcher presented the data by Frequency and Percentage.

Part 2: obj1: The analysis results of interview data about the current situation problems of digital literacy for higher vocational college teachers by Text Statistics.

Part 3: obj2: The analysis results of the questionnaire data about the digital literacy development model for higher vocational college teachers by Median, Mode and Inter-Quartile Range.

Part 4: obj3: The analysis results of the Focus Group discussion about the digital literacy development model for higher vocational college teachers by Qualitative Analysis

## **Results of Data Analysis**

The researcher analyzed the data in 4 parts as follows:

Part 1: The analysis results of the personal information of the respondents, classified by gender and educational background. The researcher presented the data by frequency and percentage.

			(n = 21)
ltems	Personal Information	Frequency	Percentage
Gender	Male	11	52.38%
	Female	10	47.62%
	Total	21	
Experience	11-20 years	10	47.62%
	21-30 years	7	33.33%
	30 years and above	4	19.05%
	Total	21	
Professional Title	Associate Professor	14	66.67%
	Professor	7	33.33%
	Total	21	
Educational	Master's degree	10	47.62%
background	Doctor's degree	11	52.38%
	Total	21	

 Table 4.1 Personal information of the survey respondents

According to table 4.1, found that most respondents were 11 males, accounting for 52.38%, and 10 females, accounting for 47.62%. As for the working years of the respondents, 10 people worked for 11-20 years, accounting for 47.62%; 12 people worked for 21-30 years, accounting for 33.33%; 30 years and above 4 people, accounting for 19.05%. The number of Associate Professor title was 14 people, accounting for 66.67%; The number of Professor title was 7 people, accounting for 33.33%. There were 10 people with master's degree, accounting for 47.62%; There are 11 people with doctor's degree, accounting for 52.38%.

Part 2: obj1: The analysis results of interview data about the current situation problems of digital literacy for higher vocational college teachers by Text Statistics.

# Round 1 Result

Table 4.2	Results	for	Round	1:	Current	situation	problems	

				(n =	= 21)
Items	High	Medium	Low	Unspecified	Total
Digital perception	7	8	2	2	21
	(33.33%)	(38.10%)	(9.52%)	(19.05%)	
Digital knowledge and	8	6	4	3	21
skills	(38.10%)	(28.57%)	(19.05%)	(14.29%)	
Digital application	5	13	3	0	21
	(23.81%)	(61.90%)	(14.29%)	(0%)	
Digital duty	7	11	2	1	21
	(33.33%)	(52.38%)	(9.52%)	(4.76%)	
Professional	6	5	5	5	21
development	(28.57%)	(23.81%)	(23.81%)	(23.81%)	
Digital communication	4	11	5	1	21
	(19.05%)	(52.38%)	(23.81%)	(4.76%)	
Digital teaching design	6	7	8	0	21
	(28.57%)	(33.33%)	(38.10%)	(0%)	
Digital teaching	4	10	7	0	21
implementation	(19.05%)	(47.62%)	(33.33%)	(0%)	
Digital leadership	6	5	4	6	21
	(28.57%)	(23.81%)	(19.05%)	(28.57%)	

According to Table 4.2, reflect the 21 experts in the Open-Ended interviews answer to Q1: What do you think are the current situation problems of digital literacy for higher vocational college teachers? found that results from a survey of current situation problems in digital literacy for higher vocational college teachers. It covers several aspects, including digital perception, digital knowledge and skills, digital application, digital duty, professional development, digital communication, digital teaching design, digital teaching implementation, and digital leadership. In each assessed dimension, evaluations were categorized into high, medium, low, or unspecified levels. Respondents who perceive their digital perception level as high constitute 33.33%, with 38.10% rating it as moderate. digital knowledge and skills show a fairly capable foundation, with 38.10% rated high, but also highlight room for improvement as 19.05% received a low evaluation. digital application is assessed as being at a moderate level by 61.90% of respondents, indicating a general capacity for application. There is a strong sense of digital duty, with over 90% of respondents achieving a medium to high evaluation. The professional development domain exhibits diversity, with an even distribution across all levels: 28.57% rated high, 23.81% medium, 23.81% low, and 23.81% unspecified. In digital communication, more than half have achieved a medium or higher level, indicating high efficiency in communication (71.43%). Evaluations of digital teaching design are favorable: 28.57% high, 33.33% medium. Implementation of digital teaching, however, is rated at a lower to medium level, with 47.62% at medium and 33.33% at low. Regarding digital leadership, while 28.57% received a high rating, an equal proportion of 28.57% did not specify their stance. This table effectively summarizes the varied perspectives on the current state of digital literacy for higher vocational college teachers.

Development model	for Digital perception
1. Establish the concept of digital	2. Establish a sense of overcoming
education for teachers	difficulties
3. Strengthen teachers' initiative to	4. Promoting digital literacy through
integrate digital technology into	new media
teaching	
5. Offer confidence building programs	6. Regularly test the teacher digital
	awareness
7. Communicate with enterprises	8. Conduct special training courses to
	enhance teachers' awareness of digital
	value
9. Learn practical examples of the use of	10. Help teachers set career goals
digitalization	
11. Conducts regular seminars on digital	
values	

Table 4.3 Results for Round 1: Digital perception

According to Table 4.3, reflect the 21 experts in the Open-Ended interviews answer to Q2: What do you think are the development model of the digital perception of the digital literacy for higher vocational college teachers? From the Item 1 to 11, a total of 11 development model for digital perception by text data statistics.

Table 4.4 Results for Round 1: Digital knowledge and skills

Development model for D	igital knowledge and skills
12. Encourage peers to exchange digital	13. Conduct digital knowledge and skills
knowledge and skills	competition
14. Strengthen the study of new	15. Conduct both online and offline
technical knowledge	lectures
16. Provide self-assessment courses	17. Provide self-study theory courses
18. Practical courses are offered	19. Provide expert guidance
20. Encourage teachers to search for	21. Master digital tools
knowledge on the Internet	

According to Table 4.4, reflect the 21 experts in the Open-Ended interviews answer to Q3: What do you think are the development model of the digital knowledge and skills of digital literacy for higher vocational college teachers? A total of 10 development model for digital knowledge and skills by text data statistics. 
 Table 4.5 Results for Round 1: Digital application

Development model	for Digital application
22. Regular digital application training	23. Strengthen teachers' ability to use
for teachers at different levels	digital tools for daily work and teaching
24. School leaders play an exemplary	25. Regularly carry out the selection of
role	excellent digital application teachers
26. Training teachers to use SPSS and	27. Training teachers use a learning
other software for statistical analysis of	management system (LMS) and other
teaching data	data analysis tool
28. Training teachers to use ChatGTP	29. Strengthen teachers' ability of
and other artificial intelligence	information retrieval, evaluation and
technology to carry out work and	utilization
teaching	
30. Encourage teachers to develop	31. According to the demand of talent
innovative digital applications	training, explore the innovation of digital
	teaching
32. Develop contextualized and	
personalized teaching resources	

According to table 4.5, reflect the 21 experts in the Open-Ended interviews answer to Q4: What do you think are the development model of the digital application of digital literacy for higher vocational college teachers? A total of 11 development model for digital application by text data statistics. Table4.6 Results for Round 1: Digital duty

Development mode	el for Digital duty
33. Learn the laws and regulations in the	34. Conduct thematic lectures on data
field of Internet	security
35. Learn great examples of securing data	36. Learn a cautionary educational
	case for data security
37. Learn the laws and regulations in the	38. Commend teachers who excel in
field of intellectual property	digital responsibility
39. Encourage self-reflection and peer	40. Install the National anti-fraud APP
evaluation of digital behavior for	
compliance with laws and regulations	
41. Encourage teachers to get your	42. Provide support for security
network security related certification	
43. Establishment of a data security group	44. Conduct simulation activities
to explore data security	
45. Watch anti-fraud documentaries	

According to table 4.6, reflect the 21 experts in the Open-Ended interviews answer to Q5: What do you think are the development model of the digital duty of digital literacy for higher vocational college teachers? A total of 11 development model for digital duty by text data statistics. Table 4.7 Results for Round 1: Professional development

Development model for	Professional development
46. Enhancing Innovative Teaching	47. Establish an annual teacher
Models and Learning Styles	development plan
48. Improve teachers' own digital	49. Improve the scientific and technical
teaching level	level of teachers
50. Improvement of teachers' level of	51. Establish a data-driven portfolio of
education reform and research	teachers' teaching ability development
52. Cultivate teachers' lifelong learning	53. Establish mutual help relationship
habits	with peers and make progress together
54. Analyze learning outcomes with	55. Learn from your peers' excellent
peers	learning methods
56. Improve their own level, form a	57. Participate in digital teaching forums
model	and conferences
58. Reflection and improvement of own	
shortcomings	

According to Table 4.7, reflect the 21 experts in the Open-Ended interviews answer to Q6: What do you think are the development model of improve the professional development of digital literacy for higher vocational college teachers? A total of 13 development model for professional development by text data statistics. Table 4.8 Results for Round 1: Digital communication

Development model fo	r Digital communication
59. Communicate with students by	60. Use network civilization language
using digital tools	
61. Improve teachers' communication	62. Strengthen teachers' ability to use
skills	communication tools
63. Learn new digital communication	64. Promote online interaction with
tools	students and parents
65. Exemplary role of leadership	66. Use a variety of communication
	methods
67. Develop empathy in teachers	68. Cultivate teacher patience
69. Cultivate teachers' emotional	
management ability	

According to Table 4.8, reflect the 21 experts in the Open-Ended interviews answer to Q7: What do you think are the development model of the digital communication of digital literacy for higher vocational college teachers? A total of 11 development model for ital communication by text data statistics. Table 4.9 Results for Round 1: Digital teaching design

Development model fo	r Digital teaching design
70. Digital instructional design ability	71. Encourage teachers to participate in
into the teacher title system	the contest of teaching ability
72. Establish a reward mechanism for	73. Focus on learning excellent digital
digital instructional design	teaching design cases
74. Establish the evaluation mechanism	75. Establish the feedback and iteration
of digital instructional design	mechanism of digital instructional
	design
76. Regularly test the teachers level of	77. Establish management and
digital design	implementation department
78. Regularly evaluate teachers'	79. Invite famous teachers lecture to
excellent cases of digital teacher design	promote teacher's teaching ability
80. Establish the learning community of	81. Provide financial support
Digital Instructional design	
82. Peers listen to each other	83. Visit the school digital construction
	results
84. Participate in campus digital	85. Visit a multimedia production
construction	company

According to Table 4.9, reflect the 21 experts in the Open-Ended interviews answer to Q8: What do you think are the development model of the digital teaching design of digital literacy for higher vocational college teachers? A total of 16 development model for digital teaching design by text data statistics.
Table 4.10	Results for	Round	1: Digital	teaching	implem	entation
			J	J		

Development model for Digital teaching implementation							
86. Establish a reward mechanism for	87. Training teachers in data analysis						
the implementation of digital teaching	and data assessment capabilities						
88. Establish the implementation plan	89. Carry out special training on the						
of digital teaching	implementation of digital teaching for						
	teachers						
90. Encourage teachers to carry out	91. Encourage teachers to use digital						
teaching reform research on the	teaching materials						
implementation of digital teaching							
92. Invited famous teachers to give	93. Teachers are encouraged to						
lectures on improving digital teaching	experiment with VR/AR teaching						
ability							
94. Establish the evaluation mechanism	95. Encourage teachers to carry out						
of digital teaching effect	individualized teaching for students						
96. Establish the evaluation mechanism	97. Establish a teacher elimination						
of digital teaching implementation	system						
98. Peers listen to each other	99. The strategic position of digital						
	teaching implementation should be						
	clarified						
100. Carry out regular evaluation of	101. Carry out the implementation of						
excellent cases of digital teaching	personalized data teaching for students						
implementation							
102. Establish teaching group to discuss	103. Carry out regular digital teaching						
and develop digital teaching	implementation exercises						
implementation model							

According to Table 4.10, reflect the 21 experts in the Open-Ended interviews answer to Q9: What do you think are the development model of the digital teaching implementation of digital literacy for higher vocational college teachers? A total of 18 development model for digital teaching implementation by text data statistics. Table 4.11 Results for Round 1: Digital leadership

Development model for Digital leadership						
104. Strengthen teachers' ability to	105. Strengthen teachers' data teaching					
guide students through digital means	management ability					
106. Strengthen the exemplary role of	107. Rationalize and control students'					
teachers' digital literacy	study time					
108. Strengthen the support of teaching	109. Cultivate teachers' reflection					
departments and school leaders	consciousness of digital education					
110. Strengthen the understanding of	111. Strengthen the knowledge base of					
teachers' data-based leadership	teachers' digital leadership					
112. Pursuit of disciplinary integration	113. Organize training programs					
	specifically for digital leadership					

According to Table 4.11, reflect the 21 experts in the Open-Ended interviews answer to Q10: What do you think are the development model of the digital leadership of digital literacy for higher vocational college teachers? A total of 10 development model for digital leadership by text data statistics. Part 3: obj2: The analysis results of the questionnaire data about the digital literacy development model for higher vocational college teachers by Median, Mode and Inter-Quartile Range.

					(1 = 21)
ltems	Digital perception	Md	Мо	IQR	Consensus(%)
1	Establish the concept of digital	5.00	5.00	0.00	95.24%
	education for teachers				
2	Establish a sense of overcoming	5.00	5.00	0.50	95.24%
	difficulties				
3	Conduct special training courses to	5.00	5.00	1.00	95.24%
	enhance teachers' awareness of				
	digital value				
4	Conducts regular seminars on	5.00	5.00	1.00	90.48%
	digital values				
5	Regularly test the teacher digital	5.00	5.00	1.00	85.71%
	awareness				
6	Learn practical examples of the use	4.00	4.00	0.00	85.71%
	of digitalization				
7	Strengthen teachers' initiative to	5.00	5.00	0.50	80.95%
	integrate digital technology into				
	teaching				
8	Offer confidence building programs	4.00	4.00	1.00	80.95%
9	Promoting digital literacy through	4.00	4.00	1.00	76.19%
	new media				

 Table 4.12 Results for Round 3: Digital perception

According to Table 4.12, 21 experts were given the task of integrating the opinions of other experts in the second round and aiming to achieve a consensus of at least 75%. The round 2 of results showed that 7 of the 11 patterns of digital perception development initially identified were confirmed as valid. In the round 3, 9 development models successfully obtained consensus and were ranked according to the proportion of consensus. There was a high degree of agreement among experts on the mode of promoting digital perception improvement, with the consensus value ranging from 76.19% to 95.24%. Specifically, the consensus values were 95.24% (items 1, 2 and 3), 90.48% (items 4) and 85.71% (items 5 and 6), followed by the

80.95% consensus rate applied to items 7 and 8, while item 9 also reached the consensus level of 76.19%.

					(n = 21)
ltems	Digital knowledge and skills	Md	Мо	IQR	Consensus(%)
1	Conduct both online and offline	5.00	5.00	1.00	95.24%
	lectures				
2	Conduct digital knowledge and	5.00	5.00	1.00	90.48%
	skills competition				
3	Strengthen the study of new	5.00	5.00	1.00	90.48%
	technical knowledge				
4	Encourage peers to exchange digital	4.00	4.00	0.50	85.71%
	knowledge and skills				
5	Provide self-assessment courses	4.00	4.00	1.00	85.71%
6	Provide self-study theory courses	4.00	4.00	1.00	85.71%
7	Provide expert guidance	4.00	4.00	1.00	85.71%
8	Practical courses are offered	5.00	5.00	1.00	80.95%

 Table 4.13 Results for Round 3: Digital knowledge and skills

According to table 4.13, 21 experts were given the task of integrating the opinions of other experts in the second round and aiming to achieve a consensus of at least 75%. The round 2 of results showed that 7 of the 10 patterns of digital knowledge and skills development initially identified were confirmed as valid. In the round 3, 8 development models successfully obtained consensus and were ranked according to the proportion of consensus. There was a high degree of agreement among experts on the mode of promoting digital knowledge and skills improvement, with the consensus value ranging from 80.95% to 95.24%. Specifically, the consensus values were 95.24% (items 1) and 90.48% (items 2 and 3), followed by the 85.71% consensus rate applied to items 4,5,6 and 7, while item 8 also reached the consensus level of 80.95%.

Table 4.14	Results	for	Round	3:	Digital	application
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					(n = 21)
ltems	Digital application	Md	Мо	IQR	Consensus(%)
1	Regular digital application training	4.00	5.00	1.00	90.48%
	for teachers at different levels				
2	Training teachers to use SPSS and	5.00	5.00	1.00	90.48%
	other software for statistical				
	analysis of teaching data				
3	Training teachers use a learning	5.00	5.00	1.00	90.48%
	management system (LMS) and				
	other data analysis tool				
4	Training teachers to use ChatGTP	5.00	5.00	1.00	90.48%
	and other artificial intelligence				
	technology to carry out work and				
	teaching				
5	Strengthen teachers' ability of	4.00	4.00	1.00	90.48%
	information retrieval, evaluation				
	and utilization				
6	Strengthen teachers' ability to use	4.00	4.00	1.00	85.71%
	digital tools for daily work and				
	teaching				
7	Regularly carry out the selection of	4.00	4.00	1.00	85.71%
	excellent digital application				
	teachers				
8	School leaders play an exemplary	4.00	4.00	0.50	80.95%
	role				
9	Encourage teachers to develop	4.00	4.00	1.00	80.95%
	innovative digital applications				

According to table 4.14, 21 experts were given the task of integrating the opinions of other experts in the second round and aiming to achieve a consensus of at least 75%. The round 2 of results showed that 7 of the 11 patterns of digital application development initially identified were confirmed as valid. In the round 3, 9 development models successfully obtained consensus and were ranked according to the proportion of consensus. There was a high degree of agreement among experts on the mode of promoting digital application improvement, with the consensus value ranging from 80.95% to 90.48%. Specifically, the consensus values were 90.48% (items 1, 2, 3, 4 and 5), followed by the 85.71% consensus rate applied to items 6 and 7, while item 8 and 9 also reached the consensus level of 80.95%.

					(n = 21)
Items	Digital duty	Md	Мо	IQR	Consensus(%)
1	Learn the laws and regulations in	5.00	5.00	1.00	95.24%
	the field of Internet				
2	Learn the laws and regulations in	4.00	4.00	1.00	90.48%
	the field of intellectual property				
3	Conduct thematic lectures on data	4.00	4.00	1.00	85.71%
	security				
4	Learn a cautionary educational case	4.00	5.00	1.00	85.71%
	for data security				
5	Encourage self-reflection and peer	5.00	5.00	1.00	85.71%
	evaluation of digital behavior for				
	compliance with laws and				
	regulations				
6	Encourage teachers to get your	5.00	5.00	1.00	85.71%
	network security related				
	certification				
7	Establishment of a data security	4.00	4.00	1.00	85.71%
	group to explore data security				
8	Conduct simulation activities	5.00	5.00	1.00	85.71%
9	Learn great examples of securing	4.00	4.00	1.00	80.95%
	data				
10	Commend teachers who excel in	4.00	4.00	1.00	80.95%
	digital responsibility				
11	Provide support for security	4.00	4.00	0.50	76.19%

 Table 4.15 Results for Round 3: Digital duty

According to table 4.15, 21 experts were given the task of integrating the opinions of other experts in the second round and aiming to achieve a consensus of at least 75%. The round 2 of results showed that 9 of the 13 patterns of digital duty development initially identified were confirmed as valid. In the round 3, 11 development models successfully obtained consensus and were ranked according to

the proportion of consensus. There was a high degree of agreement among experts on the mode of promoting digital duty improvement, with the consensus value ranging from 76.19% to 95.24%. Specifically, the consensus values were 95.24% (items 1 and 2) and 85.71% (items 3,4,5,6,7 and 8), followed by the 80.95% consensus rate applied to items 9 and 10, while item 11 also reached the consensus level of 76.19%.

					(n = 21)
ltems	Professional development	Md	Мо	IQR	Consensus(%)
1	Reflection and improvement of	4.00	4.00	1.00	95.24%
	own shortcomings				
2	Enhancing Innovative Teaching	4.00	5.00	1.00	90.48%
	Models and Learning Styles				
3	Improve teachers' own digital	4.00	4.00	1.00	90.48%
	teaching level				
4	Learn from your peers' excellent	4.00	4.00	1.00	90.48%
	learning methods				
5	Analyze learning outcomes with	4.00	4.00	1.00	85.71%
	peers				
6	Participate in digital teaching forums	4.00	5.00	1.00	85.71%
	and conferences				
7	Establish an annual teacher	4.00	4.00	0.00	85.71%
	development plan				
8	Establish a data-driven portfolio of	5.00	5.00	1.00	85.71%
	teachers' teaching ability				
	development				
9	Cultivate teachers' lifelong learning	4.00	5.00	1.00	80.95%
	habits				
10	Improvement of teachers' level of	4.00	4.00	0.50	80.95%
	education reform and research				

 Table 4.16 Results for Round 3: Professional development

According to table 4.16, 21 experts were given the task of integrating the opinions of other experts in the second round and aiming to achieve a consensus of at least 75%. The round 2 of results showed that 8 of the 13 patterns of professional development development initially identified were confirmed as valid. In the round

3, 10 development models successfully obtained consensus and were ranked according to the proportion of consensus. There was a high degree of agreement among experts on the mode of promoting professional development improvement, with the consensus value ranging from 80.95% to 95.24%. Specifically, the consensus values were 95.24% (items 1) and 90.48% (items 2,3 and 4), followed by the 85.71% consensus rate applied to items 5,6,7 and 8, while item 9 and 10 also reached the consensus level of 80.95%.

					(n = 21)
ltems	Digital communication	Md	Мо	IQR	Consensus(%)
1	Strengthen teachers' ability to use	5.00	5.00	1.00	90.48%
	communication tools				
2	Learn new digital communication	5.00	5.00	0.50	90.48%
	tools				
3	Communicate with students by	4.00	4.00	1.00	85.71%
	using digital tools				
4	Use network civilization language	4.00	4.00	1.00	85.71%
5	Improve teachers' communication	4.00	5.00	1.00	85.71%
	skills				
6	Promote online interaction with	4.00	5.00	1.00	85.71%
	students and parents				
7	Use a variety of communication	4.00	5.00	1.00	85.71%
	methods				
8	Cultivate teachers' emotional	4.00	4.00	1.00	80.95%
	management ability				
9	Cultivate teacher patience	4.00	4.00	0.00	80.95%

Table 4.17 Results for Round 3: Digital communication

According to table 4.17, 21 experts were given the task of integrating the opinions of other experts in the second round and aiming to achieve a consensus of at least 75%. The round 2 of results showed that 7 of the 11 patterns of digital communication development initially identified were confirmed as valid. In the round 3, 9 development models successfully obtained consensus and were ranked according to the proportion of consensus. There was a high degree of agreement among experts on the mode of promoting digital communication improvement, with the consensus value ranging from 80.95% to 90.48%. Specifically, the consensus

values were 90.48% (items 1 and 2), followed by the 85.71% consensus rate applied to items 3,4,5,6 and 7, while item 8 and 9 also reached the consensus level of 80.95%.

					(n = 21)
Items	Digital teaching design	Md	Мо	IQR	Consensus(%)
1	Establish a reward mechanism for	4.00	4.00	1.00	95.24%
	digital instructional design				
2	Establish the evaluation mechanism	5.00	5.00	1.00	95.24%
	of digital instructional design				
3	Establish the feedback and iteration	4.00	4.00	1.00	95.24%
	mechanism of digital instructional				
	design				
4	Digital instructional design ability	5.00	5.00	1.00	90.48%
	into the teacher title system				
5	Establish management and	4.00	5.00	1.00	90.48%
	implementation department				
6	Encourage teachers to participate	4.00	4.00	1.00	85.71%
	in the contest of teaching ability				
7	Focus on learning excellent digital	5.00	5.00	1.00	85.71%
	teaching design cases				
8	Regularly test the teachers level of	5.00	5.00	1.00	85.71%
	digital design				
9	Regularly evaluate teachers'	4.00	4.00	1.00	85.71%
	excellent cases of digital teacher				
	design				
10	Invite famous teachers lecture to	4.00	5.00	1.00	85.71%
	promote teacher's teaching ability				
11	Establish the learning community	5.00	5.00	1.00	80.95%
	of Digital Instructional design				
12	Provide financial support	4.00	5.00	1.00	80.95%

 Table 4.18 Results for Round 3: Digital teaching design

According to table 4.18, 21 experts were given the task of integrating the opinions of other experts in the second round and aiming to achieve a consensus of at least 75%. The round 2 of results showed that 12 of the 16 patterns of digital

teaching design development initially identified were confirmed as valid. In the round 3, 12 development models successfully obtained consensus and were ranked according to the proportion of consensus. There was a high degree of agreement among experts on the mode of promoting digital teaching design improvement, with the consensus value ranging from 80.95% to 95.24%. Specifically, the consensus values were 95.24% (items 1, 2 and 3) and 90.48% (items 4 and 5), followed by the 85.71% consensus rate applied to items 6,7,8,9 and 10,while item 11 and 12 also reached the consensus level of 80.95%.

					(n = 21)
Items	Digital teaching implementation	Md	Мо	IQR	Consensus(%)
1	Establish the evaluation	4.00	4.00	1.00	95.24%
	mechanism of digital teaching				
	implementation				
2	Establish a reward mechanism for	4.00	5.00	1.00	90.48%
	the implementation of digital				
	teaching				
3	Establish the implementation plan	5.00	5.00	1.00	85.71%
	of digital teaching				
4	Establish the evaluation	5.00	5.00	1.00	85.71%
	mechanism of digital teaching				
	effect				
5	Carry out the evaluation of	4.00	4.00	1.00	85.71%
	excellent cases of digital teaching				
	implementation				
6	Carry out the learn of excellent	4.00	4.00	1.00	85.71%
	cases of digital teaching				
7		1.00	1.00	1 00	
(	Establish teaching group to discuss	4.00	4.00	1.00	85.71%
	and develop digital teaching				
0	Implementation model	4.00	4.00	1 00	OF 710/
ð	carry out special training on the	4.00	4.00	1.00	85.71%
	IOF LEACHERS				

Table 4.19 Results for Round 3: Digital teaching implementation

Table 4.19 (Continue)

					(n = 21)
ltems	Digital teaching implementation	Md	Мо	IQR	Consensus(%)
9	Invited famous teachers to give	5.00	5.00	1.00	85.71%
	lectures on improving digital				
	teaching ability				
10	Training teachers in data analysis	4.00	4.00	0.50	80.95%
	and data assessment capabilities				
11	Encourage teachers to carry out	4.00	5.00	1.00	80.95%
	teaching reform research on the				
	implementation of digital teaching				
12	Encourage teachers to use digital	4.00	5.00	1.00	80.95%
	teaching materials				
13	Teachers are encouraged to	4.00	4.00	1.00	80.95%
	experiment with VR/AR teaching				
14	Encourage teachers to carry out	4.00	4.00	1.00	80.95%
	individualized teaching for				
	students				

According to table 4.19, 21 experts were given the task of integrating the opinions of other experts in the second round and aiming to achieve a consensus of at least 75%. The round 2 of results showed that 13 of the 18 patterns of digital teaching implementation development initially identified were confirmed as valid. In the round 3, 14 development models successfully obtained consensus and were ranked according to the proportion of consensus. There was a high degree of agreement among experts on the mode of promoting digital teaching implementation improvement, with the consensus value ranging from 80.95% to 95.24%. Specifically, the consensus values were 95.24% (items 1) and 90.48% (items 2), followed by the 85.71% consensus rate applied to items 3,4,5,6,7,8 and 9, while item 10,11,12,13 and 14 also reached the consensus level of 80.95%.

Table 4.20 Results for Round 3: Digital leade
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					$(   - Z_1)$
Items	Digital leadership	Md	Мо	IQR	Consensus(%)
1	Strengthen the understanding of	4.00	4.00	1.00	90.48%
	teachers' data-based leadership				
2	Strengthen the knowledge base of	4.00	4.00	1.00	90.48%
	teachers' digital leadership				
3	Organize training programs	4.00	4.00	1.00	90.48%
	specifically for digital leadership				
4	Strengthen teachers' data teaching	5.00	5.00	1.00	85.71%
	management ability				
5	Strengthen teachers' ability to guide	4.00	5.00	1.00	80.95%
	students through digital means				
6	Strengthen the exemplary role of	4.00	4.00	0.00	80.95%
	teachers' digital literacy				
7	Rationalize and control students'	4.00	4.00	1.00	80.95%
	study time				
8	Strengthen the support of teaching	4.00	4.00	1.00	80.95%
	departments and school leaders				

According to table 4.20, 21 experts were given the task of integrating the opinions of other experts in the second round and aiming to achieve a consensus of at least 75%. The round 2 of results showed that 7 of the 10 patterns of digital leadership development initially identified were confirmed as valid. In the round 3, 8 development models successfully obtained consensus and were ranked according to the proportion of consensus. There was a high degree of agreement among experts on the mode of promoting digital leadership improvement, with the consensus value ranging from 80.95% to 90.48%. Specifically, the consensus values were 90.48% (items 1, 2 and 3), followed by the 85.71% consensus rate applied to items 4, while item 5,6,7 and 8 also reached the consensus level of 80.95%.

Through Delphi method, 21 experts adjust the digital literacy of teachers in higher vocational colleges. In the first round, experts gave 113 development models. In the second round, the experts considered 113 development models and identified only 77 development models, retaining the development model with a consensus of more than 60%. In the third round, experts discussed development models with a consensus of more than 60 percent, and finally identified 90 development models with a consensus of more than 80 percent.

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Figure 4.1 The digital literacy development model for higher vocational college teachers (Version 1)

In Figure 4.1, researchers propose the digital literacy development model for higher vocational college teachers (Version 1), covering 9 different aspects. The patterns of development in each area are classified and summarized into short phrases called "themes.". These themes are followed by specific development models. The researchers proposed 9 development models of digital perception, 8 development models of digital knowledge and skills, 9 development models of digital application, 11 development models of digital duty, 10 development models of professional development, 9 development models of digital communication, 12 development models of digital instructional design, 14 development models of digital instructional implementation,8 development models of digital leadership. a total of 90 development models. The details are as follows:

Digital perception includes three themes: Establish awareness, Increase digital awareness, Resource support. Establish awareness includes two development model: Establish the concept of digital education for teachers; Establish a sense of overcoming difficulties. Increase digital awareness includes five development model: Conduct special training courses to enhance teachers' awareness of digital value; Regularly test the teacher digital awareness; Learn practical examples of the use of digitalization; Strengthen teachers' initiative to integrate digital technology into teaching; Conducts regular seminars on digital values. Resource support includes two development model: Offer confidence building programs; Promoting digital literacy through new media.

Digital knowledge and skills include two themes: Knowledge promotion, Technical support. Knowledge promotion includes four development model: Conduct both online and offline lectures; Conduct digital knowledge and skills competition; Strengthen the study of new technical knowledge; Encourage peers to exchange digital knowledge and skills. Technical support includes four development modes: Provide self-assessment courses; Provide self-study theory courses; Provide expert guidance; Practical courses are offered.

Digital application includes two themes: Cultivate ability, Establish role model. Cultivate ability includes seven development modes: Regular digital application training for teachers at different levels; Training teachers to use SPSS and other software for statistical analysis of teaching data; Training teachers use a learning management system (LMS) and other data analysis tool; Training teachers to use ChatGTP and other artificial intelligence technology to carry out work and teaching; Strengthen teachers' ability of information retrieval, evaluation and utilization; Strengthen teachers' ability to use digital tools for daily work and teaching. Encourage teachers to develop innovative digital applications. Establish role model includes two development modes: Regularly carry out the selection of excellent digital application teachers; School leaders play an exemplary role.

Digital duty includes three themes: Legal education, Train the ability of data security, Resource provision. Legal education includes two development modes: Learn the laws and regulations in the field of Internet; Learn the laws and regulations in the field of intellectual property. Train the ability of data security includes seven development modes: Conduct thematic lectures on data security; Learn a cautionary educational case for data security; Encourage self-reflection and peer evaluation of digital behavior for compliance with laws and regulations; Encourage teachers to get your network security related certification; Establishment of a data security group to explore data security; Conduct simulation activities; Learn great examples of securing data. Resource provision includes two development model: Commend teachers who excel in digital responsibility; Provide support for security.

Professional development includes three themes: self-improvement, Peer communication, Create a growth plan. self-improvement includes five development modes: Reflection and improvement of own shortcomings; Enhancing Innovative Teaching Models and Learning Styles; Improve teachers' own digital teaching level; Cultivate teachers' lifelong learning habits; Improvement of teachers' level of education reform and research. Peer communication includes three development modes: Learn from your peers' excellent learning methods; Analyze learning outcomes with peers; Participate in digital teaching forums and conferences. Create a growth plan includes two development modes: Establish an annual teacher development plan; Establish a data-driven portfolio of teachers' teaching ability development.

Digital communication includes three themes: Master communication tools, Improving communication skills includes, Emotion management. Mastering communication tools includes three development modes: Strengthen teachers' ability to use communication tools; Learn new digital communication tools; Communicate with students by using digital tools. Improving communication skills includes four development modes: Use network civilization language; Improve teachers' communication skills; Promote online interaction with students and parents; Use a variety of communication methods. Emotion management includes two development modes: Cultivate teachers' emotional management ability; Cultivate teacher patience. Digital instructional design includes three themes: Construction mechanism, Promotion ability, Resource sponsorship. Construction mechanism include five development modes: Establish a reward mechanism for digital instructional design; Establish the evaluation mechanism of digital instructional design; Establish the feedback and iteration mechanism of digital instructional design; Digital instructional design ability into the teacher title system; Establish management and implementation department. Promotion ability includes five development modes: Encourage teachers to participate in the contest of teaching ability; Focus on learning excellent digital teaching design cases; Regularly test the teachers level of digital design; Regularly evaluate teachers' excellent cases of digital teacher design; Invite famous teachers lecture to promote teacher's teaching ability. Resource sponsorship includes two development modes: Establish the learning community of Digital Instructional design; Provide financial support.

Digital teaching implementation includes two themes: Formation mechanism, Strengthen capacity. Formation mechanism include four development modes: Establish the evaluation mechanism of digital teaching implementation; Establish a reward mechanism for the implementation of digital teaching; Establish the implementation plan of digital teaching; Establish the evaluation mechanism of digital teaching effect. Strengthen capacity include ten development modes: Carry out the evaluation of excellent cases of digital teaching implementation; Carry out the learn of excellent cases of digital teaching implementation; Carry out special training on the implementation of digital teaching for teachers; Invited famous teachers to give lectures on improving digital teaching ability; Training teachers in data analysis and data assessment capabilities; Encourage teachers to carry out teaching reform research on the implementation of digital teaching; Encourage teachers to use digital teaching materials; Teachers are encouraged to experiment with VR/AR teaching; Encourage teachers to carry out individualized teaching for students.

Digital leadership includes three themes: Improve knowledge, Practice promotion, Resource replenishment. Improve knowledge includes four development modes: Strengthen the understanding of teachers' data-based leadership; Strengthen the knowledge base of teachers' digital leadership; Organize training programs specifically for digital leadership; Strengthen teachers' data teaching management ability. Practice promotion include three development modes: Strengthen teachers' ability to guide students through digital means; Strengthen the exemplary role of teachers' digital literacy; Rationalize and control students' study time. Resource replenishment consists of development modes: Strengthen the support of teaching departments and school leaders.

Part 4: obj3: The analysis results of the Focus Group discussion about the digital literacy development model for higher vocational college teachers by Qualitative Analysis

 Table 4.21 Result for discussion: Digital perception

		(n = 9)
ltems	Digital perception	Result
1	Establish the concept of digital education for teachers	Ρ
2	Establish a sense of overcoming difficulties	Ρ
3	Conduct special training courses to enhance teachers' awareness	Ρ
	of digital value	
4	Offer confidence building programs	Μ
	Provide self-study courses to develop data sensitivity	
5	Conducts regular seminars on digital values	Ρ
6	Regularly test the teacher digital awareness	Ρ
7	Learn practical examples of the use of digitalization	Р
8	Strengthen teachers' initiative to integrate digital technology into	Ρ
	teaching	
9	Promoting digital literacy through new media	Ρ
10	Build a digital campus	А

Note: P is passed, M is modified, and A is added

According to Table 4.21, 9 experts were asked to evaluate the feasibility of the 9 development model of digital perception, Item 1,2,3,5,6,7,8,9 were consensually passed, and Item 4 "Offer confidence building programs" was modified to "Provide self-study courses to develop data sensitivity", and add Item 10 " Build a digital campus ".

Table 4.22 Res	ult for discus	sion: Digital k	knowledge	and skills
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	Result
Items Digital knowledge and skills	
1 Conduct both online and offline lectures	Р
2 Conduct digital knowledge and skills competition	Р
3 Strengthen the study of new technical knowledge	Р
4 Encourage peers to exchange digital knowledge and s	skills P
5 Provide self-assessment courses	Р
6 Provide self-study theory courses	Р
7 Provide expert guidance	Р
8 Practical courses are offered	Р
9 Provide digital technology white papers	А

According to Table 4.22, 9 experts were asked to evaluate the feasibility of the 8 development model of digital knowledge and skills, Item 1,2,3,4,5,6,7,8 were consensually passed, and add Item 9 " Provide digital technology white papers".

 Table 4.23 Result for discussion: Digital application

		(n = 9)
ltems	Digital application	Result
1	Regular digital application training for teachers at different levels	Р
2	Training teachers to use SPSS and other software for statistical	Р
	analysis of teaching data	
3	Training teachers use a learning management system (LMS) and	Р
	other data analysis tool	
4	Training teachers to use ChatGTP and other artificial intelligence	Р
	technology to carry out work and teaching	
5	Strengthen teachers' ability of information retrieval, evaluation	Р
	and utilization	
6	Strengthen teachers' ability to use digital tools for daily work and	Р
	teaching	
7	Regularly carry out the selection of excellent digital application	Р
	teachers	
8	School leaders play an exemplary role	Р
9	Encourage teachers to develop innovative digital applications	Р
10	Schools develop digital enhancement programmes for teachers	А
11	Establish technical support team	А
12	Strengthen the construction of the digital application	А
	infrastructure	

According to Table 4.23, 9 experts were asked to evaluate the feasibility of the 9 development model of digital knowledge and skills, All item were consensually passed, and add Item 10 " Schools develop digital enhancement programmes for teachers ", Item 11 " Establish technical support team", Item 12 " Strengthen the construction of the digital application infrastructure".

Table 4.24	Result for	discussion:	Digital	duty
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		(n = 9)
ltems	Digital duty	Result
1	Learn the laws and regulations in the field of Internet	Р
2	Learn the laws and regulations in the field of intellectual property	Р
3	Conduct thematic lectures on data security	Р
4	Learn a cautionary educational case for data security	Р
5	Encourage self-reflection and peer evaluation of digital behavior	Р
	for compliance with laws and regulations	
6	Encourage teachers to get your network security related	Р
	certification	
7	Establishment of a data security group to explore data security	Р
8	Conduct simulation activities	М
	Role-play simulation activities to experience data security	
9	Learn great examples of securing data	Р
10	Commend teachers who excel in digital responsibility	Р
11	Provide support for security	М
	Provide technical support for teachers' data security	
12	Schools provide data security support emergency response	А

According to Table 4.24, 9 experts were asked to evaluate the feasibility of the 11 development model of digital duty, Item 1,2,3,4,5,6,7,9,10 were consensually passed, and Item 8 " Conduct simulation activities" was modified to " Role-play simulation activities to experience data security", Item 11" Provide support for security " was modified to "Provide technical support for teachers' data security" , and add Item 12 " Schools provide data security support emergency response".

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		(n = 9)
ltems	professional development	Result
1	Reflection and improvement of own shortcomings	Ρ
2	Enhancing Innovative Teaching Models and Learning Styles	Ρ
3	Improve teachers' own digital teaching level	Ρ
4	Learn from your peers' excellent learning methods	Ρ
5	Analyze learning outcomes with peers	Ρ
6	Participate in digital teaching forums and conferences	Ρ
7	Establish an annual teacher development plan	Ρ
8	Establish a data-driven portfolio of teachers' teaching ability	Ρ
	development	
9	Cultivate teachers' lifelong learning habits	Ρ
10	Improvement of teachers' level of education reform and research	Ρ
11	Teachers to the enterprise post practice	А

According to Table 4.25, 9 experts were asked to evaluate the feasibility of the 10 development model of professional development ,All item were consensually passed, and add Item 11 "Teachers to the enterprise post practice".

 Table 4.26 Result for discussion: Digital communication

		(n = 9)
ltems	Digital communication	Result
1	Strengthen teachers' ability to use communication tools	Р
2	Learn new digital communication tools	Р
3	Communicate with students by using digital tools	Р
4	Use network civilization language	Р
5	Improve teachers' communication skills	Р
6	Promote online interaction with students and parents	Р
7	Use a variety of communication methods	Р
8	Cultivate teachers' emotional management ability	Р
9	Cultivate teacher patience	Р
10	Schools provide digital communication repository	А

Note: P is passed, M is modified, and A is added

According to Table 4.26, 9 experts were asked to evaluate the feasibility of the 9 development model of digital communication, All item were consensually passed, and add Item 10 "Schools provide digital communication repository".

Table 4.27	Result for	discussion:	Digital	teaching	design
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		(n = 9)
ltems	Digital teaching design	Result
1	Establish a reward mechanism for digital instructional design	Р
2	Establish the evaluation mechanism of digital instructional design	Р
3	Establish the feedback and iteration mechanism of digital	Ρ
	instructional design	
4	Digital instructional design ability into the teacher title system	Ρ
5	Establish management and implementation department	Р
6	Encourage teachers to participate in the contest of teaching ability	Ρ
7	Focus on learning excellent digital teaching design cases	Ρ
8	Regularly test the teachers level of digital design	Ρ
9	Regularly evaluate teachers' excellent cases of digital teacher	Р
	design	
10	Invite famous teachers lecture to promote teacher's teaching	Р
	ability	
11	Establish the learning community of Digital Instructional design	Ρ
12	Provide financial support	Ρ
13	Provide digital educational resource library	А
14	Provide digital teaching design for expert teachers	А
15	Provide a workbook for conducting digital instructional design	А

Note: P is passed, M is modified, and A is added

According to Table 4.27, 9 experts were asked to evaluate the feasibility of the 12 development model of digital teaching design, All item were consensually passed, and add Item 13 "Provide digital educational resource library", Item 14 "Provide digital teaching design for expert teachers", Item 15 "Provide digital teaching design for expert teachers".

		(n = 9)
Items	Digital teaching implementation	Result
1	Establish the evaluation mechanism of digital teaching	Ρ
	implementation	
2	Establish a reward mechanism for the implementation of digital	Ρ
	teaching	
3	Establish the implementation plan of digital teaching	Ρ
4	Establish the evaluation mechanism of digital teaching effect	Ρ
5	Carry out the evaluation of excellent cases of digital teaching	Ρ
	implementation	
6	Carry out the learn of excellent cases of digital teaching	Ρ
	implementation	
7	Establish teaching group to discuss and develop digital teaching	Р
	implementation model	
8	Carry out special training on the implementation of digital teaching	Р
	for teachers	
9	Invited famous teachers to give lectures on improving digital	Р
	teaching ability	
10	Training teachers in data analysis and data assessment capabilities	Р
11	Encourage teachers to carry out teaching reform research on the	Р
	implementation of digital teaching	
12	Encourage teachers to use digital teaching materials	Р
13	Teachers are encouraged to experiment with VR/AR teaching	Р
14	Encourage teachers to carry out individualized teaching for	Р
	students	
15	Create an atmosphere for digital teacher implementation	А
16	Provide digital teaching implementation software and hardware	А
	equipment	
17	Provide a rich digital teaching resource platform	А

Table 4.28 Result for discussion: Digital teaching implementation

According to Table 4.28, 9 experts were asked to evaluate the feasibility of the 14 development model of digital teaching implementation, All item were consensually passed, and add Item 15 "Create an atmosphere for digital teacher implementation", Item 16 "Provide digital teaching implementation software and hardware equipment", Item 17 "Provide a rich digital teaching resource platform".

Table 4.29 Result for discussion: Digital leadershi
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		(n = 9)
Items	Digital leadership	Result
1	Strengthen the understanding of teachers' data-based leadership	Р
2	Strengthen the knowledge base of teachers' digital leadership	Ρ
3	Organize training programs specifically for digital leadership	Ρ
4	Strengthen teachers' data teaching management ability	Р
5	Strengthen teachers' ability to guide students through digital	Ρ
	means	
6	Rationalize and control students' study time	М
	Rationalize and control students' online learning time	
7	Strengthen the exemplary role of teachers' digital literacy	Р
8	Strengthen the support of teaching departments and school	Р
	leaders	
9	Construction of Digital Campus	А

According to Table 4.29, 9 experts were asked to evaluate the feasibility of the 8 development model of digital leadership, Item 1,2,3,4,5,7,8 were consensually passed, and Item 6 "Rationalize and control students' study time "was modified to "Rationalize and control students' online learning time", and add Item 9 "Construction of Digital Campus". focus group experts conducted in-depth discussion and evaluation on the 9 dimensions and 90 development modes of digital literacy of teachers in vocational colleges (Version 1), and finally formed a more complete digital literacy of teachers in vocational colleges (version 2). In this new version, the development mode of each dimension has been adjusted and expanded: digital perception has been extended to 11 items (8 items unanimously adopted, 1 item modified, 2 items added); Digital knowledge and skills expanded to 9 items (8 unanimously approved, 1 new item); Digital applications expanded to 12 (9 unanimously approved, 3 new); Digital responsibilities expanded to 12 (9 unanimously adopted, 2 modified, 1 new); Expansion of career development to 11 (10 unanimously approved, 1 new); Digital communication expanded to 10 items (9 unanimously approved, 1 new item); Digital instructional design expanded to 15 items (12 unanimously approved, 3 new); Digital teaching implementation expanded to 17 items (14 unanimously approved, 3 new items); Digital leadership expanded to 9 items (7 unanimously approved, 1 modified, 1 added). In summary, version 2 covers a total of 9 dimensions and 105 development modes, which is significantly richer and optimized than before.

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Figure 4.2 The digital literacy development model for higher vocational college teachers (Version 2)

According to Figure 4.2, Digital perception includes three themes: Establish awareness, Increase digital awareness, Resource support. Establish awareness includes two development model: Establish the concept of digital education for teachers; Establish a sense of overcoming difficulties. Increase digital awareness includes five development model: Conduct special training courses to enhance teachers' awareness of digital value; Regularly test the teacher digital awareness; Learn practical examples of the use of digitalization; Strengthen teachers' initiative to integrate digital technology into teaching; Conducts regular seminars on digital values. Resource support includes three development model: Provide self-study courses to develop data sensitivity; Promoting digital literacy through new media; Build a digital campus.

Digital knowledge and skills include two themes: Knowledge promotion, technical support. Knowledge promotion includes four development model: Conduct both online and offline lectures; Conduct digital knowledge and skills competition; Strengthen the study of new technical knowledge; Encourage peers to exchange digital knowledge and skills. Technical support includes five development modes: Provide self-assessment courses; Provide self-study theory courses; Provide expert guidance; Practical courses are offered; Provide digital technology white papers.

Digital application includes three themes: Cultivate ability, Establish role model, School support. Cultivate ability includes seven development modes: Regular digital application training for teachers at different levels; Training teachers to use SPSS and other software for statistical analysis of teaching data; Training teachers use a learning management system (LMS) and other data analysis tool; Training teachers to use ChatGPT and other artificial intelligence technology to carry out work and teaching; Strengthen teachers' ability of information retrieval, evaluation and utilization; Strengthen teachers' ability to use digital tools for daily work and teaching. Encourage teachers to develop innovative digital applications. Establish role model includes two development modes: Regularly carry out the selection of excellent digital application teachers; School leaders play an exemplary role. School support includes three department models: Schools develop digital enhancement programmers for teachers; Establish technical support team; Strengthen the construction of the digital application infrastructure.

Digital duty includes three themes: Legal education, Train the ability of data security, Resource provision. Legal education includes two development modes: Learn the laws and regulations in the field of Internet; Learn the laws and regulations in the field of intellectual property. Train the ability of data security includes seven development modes: Conduct thematic lectures on data security; Learn a cautionary educational case for data security; Encourage self-reflection and peer evaluation of digital behavior for compliance with laws and regulations; Encourage teachers to get your network security related certification; Establishment of a data security group to explore data security; Role-play simulation activities to experience data security; Learn great examples of securing data. Resource provision includes three development model: Commend teachers who excel in digital responsibility; Provide technical support for teachers' data security; Schools provide data security support emergency response.

Professional development includes three themes: self-improvement, Peer communication, Create a growth plan. self-improvement includes six development modes: Reflection and improvement of own shortcomings; Enhancing Innovative Teaching Models and Learning Styles; Improve teachers' own digital teaching level; Cultivate teachers' lifelong learning habits; Improvement of teachers' level of education reform and research; Teachers to the enterprise post practice. Peer communication includes three development modes: Learn from your peers' excellent learning methods; Analyze learning outcomes with peers; Participate in digital teaching forums and conferences. Create a growth plan includes two development modes: Establish an annual teacher development plan; Establish a data-driven portfolio of teachers' teaching ability development.

Digital communication includes three themes: Master communication tools, improving communication skills includes, Emotion management. Mastering communication tools includes three development modes: Strengthen teachers' ability to use communication tools; Learn new digital communication tools; Communicate with students by using digital tools. Improving communication skills includes five development modes: Use network civilization language; Improve teachers' communication skills; Promote online interaction with students and parents; Use a variety of communication methods; Schools provide digital communication repository. Emotion management includes two development modes: Cultivate teachers' emotional management ability; Cultivate teacher patience.

Digital instructional design includes three themes: Construction mechanism, Promotion ability, Resource sponsorship. Construction mechanism include five development modes: Establish a reward mechanism for digital instructional design; Establish the evaluation mechanism of digital instructional design; Establish the feedback and iteration mechanism of digital instructional design; Digital instructional design ability into the teacher title system; Establish management and implementation department. Promotion ability includes five development modes: Encourage teachers to participate in the contest of teaching ability; Focus on learning excellent digital teaching design cases; Regularly test the teachers' level of digital design; Regularly evaluate teachers' excellent cases of digital teacher design; Invite famous teachers lecture to promote teacher's teaching ability. Resource sponsorship includes five development modes: Establish the learning community of Digital Instructional design; Provide financial support; Provide digital educational resource library; Provide digital teaching design for expert teachers; Provide a workbook for conducting digital instructional design.

Digital teaching implementation includes three themes: Formation mechanism, Strengthen capacity, Resource matching. Formation mechanism include four development modes: Establish the evaluation mechanism of digital teaching implementation; Establish a reward mechanism for the implementation of digital teaching; Establish the implementation plan of digital teaching; Establish the evaluation mechanism of digital teaching effect. Strengthen capacity include ten development modes: Carry out the evaluation of excellent cases of digital teaching implementation; Carry out the learn of excellent cases of digital teaching implementation; Establish teaching group to discuss and develop digital teaching implementation model; Carry out special training on the implementation of digital teaching for teachers; Invited famous teachers to give lectures on improving digital teaching ability; Training teachers in data analysis and data assessment capabilities; Encourage teachers to carry out teaching reform research on the implementation of digital teaching; Encourage teachers to use digital teaching materials; Teachers are encouraged to experiment with VR/AR teaching; Encourage teachers to carry out individualized teaching for students. Resource matching include three development modes: Create an atmosphere for digital teacher implementation; Provide digital teaching implementation software and hardware equipment; Provide a rich digital teaching resource platform.

Digital leadership includes three themes: Improve knowledge, Practice promotion, Resource replenishment. Improve knowledge includes four development modes: Strengthen the understanding of teachers' data-based leadership; Strengthen the knowledge base of teachers' digital leadership; Organize training programs specifically for digital leadership; Strengthen teachers' data teaching management ability. Practice promotion include three development modes: Strengthen teachers' ability to guide students through digital means; Strengthen the exemplary role of teachers' digital literacy; Rationalize and control students' online learning time. Resource replenishment include two development modes: Strengthen the support of teaching departments and school leaders; Construction of Digital Campus.

# Chapter 5 Conclusion Discussion and Recommendations

The research in the Digital Literacy Development Model for Higher Vocational College Teachers in Guangxi. The objectives of this research were 1) To study the current situation of digital literacy for higher vocational college teachers, 2) To develop the digital literacy development model for higher vocational college teachers in Guangxi and 3) To evaluate the digital literacy development model for higher vocational college teachers in Guangxi were including 9 following aspects: 1) Digital perception, 2) Digital knowledge and skills, 3) Digital application, 4) Digital duty, 5) professional development, 6) Digital communication, 7) Digital teaching design, 8) Digital teaching implementation, 9) Digital leadership. The Openended Interview group was 21 experts. The Focus Group Form was 9 experts. The statistic to analyze the data were median, Mode, Inter-Quartile Range. The conclusion, discussion and recommendations of this research are as follows:

# Conclusion

The research in the Digital Literacy Development Model for Higher Vocational College Teachers in Guangxi. The researcher summarizes the conclusion into 3 parts, details as follows:

Part 1: the current situation of digital literacy for higher vocational college teachers in Guangxi.

Part 2: the develop for the digital literacy development model for higher vocational college teachers in Guangxi.

Part 3: the evaluate for the digital literacy development model for higher vocational college teachers in Guangxi.

# Part 1: the current situation of digital literacy for higher vocational college teachers in Guangxi.

The current situation of digital literacy for higher vocational college teachers in nine aspects was at medium-high level. Considering the results of this research aspects ranged from the highest to lowest level were as follow: the highest level was Digital application and Digital duty, followed by Digital perception and Digital communication, Digital leadership and Professional development was the lowest level. Digital perception was at medium level. According to the Interviews results of the teaching of the teachers to be able to produce data with sensitivity, but found no data implicit education value, also won't use data analysis to promote the education work.

Digital knowledge and skills were at medium-low level. According to the Interviews results of the teachers possess a fundamental understanding of cuttingedge technologies and development trends, as well as a basic proficiency in utilizing digital resources. However, they lack an understanding of how to apply digital technology to problem-solving and the ability to select appropriate skills based on specific needs.

Digital application was at medium-high level. According to the Interviews results of the teachers can use digital office software to complete work tasks, effectively collect and obtain the required target data, correctly choose the way of data presentation, and effectively carry out information retrieval on the Internet. But the tools of statistical analysis and the combination of online and offline teaching are not skilled enough.

Digital duty was at medium-high level. According to the Interviews results of the teachers can protect their own digital privacy, protect their own data and information, and regulate their own behavior in the network environment. There are some deficiencies in identifying and preventing network rumors, network violence and network fraud.

Professional development was at low level. According to the Interviews results of the teachers can basically use digital educational resources for self-study. However, it is impossible to use digital technology resources to analyze, reflect on and improve personal teaching. Nor will they use digital technology resources to innovate teaching models.

Digital communication was at medium level. According to the Interviews results of the teachers were able to post information through social media and communicate with colleagues and students through email. Lack of ability to use data to communicate with students. Lack of ability to use data to enable teaching teams to work together.

Digital teaching design was at medium-low level. According to the Interviews results of the teachers' ability to choose digital resources according to teaching objectives is not so good. They lack the ability to use digital tools to analyze students' learning situation, the ability to use digital technology to innovate teaching design, and the ability to collect data and make digital educational resources.

Digital teaching implementation was at medium-low level. According to the Interviews results of the teachers' ability to use digital resources to carry out teaching activities is average. Lack of ability to adjust teaching decisions according to data, lack of ability to use digital resources to carry out personalized guidance, lack of ability to use digital tools to present data analysis and interpretation, lack of ability to use digital resources to improve teaching behavior.

Digital leadership was at low level. According to the Interviews results of the teachers' ability to guide students to use digital resources for learning is average. Lack of ability to guide students to develop digital resources or digital results, lack of ability to guide students to use digital resources to carry out teamwork, lack of ability to guide students to pay attention to network security protection and telecom fraud prevention, lack of ability to guide students to use digital to use digital tools to analyze their own learning and improve.

# Part 2: the develop for the digital literacy development model for higher vocational college teachers in Guangxi.

Through two rounds of questionnaire survey and repeated argumentations on 21 experts by Delphi method, the researchers successfully constructed a development model suitable for the improvement of digital literacy of teachers in Guangxi higher vocational colleges (version 1), covering 9 dimension and a total of 90 development models, which are as follows: Digital Perception, Digital Knowledge and Skills, Digital application, Digital duty, Professional development, Digital communication, Digital teaching design, Digital teaching implementation, and Digital Leadership.

# Part 3: the evaluate for the digital literacy development model for higher vocational college teachers in Guangxi.

The focus group experts conducted in-depth discussion and evaluation on the 9 dimensions and 90 development modes of digital literacy of teachers in vocational colleges (Version 1), and finally formed a more complete digital literacy of teachers in vocational colleges (version 2). In this new version, a total of 9 dimensions and 105 development modes, which is significantly richer and optimized than before.

#### The development modes of digital perception to 10 items:

1. Establish the concept of digital education for teachers

2. Establish a sense of overcoming difficulties

3. Conduct special training courses to enhance teachers' awareness of digital

value

4. Conducts regular seminars on digital values

- 5. Regularly test the teacher digital awareness
- 6. Learn practical examples of the use of digitalization
- 7. Strengthen teachers' initiative to integrate digital technology into teaching
- 8. Provide self-study courses to develop data sensitivity
- 9. Promoting digital literacy through new media

10. Build a digital campus

#### The development modes of digital knowledge and skills to 9 items:

- 1. Conduct both online and offline lectures
- 2. Conduct digital knowledge and skills competition
- 3. Strengthen the study of new technical knowledge
- 4. Encourage peers to exchange digital knowledge and skills
- 5. Provide self-assessment courses
- 6. Provide self-study theory courses
- 7. Provide expert guidance
- 8. Practical courses are offered
- 9. Provide digital technology white papers

#### The development modes of digital applications to 12 items:

1. Regular digital application training for teachers at different levels

2. Training teachers to use SPSS and other software for statistical analysis of teaching data

3. Training teachers use a learning management system (LMS) and other data analysis tool

4. Training teachers to use ChatGPT and other artificial intelligence technology to carry out work and teaching

5. Strengthen teachers' ability of information retrieval, evaluation and utilization

6. Strengthen teachers' ability to use digital tools for daily work and teaching

7. Regularly carry out the selection of excellent digital application teachers

8. School leaders play an exemplary role

9. Encourage teachers to develop innovative digital applications

10. Schools develop digital enhancement programmers for teachers

11. Establish technical support team

12. Strengthen the construction of the digital application infrastructure

#### The development modes of digital duty to 12 items:

1. Learn the laws and regulations in the field of Internet

2. Learn the laws and regulations in the field of intellectual property

3. Conduct thematic lectures on data security

4. Learn a cautionary educational case for data security

5. Encourage self-reflection and peer evaluation of digital behavior for compliance with laws and regulations

6. Encourage teachers to get your network security related certification

7. Establishment of a data security group to explore data security

8. Role-play simulation activities to experience data security

9. Learn great examples of securing data

10. Commend teachers who excel in digital responsibility

11. Provide technical support for teachers' data security

12. Schools provide data security support emergency response

# The development modes of professional development to 11 items:

- 1. Reflection and improvement of own shortcomings
- 2. Enhancing Innovative Teaching Models and Learning Styles
- 3. Improve teachers' own digital teaching level
- 4. Learn from your peers' excellent learning methods
- 5. Analyze learning outcomes with peers
- 6. Participate in digital teaching forums and conferences
- 7. Establish an annual teacher development plan
- 8. Establish a data-driven portfolio of teachers' teaching ability development
- 9. Cultivate teachers' lifelong learning habits
- 10. Improvement of teachers' level of education reform and research
- 11. Teachers to the enterprise post practice

# The development modes of digital communication to 10 items:

- 1. Strengthen teachers' ability to use communication tools
- 2. Learn new digital communication tools
- 3. Communicate with students by using digital tools
- 4. Use network civilization language
- 5. Improve teachers' communication skills
- 6. Promote online interaction with students and parents
- 7. Use a variety of communication methods
- 8. Cultivate teachers' emotional management ability
- 9. Cultivate teacher patience
- 10. Schools provide digital communication repository

### The development modes of digital teaching design to 15 items:

1. Establish a reward mechanism for digital instructional design

2. Establish the evaluation mechanism of digital instructional design

3. Establish the feedback and iteration mechanism of digital instructional

### design

- 4. Digital instructional design ability into the teacher title system
- 5. Establish management and implementation department
- 6. Encourage teachers to participate in the contest of teaching ability
- 7. Focus on learning excellent digital teaching design cases
- 8. Regularly test the teachers level of digital design
- 9. Regularly evaluate teachers' excellent cases of digital teacher design
- 10. Invite famous teachers lecture to promote teacher's teaching ability
- 11. Establish the learning community of Digital Instructional design
- 12. Provide financial support
- 13. Provide digital educational resource library
- 14. Provide digital teaching design for expert teachers
- 15. Provide a workbook for conducting digital instructional design

# The development modes of digital teaching implementation to 17

#### items:

- 1. Establish the evaluation mechanism of digital teaching implementation
- 2. Establish a reward mechanism for the implementation of digital teaching
- 3. Establish the implementation plan of digital teaching
- 4. Establish the evaluation mechanism of digital teaching effect
- 5. Carry out the evaluation of excellent cases of digital teaching implementation
  - 6. Carry out the learn of excellent cases of digital teaching implementation
- 7. Establish teaching group to discuss and develop digital teaching implementation model
- 8. Carry out special training on the implementation of digital teaching for teachers
- 9. Invited famous teachers to give lectures on improving digital teaching ability
  - 10. Training teachers in data analysis and data assessment capabilities
- 11. Encourage teachers to carry out teaching reform research on the implementation of digital teaching
  - 12. Encourage teachers to use digital teaching materials

13. Teachers are encouraged to experiment with VR/AR teaching

14. Encourage teachers to carry out individualized teaching for students

15. Create an atmosphere for digital teacher implementation

16. Provide digital teaching implementation software and hardware equipment

17. Provide a rich digital teaching resource platform

### The development modes of digital leadership to 9 items:

1. Strengthen the understanding of teachers' data-based leadership

2. Strengthen the knowledge base of teachers' digital leadership

3. Organize training programs specifically for digital leadership

4. Strengthen teachers' data teaching management ability

5. Strengthen teachers' ability to guide students through digital means

6. Strengthen the exemplary role of teachers' digital literacy

7. Rationalize and control students' online learning time

8. Strengthen the support of teaching departments and school leaders

9. Construction of Digital Campus

### Discussion

The research in the Digital Literacy Development Model for Higher Vocational College Teachers in Guangxi. The researcher summarizes the discussion into 2 parts, details as follows:

Part 1: the current situation of digital literacy for higher vocational college teachers in Guangxi.

Part 2: the digital literacy development model for higher vocational college teachers in Guangxi.

# Part 1: the current situation of digital literacy for higher vocational college teachers in Guangxi.

The current situation of digital literacy for higher vocational college teachers in nine aspects was at medium-high level. Considering the results of this research aspects ranged from the highest to lowest level were as follow: the highest level was Digital application and Digital duty, followed by Digital perception, Digital communication, Digital knowledge and skills, Digital teaching design and Digital teaching implementation, Digital leadership and Professional development was the lowest level.
Although teachers have a strong desire to digitize, they have a weak will to digitize, that is, they pay more attention to the use of digital technology and resources, but relatively ignore the selection strategy of knowledge principles and high-level digital application ability. The progress of teachers in digital collaborative education is slow, and although they have a high recognition on digital social responsibility, there is still a gap between their professional development ability and the requirements of international cooperative education (Zhang Hongyan, 2023).

With the digital transformation of higher education, the digital competence of college teachers has become a key factor in the evaluation and development. At present, college teachers have shortcomings in the application of digital technology, teaching ability, teamwork, scientific research innovation and digital literacy, especially in the processing of information teaching resources, practical operation ability, classroom control and so on (Wang Xiaodan, Wang Jun, 2023).

The importance of improving the digital literacy of teachers in local colleges and universities. The traditional research and training mode emphasizes theoretical teaching in content, neglects the training of practical operation ability, and lacks flexibility and interaction in the way, which leads to the limitation of teachers' digital technology application ability (Han dan, 2024).

Teachers' digital literacy shows the comprehensive ability of information, data and computing literacy in the process of information technology education, but there are some problems such as insufficient investment in digital literacy training, imperfect curriculum system and limited training resources (Song Jingjing et al., 2023).

Improving teachers' digital literacy is of great value to accelerate the digital transformation of education, adapt to the needs of the digital economy, and promote the construction of a powerful education country. However, college teachers are faced with a series of difficulties in the process of improving digital literacy, including the phenomenon of "digital information cocoon", which leads to limited information acquisition and cognitive vision; The risk of digital ideology, that is, the conflict of values and misdirection that may be brought about by the use of digital technology; And the "digital divide," an imbalance in digital skills and application among different teachers (Yan Chaoyang, Yang Jie, 2024).

# Part 2: the digital literacy development model for higher vocational college teachers in Guangxi.

1. Exploring the development mode of digital perception

The research results show that the digital literacy for higher vocational college teachers in Guangxi is at medium level in terms of digital perception. which

requires establish the concept of digital education for teachers, establish a sense of overcoming difficulties, conduct special training courses to enhance teachers' awareness of digital value, conducts regular seminars on digital values, regularly test the teacher digital awareness, learn practical examples of the use of digitalization, strengthen teachers' initiative to integrate digital technology into teaching, provide self-study courses to develop data sensitivity, promoting digital literacy through new media, build a digital campus. This is consistent with the results of some studies. For example, special training courses are conducted to enhance teachers' awareness of informatization. In the training courses, they learn practical cases of digitalization, strengthen their perception of educational digitalization, establish a positive view of information application, overcome difficulties in the use of digital education, and clearly define the auxiliary functions of technology in education (Zhang Ranni, 2023); teachers actively participate in digital training to enhance their awareness of the importance of data and their confidence in data application. Cultivate teachers' awareness of integrating digital technology into teaching. Strengthen the exchange of digital teaching cases and experience sharing among teachers, use new media channels to publicize digital literacy, and establish a good digital environment in the campus. In addition, practical actions are taken to improve teachers' digital literacy, and lessons are summarized to promote the development and innovation of digital literacy theory (He Xunshu, Ye Guoping.2020); To carry out ideological education for teachers, establish the concept of digital education, accept the technological update, treat digital education correctly, and enhance digital consciousness. Through selfstudy courses, cultivate teachers' ability to learn consciously and enhance digital consciousness; Set up an incentive system, first test the ability, then training, then assessment, and repeat it periodically (He Jian, 2021); Consciousness leads behavior and predicts future actions. Through digital education environment construction, professional skills training, ability evaluation and incentive system construction, it can effectively shape the identification, motivation and determination of vocational teachers on education digitalization, deeply realize the influence of digital technology on education transformation, and motivate them to spontaneously improve their digital ability. Teachers should correctly understand and actively explore cutting-edge technologies such as big data, artificial intelligence and virtual reality, integrate them into daily teaching, and have the courage to overcome challenges in digital practice (Feng Yanhua, 2023).

#### 2. Exploring the development mode of digital knowledge and skills

The research results show that the digital literacy for higher vocational college teachers in Guangxi is at medium-low level in terms of digital knowledge and skills. which requires conduct both online and offline lectures, conduct digital knowledge and skills competition, strengthen the study of new technical knowledge, encourage peers to exchange digital knowledge and skills, provide self-assessment courses, provide self-study theory courses, provide expert guidance, practical courses are offered, provide digital technology white papers. This is consistent with the results of some studies. For example, provide diverse forms of training for teachers, using a combination of online and offline methods to ensure that teachers master digital technology. Develop a comprehensive training plan, including basic and advanced stages, to meet the needs of different levels of learning. Establish learning communities and cooperation platforms to promote exchanges and cooperation among teachers and jointly improve digital literacy. Provide technical support and consulting services: Provide necessary technical support to teachers to help solve technical problems (Wang Tingting, 2024); create a learning service platform to provide personalized learning resources, including theoretical courses on digital technology, practical courses on digital technology, white papers on digital technology, etc. There are also experts on how to improve digital knowledge and skills (Zhang Hongyan, 2023); establish a digital technology learning community to promote teachers' continuous learning, in which they can learn digital knowledge and skills, share learning skills, and supervise each other, so that teachers' knowledge and skills can alternately improve and promote each other (Yi Ye, Xue Feng, 2022); different levels of training and lectures are conducted according to teachers' current level of digital knowledge and skills. Conduct digital knowledge and skills competitions, give feedback to teachers and reward the winners. Provide self-testing courses for teachers, and give expert guidance to teachers to improve their digital knowledge and skills according to the test results. Only in this way can the digital knowledge reserve and application ability of higher vocational teachers be effectively improved (Feng Yanhua, 2023).

3. Exploring the development mode of digital application

The research results show that the digital literacy for higher vocational college teachers in Guangxi is at medium-high level in terms of digital application. which requires regular digital application training for teachers at different levels, training teachers to use SPSS and other software for statistical analysis of teaching data, training teachers use a learning management system (LMS) and other data

analysis tool, training teachers to use ChatGTP and other artificial intelligence technology to carry out work and teaching, strengthen teachers' ability of information retrieval, evaluation and utilization, strengthen teachers' ability to use digital tools for daily work and teaching, regularly carry out the selection of excellent digital application teachers, school leaders play an exemplary role, encourage teachers to develop innovative digital applications, schools develop digital enhancement programmes for teachers, establish technical support team, strengthen the construction of the digital application infrastructure. This is consistent with the results of some studies. For example, schools develop assessment tools and design scales, questionnaires or observation sheets to evaluate teachers' digital applications. Develop and implement training and training programs, provide systematic learning opportunities and support, and help teachers comprehensively improve their digital technology application capabilities and information literacy. Resource support, platform construction and team support, providing necessary resources and building corresponding learning platforms to promote communication among teachers. Incentive mechanisms and incentive measures are designed to encourage and reward teachers to actively participate in digital literacy promotion activities and achieve excellent results (Han Dan, 2024); the digital literacy system of teachers should be established, and the digital improvement plan for teachers should be formulated. Strengthen the construction of teaching resources, teachers use digital technology to innovate, create and reconstruct teaching content, and encourage teachers to use digital technology to compile textbooks and scientific research. Provide targeted, timely feedback and personalized learning support for teachers using digital assessment tools and methods (Zhu Jianjun, Wang jinlong, 2023); the school has established a system to incorporate teachers' digital literacy ability into the evaluation system of teachers' professional ability and carry out the selection of excellent cases of digital application. Colleges and universities are encouraged to explore daily working methods based on "Internet +", and colleges and universities should provide high-quality hardware and software to provide sufficient conditions for teachers' training and learning. Teachers need to continuously learn relevant technologies, enhance digital literacy, and enhance digital teaching resource processing ability, digital application ability and digital innovation ability (Wang Xiaodan, Wang Jun, 2023); according to the teachers' interests and development needs, make personalized study plans. To improve teachers' digital application as the core goal of the study, through the hybrid study mode to comprehensively improve teachers' digital technology application ability. Formulate targeted study programs and carry

out diversified study activities, including the use of SPSS data statistical software, the use of LMS system and the use of artificial intelligence technology. Focus on the design of practical links, and form a closed loop of continuous improvement (Chen Qiong, 2024).

#### 4. Exploring the development mode of digital duty

The research results show that the digital literacy for higher vocational college teachers in Guangxi is at medium-high level in terms of digital duty. which requires learn the laws and regulations in the field of Internet, learn the laws and regulations in the field of intellectual property, conduct thematic lectures on data security, learn a cautionary educational case for data security, encourage selfreflection and peer evaluation of digital behavior for compliance with laws and regulations, encourage teachers to get your network security related certification, establishment of a data security group to explore data security, role-play simulation activities to experience data security, learn great examples of securing data, commend teachers who excel in digital responsibility, provide technical support for teachers' data security, schools provide data security support emergency response. This is consistent with the results of some studies. For example, improve the level of safety awareness, strengthen the digital safety knowledge education for teachers and students, and ensure the popularization of digital safety awareness. In higher vocational colleges, establishing and improving network information security management mechanism, clarifying security responsibilities and strengthening security management are extremely critical steps. Increasing investment in research and development of network security technology and adopting cutting-edge network security technology means to enhance the security protection efficiency of cyberspace are of great significance to maintaining national network security and promoting the digital process. Pay attention to the cultivation of cybersecurity professionals, provide a strong human resource guarantee for the construction of information security system, and encourage teachers to obtain cybersecurity related certifications, and commend teachers who perform excellent performance in the implementation of digital responsibilities(Zhang Xin.2024); the school will strengthen its digital security protection capabilities, provide appropriate technical support, enhance teachers' digital security awareness, enhance digital moral and ethical awareness, and build a digital education security prevention system. The school carried out data security activity week, allowing teachers to participate in role-playing simulation activities to experience data security, showing excellent cases of data security, and rewarding teachers who are outstanding in data security (Hu Weiwei,

Zhang Lu, 2024); strengthen the construction of smart campuses and clarify the functions of different departments. Accelerate the construction of resources for digital responsibility, build a library of ideological and political education resources with Chinese characteristics, improve the information feedback mechanism, encourage teachers to self-check and self-correct their personal digital behavior, and improve their own level of digital responsibility (Lang Lihong, 2023).

5. Exploring the development mode of professional development

The research results show that the digital literacy for higher vocational college teachers in Guangxi is at low level in terms of professional development. which requires reflection and improvement of own shortcomings, enhancing Innovative Teaching Models and Learning Styles, improve teachers' own digital teaching level, learn from your peers' excellent learning methods, analyze learning outcomes with peers, participate in digital teaching forums and conferences, establish an annual teacher development plan. establish a data-driven portfolio of teachers' teaching ability development, cultivate teachers' lifelong learning habits, improvement of teachers' level of education reform and research, teachers to the enterprise post practice. This is consistent with the results of some studies. For example, in the era of big data, emerging educational technologies not only revolutionize teaching methods, but also reshape the path of teacher professional development. Establish a digital alliance cooperation platform, based on which teachers can make progress together with their peers, learn advanced technologies and skills together, learn excellent cases, and share their learning experiences, so as to promote teachers' personal professional development. Cultivate teachers' innovative thinking, enhance teachers' innovative spirit, and integrate them into digital teaching to continuously improve their professional level (Li Guocheng, Xiang Yanling, 2019); improve the professional level of teachers, learn more and practice more, enhance the creative ability of digital technology, and cultivate the habit of lifelong learning of teachers. Teachers are encouraged to constantly reflect on and improve their professional level, actively participate in teaching reform and scientific research projects, improve their professional development, and improve their digital teaching level. The school has developed incentive policies to make teachers more motivated to improve their professional level (Pang Lili, 2023); establish a digital literacy development file for teachers' lifelong learning. Teachers are encouraged to upgrade advanced technologies in enterprises and share learning results with peers. Through various forms of training, including curriculum training, innovative teaching mode training and technical training, to improve the digital professional level of teachers

themselves. Encourage teachers to share their digital teaching experience and excellent learning methods with their peers at forums and conferences (Song Jinjin et al. 2023); to build a three-level linkage of teachers' digital archives, build a professional growth points system platform, accelerate the construction of digital teachers' intelligent research and training platform, promote teachers to continue to strengthen digital research and training, and promote professional development. Build standards so that teachers can self-reflect and improve the shortcomings. Build a digital and intelligent teaching environment, encourage teachers to collect teaching and evaluation data, improve teaching implementation, and raise the level of digital teaching management (Jiang Miao, Li Jing, 2024).

#### 6. Exploring the development mode of digital communication

The research results show that the digital literacy for higher vocational college teachers in Guangxi is at medium level in terms of digital communication, which requires strengthen teachers' ability to use communication tools, learn new digital communication tools, communicate with students by using digital tools, use network civilization language, improve teachers' communication skills, promote online interaction with students and parents, use a variety of communication methods, cultivate teachers' emotional management ability, cultivate teacher patience, schools provide digital communication repository. This is consistent with the results of some studies. For example, the school will carry out special training, constantly improve teachers' theoretical level and skills, improve teachers' digital communication ability, and ensure that teachers can effectively communicate with students and parents. College teachers are encouraged to use new media tools, such as home-school wechat groups, QQ groups and social forums, to maintain close communication with college students' parents, ensure smooth information sharing, and establish daily communication mechanisms (Guo Yongzhi, Liang Chen, 2023); the school creates a digital communication environment, uses online mode to broaden education channels, and strengthens teachers' ability to use digital communication tools. Regular online and offline training activities are held to improve teachers' communication language and communication skills, cultivate teachers' emotional management ability and cultivate teachers' patience. Develop a home-school cooperation model, encourage teachers to communicate with parents through online linkage, and promote in-depth understanding between the two sides (Lu Tingting et al.2023); enhancing teachers' digital communication and coordination skills and facilitating communication with students, parents, colleagues and superiors through scientific and technological means are the key methods to improve teaching quality and efficiency. Continuous communication and collaboration among teacher teams to jointly explore educational concepts, innovate teaching methods, share experience, complement advantages, and realize knowledge sharing and resource sharing can create a positive working environment and ultimately improve teachers' digital communication ability (Wang Yu, 2022).

7. Exploring the development mode of digital teaching design

The research results show that the digital literacy for higher vocational college teachers in Guangxi is at medium-low level in terms of digital teaching design, which requires establish a reward mechanism for digital instructional design, establish the evaluation mechanism of digital instructional design, establish the feedback and iteration mechanism of digital instructional design, digital instructional design ability into the teacher title system, establish management and implementation department, encourage teachers to participate in the contest of teaching ability, focus on learning excellent digital teaching design cases, regularly test the teachers level of digital design, regularly evaluate teachers' excellent cases of digital teacher design, invite famous teachers lecture to promote teacher's teaching ability, establish the learning community of Digital Instructional design, provide financial support, provide digital educational resource library, provide digital teaching design for expert teachers, provide a workbook for conducting digital instructional design. This is consistent with the results of some studies. For example, set up a dedicated management department to promote participation in teaching competitions, focus on discussing excellent cases, regularly evaluate and evaluate teachers' digital design works, invite famous teachers to hold lectures, create learning communities, ensure the supply of funds and resource libraries, and provide expert guidance and workbook support. In addition, improve the digital training system, covering multi-level and diverse courses, and establish an advanced teaching experiment base for practice and exploration. Actively encourage teachers to participate in digital teaching research, set up special and reward mechanisms, and strengthen academic exchanges. At the same time, strengthen the construction of resource base, promote resource exchange and cooperation, establish a sound teaching effect evaluation system, including key evaluation indicators such as digital technology application ability, in order to comprehensively improve the level of digital education(Xu Meng.et al.2023); in order to stimulate the enthusiasm of physical education teachers in digital teaching, it is necessary to build a system including reward mechanism, assessment mechanism and feedback iteration mechanism, and incorporate digital teaching design ability into the promotion conditions of teachers' professional titles, and set up a special management and implementation department. Through encouraging participation in teaching competitions, focusing on studying excellent cases, regular skill tests and case evaluations, inviting famous teachers to give lectures, establishing learning communities, providing adequate funding and access to resource libraries, personalized guidance from experts and practical workbooks, the digital literacy of physical education teachers is promoted in all aspects. At the same time, a scientific evaluation system of physical education teachers' digital literacy should be established, periodic monitoring should be implemented, and multiple incentive strategies should be combined to enhance teachers' intrinsic motivation. On this basis, the government and schools should work together to improve the security system, formulate personalized training programs, form a research cooperation mechanism, and ensure the continuous and normal improvement of physical education teachers' digital literacy (Song Bing, Liu Shuang, 2024); teachers should deeply understand the importance of digital teaching, master basic digital technology, and deeply integrate it with teaching content to design interactive teaching activities. In order to promote this process, the school management level should actively help, including training teachers' digital instructional design ability, broadening their knowledge horizon, and through the establishment of reward and assessment mechanism, digital instructional design ability into the teacher title system, and the establishment of management departments focusing on this field. At the same time, innovative exploration path strategies, such as the implementation of immersive technology training, the creation of independent innovation of digital teaching platform, the establishment of internal tutor system to teach new, the organization of interactive teaching design competition, and the construction of dynamic evaluation system to stimulate growth (Zhang Xibing, 2023).

8. Exploring the development mode of digital teaching implementation

The research results show that the digital literacy for higher vocational college teachers in Guangxi is at medium-low level in terms of digital teaching implementation, which requires establish the evaluation mechanism of digital teaching implementation, establish a reward mechanism for the implementation of digital teaching, establish the implementation plan of digital teaching, establish the evaluation mechanism of digital teaching effect, carry out the evaluation of excellent cases of digital teaching implementation, establish teaching group to discuss and develop digital teaching implementation model, carry out special training on the implementation of digital teaching for teachers, invited famous teachers to give

lectures on improving digital teaching ability, training teachers in data analysis and data assessment capabilities, encourage teachers to carry out teaching reform research on the implementation of digital teaching, encourage teachers to use digital teaching materials, teachers are encouraged to experiment with VR/AR teaching, encourage teachers to carry out individualized teaching for students, create an atmosphere for digital teacher implementation, provide digital teaching implementation software and hardware equipment, provide a rich digital teaching resource platform. This is consistent with the results of some studies. For example, promote teachers to use digital technology to compile textbooks and scientific research, innovate the form and content of textbooks, and deepen the digital application of scientific research methods. In assessment and evaluation, teachers should adopt digital assessment tools and methods to achieve immediacy and pertinence of evaluation, provide personalized learning feedback and support for students, and fully integrate into all aspects of digital teaching practice. It provides necessary software and hardware equipment and rich online teaching resource platform to support teachers to use digital technology to innovate teaching content, restructure courses, and integrate digital elements into teaching mode (Zhu Jianjun, Wang Jinlong, 2023); through systematic digital teaching implementation training, help teachers keep up with the pace of digital education, and build diversified digital teaching resources, such as digital textbooks, courses and platforms. Establish a set of detailed digital teaching implementation evaluation system, clear evaluation standards and methods, and implement regular evaluation. Further encourage teachers to participate in the digital teaching reform, with the help of policy support, resource investment and school-enterprise cooperation, improve the digital teaching ability of teachers in an all-round way. Advocate the use of digital teaching materials and try VR/AR teaching, carry out teaching practice according to students' personalized, and equip corresponding hardware and software equipment and teaching resource platform (Yan yan); under the guidance of the state and the attention of colleges and universities, the formulation of corresponding policies not only provides information technology training and rich digital resources, but also focuses on the establishment of evaluation and reward mechanisms for the implementation of digital teaching, the design of implementation plans, and the evaluation and learning of excellent cases. By setting up teaching groups to explore digital teaching models, conducting special training and lectures by famous teachers, strengthening teachers' ability of data analysis and evaluation, encouraging teaching reform research, using digital teaching materials and trying new technologies such as

VR/AR, promoting personalized teaching, creating a digital teaching atmosphere, and equips with necessary hardware and software facilities and resource platforms (Sha Tingting, Pu Junlan, 2024); schools strengthen the digital and intelligent construction of teaching facilities, such as setting up smart classrooms, introducing or self-building teaching platforms, promoting teachers to create and apply digital course resources, and supporting incentive policies to guide teachers to improve digital teaching capabilities. Organize special digital teaching skills training, covering resource construction, teaching environment construction, activity design, evaluation method innovation, etc., so that teachers can focus on improving their shortcomings according to their own needs. Encourage teachers to explore in practice, such as the implementation of online and offline mixed teaching, in order to improve the implementation skills of digital teaching in practice, and deepen theoretical understanding in research, so as to comprehensively accelerate the improvement of teachers' digital teaching skills (Yi Ye, Xue Feng, 2022).

9. Exploring the development mode of digital leadership

The research results show that the digital literacy for higher vocational college teachers in Guangxi is at low level in terms of digital leadership, which requires strengthen the understanding of teachers' data-based leadership, strengthen the knowledge base of teachers' digital leadership, organize training programs specifically for digital leadership, strengthen teachers' data teaching management ability, strengthen teachers' ability to guide students through digital means, strengthen the exemplary role of teachers' digital literacy, rationalize and control students' online learning time, strengthen the support of teaching departments and school leaders, construction of Digital Campus. This is consistent with the results of some studies. For example, stimulate teachers' awareness of digital leadership and deepen their identity as digital leaders. To strengthen the training of teachers' digital skills, schools should set up special courses to improve teachers' ability in the application of digital technology and the thinking and skills of digital education. Create a campus environment conducive to teachers' digital growth, create a strong digital cultural atmosphere, encourage resource sharing and collaboration among teachers, and serve as a catalyst to enhance teachers' digital leadership. A joint digital learning and Leadership team is formed, which is intelligently configured on the digital platform according to the unique expertise of each teacher, to ensure that each teacher can realize his or her potential in the most suitable areas and demonstrate his or her strength and effectiveness in digital leadership (Wang Yu, 2022); promote teachers' cognitive update of digital change, establish new educational concepts adapted to

the digital era, let teachers actively embrace digital technology, and enhance teachers' digital leadership. Encourage teachers to actively learn the knowledge of digital leadership, play a leading role in digital leadership, and lead students to improve their digital innovation spirit and ability. Encourage teachers to actively participate in digital teaching practice activities to activate the synergistic effect of their digital leadership and further enhance the effectiveness of the overall digital leadership of the school. Create a strong digital environment on campus, jointly plan the future vision of digital leadership, create a digital leadership community composed of faculty and staff, vigorously promote close cooperation between teachers and students in education, competition, scientific research and other dimensions, extensively use digital technology to enhance communication, sharing and collaboration, and bravely explore new models of digital teaching and talent training. Implement a continuous evaluation and incentive system to fully ignite the inherent potential of teachers in digital leadership, build an evaluation system and incentive mechanism for digital teaching skills, strengthen the guidance, feedback and supervision of teachers in improving digital skills, and adopt positive incentive policies to encourage teachers to continuously improve blended teaching management and digital leadership skills in daily educational activities (He Meixian, Ni Chunli, 2002); encourage teachers to rationalize and control students' online learning time through digital means. Strengthen the training of teachers in digital means, improve teachers' digital management ability, improve teachers' online and offline teaching ability, so as to better guide students to carry out digital innovation and promote the improvement of teachers' digital leadership (Zhao Leilei, Zhang Rongfei, 2019); strengthen the understanding of teachers' digital leadership and consolidate the idea of teachers' digital leadership. Encourage teachers to reflect on education management, improve their own digital teaching management ability, establish a digital leadership community, communicate and help with peers, strengthen the sense of cooperation, and promote teachers' digital leadership. The school supports and guarantees the implementation of teachers' digital leadership, and strengthens teachers' ability to guide students through digital means (Sun Zhenxiang, Liu Xiaocui, 2015).

#### Recommendations

#### Implications

The research results showed that the recommendations about the Digital Literacy Development Model for Higher Vocational College Teachers in Guangxi are as follows:

1. The dimension of digital perception should be establish the concept of digital education for teachers, establish a sense of overcoming difficulties, conduct special training courses to enhance teachers' awareness of digital value, conducts regular seminars on digital values, regularly test the teacher digital awareness, learn practical examples of the use of digitalization, strengthen teachers' initiative to integrate digital technology into teaching, provide self-study courses to develop data sensitivity, promoting digital literacy through new media, build a digital campus.

2. The dimension of digital knowledge and skills should be requires conduct both online and offline lectures, conduct digital knowledge and skills competition, strengthen the study of new technical knowledge, encourage peers to exchange digital knowledge and skills, provide self-assessment courses, provide self-study theory courses, provide expert guidance, practical courses are offered, provide digital technology white papers.

3. The dimension of digital application should be to regular digital application training for teachers at different levels, training teachers to use SPSS and other software for statistical analysis of teaching data, training teachers use a learning management system (LMS) and other data analysis tool, training teachers to use ChatGTP and other artificial intelligence technology to carry out work and teaching, strengthen teachers' ability of information retrieval, evaluation and utilization, strengthen teachers' ability to use digital tools for daily work and teaching, regularly carry out the selection of excellent digital application teachers, school leaders play an exemplary role, encourage teachers to develop innovative digital applications, schools develop digital enhancement programmes for teachers, establish technical support team, strengthen the construction of the digital application infrastructure.

4. The dimension of digital obligation should be to strengthen teachers' legal awareness and data protection ability in the digital era, organize learning of relevant laws and regulations in the field of Internet and intellectual property, conduct lectures on data security, conduct warning education through real cases, and promote teachers' self-reflection and peer evaluation of digital compliance. Conduct compliance. Teachers are encouraged to obtain cybersecurity certification, set up dedicated data security groups for in-depth discussions, and deepen understanding

through simulation activities such as role playing. At the same time, we share examples of good practices in protecting data security, recognize teachers who demonstrate outstanding digital responsibility, provide the necessary technical support to assist teachers in ensuring data security, and establish a school-level data security emergency response mechanism to ensure data security and compliance in all aspects of the educational environment.

5. The dimension of professional development should be to promote the professional growth of teachers, the project emphasizes personal reflection and continuous improvement, aims to promote innovative teaching methods and learning strategies, and focuses on improving teachers' digital teaching skills. Teachers are encouraged to learn and draw on the effective teaching methods of their peers, jointly analyze the teaching effects, and realize the sharing of experience. Participate in digital teaching forums, conferences and other activities to broaden your horizons and keep up with the forefront of educational technology. Establish annual development goals for each teacher, record the growth track of teachers' teaching ability with data-supported archives, and cultivate teachers' lifelong learning habits. At the same time, efforts should be made to improve teachers' teaching reform and scientific research ability. By organizing teachers to carry out on-the-job internship in enterprises, practical experience can be enhanced, the deep combination of theory and practice can be promoted, and the professional quality and practical ability of teachers can be comprehensively improved.

6. The dimension of digital communication should be to enhance teachers' communication effectiveness in the digital age, and the plan covers improving teachers' ability to use modern communication tools, especially to learn emerging digital communication technologies, and to effectively use these digital tools to establish communication channels with students. It emphasizes the use of civilized language in online communication, while improving teachers' traditional and online communication skills, and promoting more frequent and effective online interaction between teachers, students and parents. Promote the use of diverse communication strategies to meet the needs of different students. In addition, emphasis is placed on cultivating teachers' emotional management and patience to ensure an efficient and harmonious communication environment. The school will build a digital communication resource library to provide teachers with a wealth of communication skills.

7. The dimension of digital instructional design should be to promote the popularization and optimization of digital instructional design, establish a reward mechanism to commend excellent digital instructional design achievements, set up an assessment mechanism to evaluate teachers' design ability, and build a feedback and iteration mechanism to promote continuous improvement. The digital instructional design ability should be included in the teacher title evaluation system to enhance its importance. Set up a special management department responsible for implementation and supervision. Encourage teachers to participate in all kinds of teaching ability competitions, focus on learning high-quality digital teaching design cases in the industry, and regularly test and evaluate teachers' design level and cases to promote progress. Renowned teaching experts will be invited to give lectures to enhance teachers' comprehensive teaching ability and establish learning communities to facilitate exchanges. Provide necessary funds, rich digital education resource library and expert guidance services, equip teachers with workbooks to guide the practice of digital teaching design, and comprehensively support the development and innovation of teachers in this field.

8. The dimensions of the implementation of digital teaching should be to promote the efficient implementation of digital teaching, establish the evaluation and reward mechanism of digital teaching implementation, clarify the implementation plan, and establish the scientific evaluation criteria of teaching effect. Through the organization of excellent case evaluation and learning activities, to stimulate the exchange and sharing of experience among teachers. Set up a special teaching group to discuss and formulate a suitable digital teaching implementation model, and carry out special training to improve teachers' practical ability in this field. Well-known teaching experts were invited to hold lectures, with special emphasis on training teachers in data analysis and evaluation skills, and teachers were encouraged to devote themselves to teaching reform research in the implementation of digital teaching, adopt digital teaching materials, and actively explore new teaching methods such as VR/AR to implement personalized teaching. At the same time, we strive to create a campus culture that supports the implementation of digital teaching, ensure sufficient software and hardware equipment, and provide a rich variety of digital teaching resource platforms to ensure the smooth promotion and in-depth application of digital teaching in an all-round way.

9. The dimension of digital leadership should be to enhance the digitalized leadership of teachers. The plan focuses on strengthening the implementation of the following aspects: First, improve teachers' awareness of the importance of digitalized leadership and consolidate their knowledge base in this field. Through the organization of special training programs, targeted to enhance teachers' professional skills in digital leadership. At the same time, emphasis should be placed on enhancing teachers' ability in data-based teaching management and using digital means to effectively guide students' learning. Teachers are encouraged to play an exemplary role in digital literacy in their daily lives, rationally arrange and guide students' online learning time, and ensure the effective use of digital resources. Strengthen the support of teaching management and school leadership, form a joint force, jointly promote the construction of digital campus, and provide a good environment for teachers to practice and improve digital leadership.

#### Future Researches

Based on the existing conclusions and in-depth analysis of the development model of teachers' digital literacy in Guangxi higher vocational colleges, in order to promote the development of teachers' digital literacy more effectively, the researchers emphasize the following three development models, details as follows:

1. Research on the development models of digital literacy of teachers at different levels in higher vocational colleges.

2. Research on quality assurance system of digital literacy development model of teachers in higher vocational colleges.

3. Research on evaluation system of digital literacy development model of teachers in higher vocational colleges

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Appendix A List of Specialists and Letters of Specialists Invitation for IOC Verification

# List of Specialists and Letters of Specialists Invitation for IOC Verification

1	Professor Dr. Zhou Huiguo	Guangxi Vocational & Technical College
2	Professor Dr.Zeng Gang	Guangxi University
3	Professor Dr. Lin Feng	Guangxi Technological College of Machinery
		and Electricity
4	Professor Dr. Shan Shusan	Guangxi Vocational &Technical College
5	Professor Dr.Tang Meixia	Nanning College for Vocational Technology

### List of interviews with 21 experts

1	Professor Ms.Wei Shanzhou	Guangxi Technological College of
		Machinery and Electricity
2	Associate Professor Ms.Zhang	Guangxi Polytechnic of Industry and
	Yang	Technology
3	Associate Professor Dr.Wang Yuandai	Guangxi Ecological Engineering College
4	Associate Professor Msguo Hang	Guangxi College of Information Technology
5	Associate Professor Dr.Wei Liang	Guangxi Finance Vocational and Technical College
6	Professor Ms.Liang Xiao	Guangxi College of Information Technology
7	Associate Professor Dr.Wang Daiyuan	Guangxi Ecological Engineering College
8	Associate Professor Ms.Fu Baolong	Liuzhou Vocational and Technical College
9	Associate Professor Dr.Li Liang	Wuzhou Vocational College
10	Associate Professor Ms.Feng Xu	Liuzhou City vocational and technical College
11	Professor Dr.Xie Cong	Guangxi Police College
12	Associate Professor Ms.Tang Meixia	Nanning College for Vocational Technology
13	Associate Professor Dr.Long Yan	Nanning College for Vocational Technology
14	Professor Ms.Guo Man	Guangxi Polytechnic of Industry and Commerce
15	Associate Professor Dr.Wei	Guangxi Ecological Engineering College
	Chunyuan	
16	Professor Dr.Liang Yijuan	Guangxi Electric Power Vocational Technical College
17	Professor Dr.Long Yifei	Guangxi Agricultural Vocational Technology University
18	Associate Professor Ms.Li Shanshan	Nanning University

19	Associate Professor Dr.Ling	Guangxi Vocational & Technical College
	Rongrong	
20	Professor Dr.Zhou Lin	Guangxi Modern Vocational and Technical
		College
21	Associate Professor Ms.Feng Xiang	Baise Vocational College

## List of focus group with 21 experts

1	professor Dr.Chen Ningjiang	Guangxi University
2	professor Dr.Mu Liang	Sichuan Aosha Technology Co., LTD
3	professor Dr.Xie Cong	Guangxi Police College
4	professor Dr.Zhang Wenyuan	Guangxi Vocational & Technical College
5	professor Dr.Peng Yuzhong	Nanning Normal University
6	professor Dr.Ao Maoyao	Guangxi Vocational & Technical College
7	professor Dr.Tan Chaoyang	Baise College
8	professor Dr.Huang Fuge	Guangxi Vocational & Technical College
9	professor Dr.Chen He zhan	Guangxi Technological College of Machinery
		and Electricity


Ref.No. MHESI 0643.14/939

Bansomdejchaopraya Rajabhat University 1061 Itsaraparb Hirunrujee Thonburi Bangkok 10600

1 April 2024

Subject: Invitation to validate research instrument

Dear

Professor Dr. Zhou Huiguo, Guangxi Vocational & Technical College

Mr. Feng Yu is a graduate student in Digital Technology Management for Education of Bansomdejchaopraya Rajabhat University. He is undertaking research entitled "The Digital Literacy Development Model for Higher Vocational College Teachers in Guangxi"

The thesis advisory committee has considered that you are an expert in this topic. Your recommendations would be useful for further improvement of this research instrument.

With your expertise, we would like to ask your permission to validate the attached research instrument. In this regard, we would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

Yours faithfully,

n

Assistant Professor Akaranun Asvarutpokin (Vice Dean of Graduate School for Dean of Graduate School)

Bansomdejchaopraya Rajabhat University Tel.+662-473-7000 www.bsru.ac.th E-mail: grad@bsru.ac.th

Appendix B Official Letter



มหาวิทยาลัยราชภัฏบ้านสมเด็จเจ้าพระยา BANSOMDEJCHAOPRAYA RAJABHAT UNIVERSITY

No.0643.13/304

10<sup>th</sup> June 2021

#### Letter of Acceptance

To Whom It May Concern

BSRU has accepted Mr. Feng Yu, holding a passport number E63181605, Chinese citizen, to be a full time student in the Doctor of Philosophy (Digital Technology Management for Education), Graduate School. The Degree is for a period of 3 years; will start from August 2021 and is expected to complete the Doctor of Philosophy in August 2024 depending on the credit transfer.

On behalf of the program, I would like to express my gratitude to Mr. Fang Yu for choosing Bansomdejchaopraya Rajabhat University to be a part of his professional growth.

If you need any information, please do not hesitate to contact me.



#### **Please Notice:**

This letter shall be effective when a student completes the whole registration process of Graduate School.
The enrollment fees must be transferred to -Bansomdejchaopraya Rajabhat University bank account only.
In case that the number of students does not reach the minimum number of acceptance as indicated in the announcement of Graduate School. Bansomdejchaopraya Rajabhat University reserves the right to cancel this letter of acceptance without prior notice. The student could request the enrollment refund by using original receipt or transfer slip to Bansomdejchaopraya Rajabhat University only.

4) Bansomdejchaopraya Rajabhat University accepts for enrollment refund request only the case as stated in number 3).

มหาวิทยาลัยราชภัฏบ้านสมเด็จเจ้าพระยา 1061 ถนนอิสรภาพ 15 แขวงที่รัญรูจี เขตธมบุรี กรุงเทพฯ 10600 โทร. 0-2473-7000 โทรสาร 0-2466-6539 BANSOMDEJCHAOPRAYA RAJABHAT UNIVERSITY 1061 Isaraphab 15 Rd Dhonburi Bangkok 10600 www.bsru.ac.th

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Appendix C Research Instrument

### 1. Open-ended Interview

Open-ended Interview of the current situation of digital literacy for higher vocational college teachers

#### Instructions:

In order to understand the current situation of digital literacy of teachers in Guangxi higher vocational colleges, this paper puts forward a development model conducive to improving the digital literacy of teachers in Guangxi higher vocational colleges. Please fill in the answers to this open interview according to the actual situation. Your personal information will be kept confidential.

#### Part 1: Respondent Status (Personal Information)

Name: Gender: School: Experience: Educational background: Professional Title:

#### Part 2: Interview outline

Questions	Answer
Q1: What do you think are the current situation	
problems of digital literacy for higher vocational	
college teachers?	
Q2: What do you think are the dimensions of digital	
perception in the digital literacy development	
model of higher vocational teachers? What are the	
improvements in this dimension?	
Q3: What do you think are the dimensions of digital	
knowledge and skills in the digital literacy	
development model of higher vocational teachers?	
What are the improvements in this dimension?	
Q4: What do you think are the dimensions of digital	
application in the digital literacy development	
model of higher vocational teachers? What are the	
improvements in this dimension?	

Questions	Answer
Q5: What do you think are the dimensions of digital	
duty in the digital literacy development model of	
higher vocational teachers? What are the	
improvements in this dimension?	
Q6: What do you think are the dimensions of	
professional development in the digital literacy	
development model of higher vocational teachers?	
What are the improvements in this dimension?	
Q7: What do you think are the dimensions of digital	
communication in the digital literacy development	
model of higher vocational teachers? What are the	
improvements in this dimension?	
Q8: What do you think are the dimensions of digital	
teaching design in the digital literacy development	
model of higher vocational teachers? What are the	
improvements in this dimension?	
Q9: What do you think are the dimensions of digital	
teaching implementation in the digital literacy	
development model of higher vocational teachers?	
What are the improvements in this dimension?	
Q10: What do you think are the dimensions of	
digital leadership in the digital literacy	
development model of higher vocational teachers?	
What are the improvements in this dimension?	

# 2. Results of Round 2

NO	ltem	Md	Мо	IQR	Consensus(%)	Suggest				
	Digital perception									
	Establish the concept of	5.00	5.00	0.50	85.71%					
1	digital education for									
	teachers									
2	Establish a sense of	5.00	5.00	0.50	90.48%					
	overcoming difficulties									
	Strengthen teachers'	5.00	5.00	0.50	80.95%					
3	initiative to integrate digital									
	technology into teaching									
4	Promoting digital literacy	4.00	4.00	1.00	66.67%					
	through new media									
5	Offer confidence building	4.00	4.00	1.50	66.67%					
	programs									
6	Regularly test the teacher	4.00	5.00	1.50	76.19%					
	digital awareness									
7	Communicate with	2.00	2.00	1.00	19.05%					
	enterprises									
	Conduct special training	4.00	5.00	1.00	90.48%					
8	courses to enhance									
	teachers' awareness of									
	digital value									
9	Learn practical examples of	4.00	4.00	0.00	80.95%					
	the use of digitalization									
10	Help teachers set career	4.00	4.00	1.00	66.67%					
	goals									
11	Conducts regular seminars	5.00	5.00	1.00	85.71%					
	on digital values									
	Digital k	knowle	dge an	d skills						
	Encourage peers to	4.00	4.00	0.50	85.71%					
12	exchange digital knowledge									
	and skills									

NO	ltem	Md	Мо	IQR	Consensus(%)	Suggest
13	Conduct digital knowledge and skills competition	5.00	5.00	1.00	90.48%	
14	Strengthen the study of new technical knowledge	5.00	5.00	1.00	90.48%	
15	Conduct both online and offline lectures	5.00	5.00	1.00	85.71%	
16	Provide self-assessment courses	4.00	4.00	1.00	85.71%	
17	Provide self-study theory courses	4.00	4.00	1.00	61.90%	
18	Practical courses are offered	5.00	5.00	1.00	80.95%	
19	Provide expert guidance	4.00	4.00	1.00	76.19%	
20	Encourage teachers to search for knowledge on	4.00	4.00	1.00	61.90%	
21	Master digital tools	3.00	2.00	1 50	23 8106	
21		vital an	nlicatio	n	23.0170	
22	Regular digital application training for teachers at different levels	4.00	5.00	1.00	90.48%	
23	Strengthen teachers' ability to use digital tools for daily work and teaching	4.00	4.00	1.50	76.19%	
24	School leaders play an exemplary role	4.00	4.00	1.50	66.67%	
25	Regularly carry out the selection of excellent digital application teachers	4.00	4.00	1.00	80.95%	
26	Training teachers to use SPSS and other software for statistical analysis of teaching data	5.00	5.00	1.00	80.95%	

NO	ltem	Md	Мо	IQR	Consensus(%)	Suggest
27	Training teachers use a learning management system (LMS) and other data analysis tool	4.00	5.00	1.50	76.19%	
28	Training teachers to use ChatGTP and other artificial intelligence technology to carry out work and teaching	4.00	5.00	1.00	80.95%	
29	Strengthen teachers' ability of information retrieval, evaluation and utilization	4.00	4.00	1.50	66.67%	
30	Encourage teachers to develop innovative digital applications	4.00	4.00	1.00	80.95%	
31	According to the demand of talent training, explore the innovation of digital teaching	3.00	3.00	1.00	28.57%	
32	Develop contextualized and personalized teaching resources	4.00	4.00	1.50	66.67%	
		Digital	duty			
33	Learn the laws and regulations in the field of Internet	4.00	4.00	1.00	80.95%	
34	Conduct thematic lectures on data security	4.00	4.00	1.00	85.71%	
35	Learn great examples of securing data	4.00	4.00	1.00	80.95%	
36	Learn a cautionary educational case for data security	4.00	5.00	1.00	80.95%	

NO	ltem	Md	Мо	IQR	Consensus(%)	Suggest
	Learn the laws and	4.00	4.00	1.00	85.71%	
37	regulations in the field of					
	intellectual property					
20	Commend teachers who	4.00	4.00	1.50	66.67%	
50	excel in digital responsibility					
	Encourage self-reflection	5.00	5.00	1.00	85.71%	
	and peer evaluation of					
39	digital behavior for					
	compliance with laws and					
	regulations					
10	Install the National anti-	3.00	4.00	1.00	47.62%	
	fraud APP					
	Encourage teachers to get	5.00	5.00	1.00	80.95%	
41	your network security					
	related certification					
42	Provide support for security	4.00	4.00	1.00	61.90%	
	Establishment of a data	4.00	4.00	1.00	85.71%	
43	security group to explore					
	data security					
11	Conduct simulation	5.00	5.00	1.00	85.71%	
44	activities					
15	Watch anti-fraud	3.00	3.00	1.00	33.33%	
45	documentaries					
	Profess	ional c	levelop	oment		1
	Enhancing Innovative	4.00	4.00	1.00	80.95%	
46	Teaching Models and					
	Learning Styles					
47	Establish an annual teacher	4.00	4.00	1.00	66.67%	
47	development plan					
10	Improve teachers' own	4.00	4.00	1.00	76.19%	
40	digital teaching level					
40	Improve the scientific and	3.00	3.00	1.00	42.86%	
49	technical level of teachers					

NO	ltem	Md	Мо	IQR	Consensus(%)	Suggest
50	Improvement of teachers' level of education reform and research	4.00	4.00	1.00	66.67%	
51	Establish a data-driven portfolio of teachers' teaching ability development	5.00	5.00	1.50	76.19%	
52	Cultivate teachers' lifelong learning habits	4.00	5.00	1.00	80.95%	
53	Establish mutual help relationship with peers and make progress together	4.00	4.00	1.00	66.67%	
54	Analyze learning outcomes with peers	4.00	4.00	1.00	80.95%	
55	Learn from your peers' excellent learning methods	4.00	4.00	1.00	85.71%	
56	Improve their own level, form a model	4.00	4.00	1.00	52.38%	
57	Participate in digital teaching forums and conferences	4.00	5.00	1.00	85.71%	
58	Reflection and improvement of own shortcomings	4.00	4.00	1.50	76.19%	
	Digita	al comi	munica	ntion		
59	Communicate with students by using digital tools	4.00	4.00	1.00	85.71%	
60	Use network civilization language	4.00	4.00	1.50	76.19%	
61	Improve teachers' communication skills	4.00	5.00	1.00	80.95%	

NO	ltem	Md	Мо	IQR	Consensus(%)	Suggest
	Strengthen teachers' ability	5.00	5.00	1.00	80.95%	
62	to use communication					
	tools					
63	Learn new digital	5.00	5.00	1.00	85.71%	
	communication tools					
64	Promote online interaction	4.00	5.00	1.00	80.95%	
	with students and parents					
65	Exemplary role of	4.00	4.00	1.00	52.38%	
	leadership	1.0.0		4 = 0	- / / 00/	
66	Use a variety of	4.00	5.00	1.50	76.19%	
		4.00	1.0.0	4 50		
67	Develop empathy in	4.00	4.00	1.50	66.67%	
	teachers	4.00	1.0.0	1.00		
68	Cultivate teacher patience	4.00	4.00	1.00	66.67%	
(0)	Cultivate teachers	4.00	4.00	1.00	61.90%	
69	emotional management					
	ability		• •	•		
		al teach	ning de	esign	00.050/	
70	Digital instructional design	4.00	5.00	1.00	80.95%	
70	ability into the teacher title					
	system	1.00	1.0.0	1.00	00.050/	
71	Encourage teachers to	4.00	4.00	1.00	80.95%	
/1	participate in the contest of					
		1.00	1.00	1 50	76 100/	
70	Establish a reward	4.00	4.00	1.50	76.19%	
12						
		1.00	F 00	1.00		
73	Focus on learning excellent	4.00	5.00	1.00	80.95%	
	digital teaching design cases	4.00		1.00	00.050/	
74	Establish the evaluation	4.00	5.00	1.00	80.95%	
/4	mechanism of digital					
	instructional design					

NO	ltem	Md	Мо	IQR	Consensus(%)	Suggest
	Establish the feedback and	4.00	4.00	0.50	80.95%	
75	iteration mechanism of					
	digital instructional design					
76	Regularly test the teachers	5.00	5.00	1.00	80.95%	
	level of digital design	1.00	1.00	1 50	76 4000	
77	Establish management and	4.00	4.00	1.50	76.19%	
( (	Implementation					
	Regularly evaluate teachers'	4.00	4.00	1.00	80.95%	
78	excellent cases of digital	4.00	4.00	1.00	00.7570	
10	teacher design					
	Invite famous teachers	4.00	5.00	1.00	85.71%	
79	lecture to promote					
	teacher's teaching ability					
	Establish the learning	5.00	5.00	1.00	80.95%	
80	community of Digital					
	Instructional design					
81	Provide financial support	4.00	5.00	1.00	80.95%	
82	Peers listen to each other	4.00	4.00	1.00	61.90%	
83	Visit the school digital	4.00	4.00	1.00	66.67%	
	construction results					
84	Participate in campus digital	3.00	4.00	2.00	38.10%	
	construction					
85	Visit a multimedia	3.00	3.00	2.00	33.33%	
	production company					
	Digital tea	iching i	mplem	nentatic	n	
	Establish a reward	4.00	4.00	1.00	80.95%	
86	mechanism for the					
	implementation of digital					
	teaching	4.0-	4.05	0 = -	00.076	
07	I raining teachers in data	4.00	4.00	0.50	80.95%	
87	analysis and data					
	assessment capabilities					

NO	ltem	Md	Мо	IQR	Consensus(%)	Suggest
	Establish the	4.00	5.00	1.50	76.19%	
88	implementation plan of					
	digital teaching					
	Carry out special training on	4.00	4.00	1.50	76.19%	
89	the implementation of					
	digital teaching for teachers					
	Encourage teachers to carry	4.00	5.00	1.00	80.95%	
	out teaching reform					
90	research on the					
	implementation of digital					
	teaching	1.00	F 00	1.00	00.050/	
91	Encourage teachers to use	4.00	5.00	1.00	80.95%	
	digital teaching materials	E 00	E 00	1 50	76 100/	
02		5.00	5.00	1.50	70.19%	
72	digital teaching ability					
	Teachers are encouraged to	4.00	4.00	1.00	80.95%	
93	experiment with VR/AR	4.00	4.00	1.00	00.7370	
,,,	teaching					
	Establish the evaluation	5.00	5.00	1.00	85.71%	
94	mechanism of digital					
	teaching effect					
	Encourage teachers to carry	4.00	4.00	1.00	80.95%	
95	out individualized teaching					
	for students					
	Establish the evaluation	4.00	4.00	1.00	80.95%	
96	mechanism of digital					
	teaching implementation					
97	Establish a teacher	4.00	4.00	1.50	66.67%	
	elimination system					
98	Peers listen to each other	4.00	4.00	1.00	61.90%	
99	The strategic position of digital teaching	3.00	3.00	1.50	42.86%	

NO	ltem	Md	Мо	IQR	Consensus(%)	Suggest
	implementation should be clarified					
100	Carry out the evaluation of excellent cases of digital teaching implementation	4.00	4.00	1.00	80.95%	
101	Carry out the learn of excellent cases of digital teaching implementation	4.00	4.00	1.00	61.90%	
102	Establish teaching group to discuss and develop digital teaching implementation model	4.00	4.00	1.00	80.95%	
103	Carry out regular digital teaching implementation exercises	3.00	3.00	1.00	47.62%	
	Dig	gital lea	adershi	ip	-	
104	Strengthen teachers' ability to guide students through digital means	4.00	5.00	1.00	80.95%	
105	Strengthen teachers' data teaching management ability	5.00	5.00	1.50	76.19%	
106	Strengthen the exemplary role of teachers' digital literacy	4.00	4.00	1.00	66.67%	
107	Rationalize and control students' study time	4.00	4.00	1.50	76.19%	
108	Strengthen the support of teaching departments and school leaders	4.00	4.00	1.50	76.19%	
109	Cultivate teachers' reflection consciousness of digital education	4.00	3.00	1.00	52.38%	

NO	ltem	Md	Мо	IQR	Consensus(%)	Suggest
110	Strengthen the understanding of teachers' data-based leadership	4.00	4.00	1.00	80.95%	
111	Strengthen the knowledge base of teachers' digital leadership	4.00	4.00	1.00	80.95%	
112	Pursuit of disciplinary integration	2.00	2.00	0.50	0.00%	
113	Organize training programs specifically for digital leadership	4.00	4.00	1.00	85.71%	

#### 3. Questionnaire

For the questionnaire about the development mode of digital literacy of teachers in higher vocational colleges in Guangxi, please select your degree of agreement with the following description according to the actual situation. The degree of agreement ranges from 5 to 1, strongly agree, agree, neutral, disagree, and strongly disagree. Please select one according to your actual situation. It may also provide any modifications, additions or deletions to the development model, as well as suggestions for modifying the description.

Part 1: Respondent Status (Personal Information)

Name: Gender: School: Experience: Educational background: Professional Title:

Part 2: Questionnaire

				Scor	e		suggest
NO	Item	5	4	3	2	1	
	Digital perception						
1	Establish the concept of digital education						
L	for teachers						
2	Establish a sense of overcoming difficulties						
3	Conduct special training courses to enhance						
	teachers' awareness of digital value						
4	Conducts regular seminars on digital values						
5	Regularly test the teacher digital awareness						
6	Learn practical examples of the use of						
0	digitalization						
7	Strengthen teachers' initiative to integrate						
1	digital technology into teaching						
8	Offer confidence building programs						
Q	Promoting digital literacy through new						
	media						
	Digital knowledge and	skills	5	1	1	1	
10	Conduct both online and offline lectures						
11	Conduct digital knowledge and skills						
11	competition						
12	Strengthen the study of new technical						
12	knowledge						
13	Encourage peers to exchange digital						
15	knowledge and skills						
14	Provide self-assessment courses						
15	Provide self-study theory courses						
16	Provide expert guidance						
17	Practical courses are offered						
	Digital application	1	1	1	1	1	
18	Regular digital application training for						
18	teachers at different levels						

	li e u			Scor	e		
NO	ltem	5	4	3	2	1	suggest
	Training teachers to use SPSS and other						
19	software for statistical analysis of teaching						
	data						
	Training teachers use a learning						
20	management system (LMS) and other data						
	analysis tool						
	Training teachers to use ChatGTP and other						
21	artificial intelligence technology to carry out						
	work and teaching						
22	Strengthen teachers' ability of information						
	retrieval, evaluation and utilization						
22	Strengthen teachers' ability to use digital						
25	tools for daily work and teaching						
24	Regularly carry out the selection of						
24	excellent digital application teachers						
25	School leaders play an exemplary role						
26	Encourage teachers to develop innovative						
20	digital applications						
	Digital duty	1		1	1	1	ſ
27	Learn the laws and regulations in the field						
21	of Internet						
28	Learn the laws and regulations in the field						
20	of intellectual property						
29	Conduct thematic lectures on data security						
30	Learn a cautionary educational case for						
	data security						
	Encourage self-reflection and peer						
31	evaluation of digital behavior for						
	compliance with laws and regulations						
32	Encourage teachers to get your network						
52	security related certification						
33	Establishment of a data security group to						
	explore data security						
34	Conduct simulation activities						

		Score					
NO	ltem	5	4	3	2	1	suggest
35	Learn great examples of securing data						
36	Commend teachers who excel in digital						
50	responsibility						
37	Provide support for security						
	Professional developm	hent	1	1	1	1	Γ
38	Reflection and improvement of own						
50	shortcomings						
39	Enhancing Innovative Teaching Models and						
	Learning Styles						
40	Improve teachers' own digital teaching level						
41	Learn from your peers' excellent learning						
	methods						
42	Analyze learning outcomes with peers						
43	Participate in digital teaching forums and						
	conferences						
44	Establish an annual teacher development						
	plan						
45	Establish a data-driven portfolio of teachers'						
	teaching ability development						
46	Cultivate teachers' lifelong learning habits						
47	Improvement of teachers' level of						
	education reform and research						
	Digital communicatio						
48	sommunication tools						
10							
49	Communicate with students by using digital						
50	tools						
51	Use network civilization language						
52	Improve teachers' communication skills						
	Promote online interaction with students						
53	and parents						
54	Use a variety of communication methods						

				Scor	е		cussost
NO	ltem	5	4	3	2	1	suggest
	Cultivate teachers' emotional management						
55	ability						
56	Cultivate teacher patience						
	Digital teaching designed	gn	1	1	1		I
57	Establish a reward mechanism for digital						
51	instructional design						
58	Establish the evaluation mechanism of						
50	digital instructional design						
59	Establish the feedback and iteration						
	mechanism of digital instructional design						
60	Digital instructional design ability into the						
00	teacher title system						
61	Establish management and implementation						
01	department						
62	Encourage teachers to participate in the						
02	contest of teaching ability						
63	Focus on learning excellent digital teaching						
	design cases						
64	Regularly test the teachers level of digital						
	design						
65	Regularly evaluate teachers' excellent cases						
	of digital teacher design						
66	Invite famous teachers lecture to promote						
	teacher's teaching ability						
67	Establish the learning community of Digital						
	Instructional design						
68	Provide financial support						
	Digital teaching impleme	ntati	on				
69	Establish the evaluation mechanism of						
	digital teaching implementation						
70	Establish a reward mechanism for the						
	implementation of digital teaching						
71	Establish the implementation plan of digital						
1 1	teaching						

			:	Scor	e		suggest
NO	Item	5	4	3	2	1	suggest
70	Establish the evaluation mechanism of						
12	digital teaching effect						
73	Carry out the evaluation of excellent cases						
15	of digital teaching implementation						
74	Carry out the learn of excellent cases of						
14	digital teaching implementation						
	Establish teaching group to discuss and						
75	develop digital teaching implementation						
	model						
	Carry out special training on the						
76	implementation of digital teaching for						
	teachers						
77	Invited famous teachers to give lectures on						
	improving digital teaching ability						
78	Training teachers in data analysis and data						
10	assessment capabilities						
	Encourage teachers to carry out teaching						
79	reform research on the implementation of						
	digital teaching						
80	Encourage teachers to use digital teaching						
00	materials						
Q1	Teachers are encouraged to experiment						
01	with VR/AR teaching						
82	Encourage teachers to carry out						
02	individualized teaching for students						
	Digital leadership	1	1	1	Γ	r	
02	Strengthen the understanding of teachers'						
00	data-based leadership						
04	Strengthen the knowledge base of teachers'						
04	digital leadership						
05	Organize training programs specifically for						
00	digital leadership						
04	Strengthen teachers' data teaching						
86	management ability						

	ltem		0	cuggost			
NO	ltem	5	4	3	2	1	suggest
07	Strengthen teachers' ability to guide						
07	students through digital means						
00	Strengthen the exemplary role of teachers'						
00	digital literacy						
89	Rationalize and control students' study time						
90	Strengthen the support of teaching						
	departments and school leaders						

## 4. Evaluate

Please comment on the development pattern of each dimension and mark the appropriate box with " $\checkmark$ " if you agree. You can also fill in suggestions. Please fill in the corresponding box to modify or supplement the indicator. (P for pass, E for edit and D for delete).

NO	Item	Р	E	D
	Digital perception	-		
1	Establish the concept of digital education for teachers			
2	Establish a sense of overcoming difficulties			
3	Conduct special training courses to enhance teachers' awareness of digital value			
4	Provide self-study courses to develop data sensitivity			
5	Conducts regular seminars on digital values			
6	Regularly test the teacher digital awareness			
7	Learn practical examples of the use of digitalization			
8	Strengthen teachers' initiative to integrate digital technology into teaching			
9	Promoting digital literacy through new media			
10	Build a digital campus			
Sugge	stions:			

NO	Item	Р	E	D
	Digital knowledge and skills			
11	Conduct both online and offline lectures			
12	Conduct digital knowledge and skills competition			
13	Strengthen the study of new technical knowledge			
14	Encourage peers to exchange digital knowledge and skills			
15	Provide self-assessment courses			
16	Provide self-study theory courses			
17	Provide expert guidance			
18	Practical courses are offered			
19	Provide digital technology white papers			
	Digital application			
20	different levels			
21	Training teachers to use SPSS and other software for statistical analysis of teaching data			
22	Training teachers use a learning management system (LMS) and other data analysis tool			
23	Training teachers to use ChatGTP and other artificial intelligence technology to carry out work and teaching			
24	Strengthen teachers' ability of information retrieval, evaluation and utilization			
25	Strengthen teachers' ability to use digital tools for daily work and teaching			
26	Regularly carry out the selection of excellent digital application teachers			
27	School leaders play an exemplary role			
28	Encourage teachers to develop innovative digital applications			

NO	Item	Р	Е	D
20	Schools develop digital enhancement			
29	programmes for teachers			
30	Establish technical support team			
21	Strengthen the construction of the digital			
51	application infrastructure			
Sugge	stions:			
	Digital duty			
20	Learn the laws and regulations in the field of			
52	Internet			
22	Learn the laws and regulations in the field of			
	intellectual property			
34	Conduct thematic lectures on data security			
35	Learn a cautionary educational case for data			
	security			
	Encourage self-reflection and peer evaluation of			
36	digital behavior for compliance with laws and			
	regulations			
37	Encourage teachers to get your network security			
	related certification			
38	Establishment of a data security group to explore			
	data security			
39	Role-play simulation activities to experience data			
10	security			
40	Learn great examples of securing data			
41	Commend teachers who excel in digital			
	responsibility			
42	Provide technical support for teachers data			
-	security			
43	schools provide data security support emergency			
Sugge	tions:			
Jugge	SUULIS.			

NO	Item	Р	Е	D				
	professional development							
44	Reflection and improvement of own shortcomings							
45	Enhancing Innovative Teaching Models and							
45	Learning Styles							
46	Improve teachers' own digital teaching level							
47	Learn from your peers' excellent learning							
47	methods							
48	Analyze learning outcomes with peers							
40	Participate in digital teaching forums and							
49	conferences							
50	Establish an annual teacher development plan							
51	Establish a data-driven portfolio of teachers'							
51	teaching ability development							
52	Cultivate teachers' lifelong learning habits							
52	Improvement of teachers' level of education							
55	reform and research							
54	Teachers to the enterprise post practice							
Sugge	stions:							
	Digital communication							
	Strengthen teachers' ability to use communication							
55	tools							
56	Learn new digital communication tools							
57	Communicate with students by using digital tools							
58	Use network civilization language							
59	Improve teachers' communication skills							
(0)	Promote online interaction with students and							
60	parents							
61	Use a variety of communication methods							
62	Cultivate teachers' emotional management ability							
63	Cultivate teacher patience							
64	Schools provide digital communication repository							

NO	Item	Р	E	D
Sugge	stions:			
	Digital teaching design			
	Establish a reward mechanism for digital			
65	instructional design			
	Establish the evaluation mechanism of digital			
00	instructional design			
67	Establish the feedback and iteration mechanism			
01	of digital instructional design			
68	Digital instructional design ability into the teacher			
	title system			
69	Establish management and implementation			
	department			
70	Encourage teachers to participate in the contest			
	of teaching ability			
71	Focus on learning excellent digital teaching design			
70	Cases			
12	Regularly evaluate teachers level of digital design			
73	digital teacher design			
	Invite famous teachers lecture to promote			
74	teacher's teaching ability			
	Establish the learning community of Digital			
75	Instructional design			
76	Provide financial support			
77	Provide digital educational resource library			
78	Provide digital teaching design for expert teachers			
70	Provide a workbook for conducting digital			
19	instructional design			
Sugge	stions:			

NO	Item	Р	Е	D					
	Digital teaching implementation								
00	Establish the evaluation mechanism of digital								
00	teaching implementation								
01	Establish a reward mechanism for the								
01	implementation of digital teaching								
82	Establish the implementation plan of digital								
02	teaching								
83	Establish the evaluation mechanism of digital								
00	teaching effect								
01	Carry out the evaluation of excellent cases of								
04	digital teaching implementation								
95	Carry out the learn of excellent cases of digital								
- 00	teaching implementation								
06	Establish teaching group to discuss and develop								
00	digital teaching implementation model								
07	Carry out special training on the implementation								
87	of digital teaching for teachers								
00	Invited famous teachers to give lectures on								
00	improving digital teaching ability								
00	Training teachers in data analysis and data								
09	assessment capabilities								
	Encourage teachers to carry out teaching reform								
90	research on the implementation of digital								
	teaching								
01	Encourage teachers to use digital teaching								
91	materials								
0.0	Teachers are encouraged to experiment with								
92	VR/AR teaching								
02	Encourage teachers to carry out individualized								
95	teaching for students								
0.1	Create an atmosphere for digital teacher								
94	implementation								
05	Provide digital teaching implementation software								
95	and hardware equipment								
96	Provide a rich digital teaching resource platform								

NO	ltem	Р	E	D					
Sugge	Suggestions:								
	Digital leadership								
97	Strengthen the understanding of teachers' data-								
	based leadership								
98	Strengthen the knowledge base of teachers'								
- 20	digital leadership								
00	Organize training programs specifically for digital								
99	leadership								
100	Strengthen teachers' data teaching management								
100	ability								
101	Strengthen teachers' ability to guide students								
101	through digital means								
100	Rationalize and control students' online learning								
102	time								
100	Strengthen the exemplary role of teachers' digital								
103	literacy								
10.1	Strengthen the support of teaching departments								
104	and school leaders								
105	Construction of Digital Campus								
Sugge	stions:								

Appendix D The Results of the Quality Analysis of Research Instruments

			E	Expert				
NO	ltem	NO	NO	NO	NO	NO	IOC	Validlity
		1	2	3	4	5		
	Digit	al pe	rcepti	on	I			1
1	Establish the concept of digital education for teachers	1	1	1	1	1		valid
2	Establish a sense of overcoming difficulties	1	1	1	1	1		valid
3	Strengthen teachers' initiative to integrate digital technology into teaching	1	1	1	1	1		valid
4	Promoting digital literacy through new media	1	1	1	1	1		valid
5	Offer confidence building programs	1	1	1	1	1		valid
6	Regularly test the teacher digital awareness	1	1	1	1	1		valid
7	Communicate with enterprises	1	1	1	1	1		valid
8	Conduct special training courses to enhance teachers' awareness of digital value	1	1	1	1	1		valid
9	Learn practical examples of the use of digitalization	1	1	1	1	1		valid
10	Help teachers set career goals	1	1	1	1	1		valid
11	Conducts regular seminars on digital values	1	1	1	1	1		valid
	Digital kn	owled	dge ar	nd skil	lls			
12	Encourage peers to exchange digital knowledge and skills	1	1	1	1	1		valid
13	Conduct digital knowledge and skills competition	1	1	1	1	1		valid
14	Strengthen the study of new technical knowledge	1	1	1	1	1		valid

			E	Expert				
NO	ltem	NO	NO	NO	NO	NO	IOC	Validlity
		1	2	3	4	5		
15	Conduct both online and offline lectures	1	1	1	1	1		valid
16	Provide self-assessment courses	1	1	1	1	1		valid
17	Provide self-study theory courses	1	1	1	1	1		valid
18	Practical courses are offered	1	1	1	1	1		valid
19	Provide expert guidance	1	1	1	1	1		valid
20	Encourage teachers to search for knowledge on the Internet	1	1	1	1	1		valid
21	Master digital tools	1	1	1	1	1		valid
	Digit	al app	olicati	on				
22	Regular digital application training for teachers at different levels	1	1	1	1	1		valid
23	Strengthen teachers' ability to use digital tools for daily work and teaching	1	1	1	1	1		valid
24	School leaders play an exemplary role	1	1	1	1	1		valid
25	Regularly carry out the selection of excellent digital application teachers	1	1	1	1	1		valid
26	Training teachers to use SPSS and other software for statistical analysis of teaching data	1	1	1	1	1		valid
27	Training teachers use a learning management system (LMS) and other data analysis tool	1	1	1	1	1		valid

			E	Expert				
NO	Item	NO	NO	NO	NO	NO	IOC	Validlity
		1	2	3	4	5		
	Training teachers to use							
28	ChatGTP and other artificial	1	1	1	1	1		valid
	intelligence technology to	-	-	-	1	-		
	carry out work and teaching							
	Strengthen teachers' ability of							
29	information retrieval,	1	1	1	1	1		valid
	evaluation and utilization							
	Encourage teachers to							
30	develop innovative digital	1	1	1	1	1		valid
	applications							
	According to the demand of							
31	talent training, explore the	1	1	1	1	1		valid
	innovation of digital teaching							
	Develop contextualized and							
32	personalized teaching	1	1	1	1	1		valid
	resources							
	C	Digital	duty	1				
	Learn the laws and							
33	regulations in the field of	1	1	1	1	1		valid
	Internet							
34	Conduct thematic lectures	1	1	1	1	1		valid
	on data security	-	-	_				
35	Learn great examples of	1	1	1	1	1		valid
	securing data	-	-	-	-			
	Learn a cautionary							
36	educational case for data	1	1	1	1	1		valid
	security							
	Learn the laws and							
37	regulations in the field of	1	1	1	1	1		valid
	intellectual property							
38	Commend teachers who	1	1	1	1	1		valid
50	excel in digital responsibility	T	T	T	T	T		valiu

			Experts					
NO	Item	NO	NO	NO	NO	NO	IOC	Validlity
		1	2	3	4	5		
	Encourage self-reflection and							
39	peer evaluation of digital	1	1	1	1	1		valid
37	behavior for compliance with	-	-	-	-	-		valia
	laws and regulations							
40	Install the National anti-fraud	1	1	1	1	1		valid
-10	APP	-	-	-	-	1		valia
	Encourage teachers to get							
41	your network security related	1	1	1	1	1		valid
	certification							
42	Provide support for security	1	1	1	1	1		valid
	Establishment of a data							
43	security group to explore	1	1	1	1	1 1		valid
	data security							
44	Conduct simulation activities	1	1	1	1	1		valid
45	Watch anti-fraud	1	1	1	1	1		valid
40	documentaries	T	Ţ	T	Ţ	T		valiu
	Professio	onal d	evelo	pmer	nt			
	Enhancing Innovative							
46	Teaching Models and	1	1	1	1	1		valid
	Learning Styles							
47	Establish an annual teacher	1	1	1	1	1		valid
47	development plan	T	Ţ	T	Ţ	Ţ		valiu
18	Improve teachers' own digital	1	1	1	1	1		valid
40	teaching level	T	1	T	T			valiu
19	Improve the scientific and	1	1	1	1	1		valid
47	technical level of teachers	1	T	1	T	T		valid
	Improvement of teachers'							
50	level of education reform	1	1	1	1	1		valid
	and research							
	Establish a data-driven							
51	portfolio of teachers'	1	1	1	1	1		valid
	teaching ability development							

			E	Expert				
NO	ltem	NO 1	NO 2	NO 3	NO 4	NO 5	IOC	Validlity
52	Cultivate teachers' lifelong learning habits	1	1	1	1	1		valid
53	Establish mutual help relationship with peers and make progress together	1	1	1	1	1		valid
54	Analyze learning outcomes with peers	1	1	1	1	1		valid
55	Learn from your peers' excellent learning methods	1	1	1	1	1		valid
56	Improve their own level, form a model	1	1	1	1	1		valid
57	Participate in digital teaching forums and conferences	1	1	1	1	1		valid
58	Reflection and improvement of own shortcomings	1	1	1	1	1		valid
	Digital	comr	nunic	ation				
59	Communicate with students by using digital tools	1	1	1	1	1		valid
60	Use network civilization language	1	1	1	1	1		valid
61	Improve teachers' communication skills	1	1	1	1	1		valid
62	Strengthen teachers' ability to use communication tools	1	1	1	1	1		valid
63	Learn new digital communication tools	1	1	1	1	1		valid
64	Promote online interaction with students and parents	1	1	1	1	1		valid
65	Exemplary role of leadership	1	1	1	1	1		valid
66	Use a variety of communication methods	1	1	1	1	1		valid
67	Develop empathy in teachers	1	1	1	1	1		valid
68	Cultivate teacher patience	1	1	1	1	1		valid

			E	Expert				
NO	ltem	NO	NO	NO	NO	NO	IOC	Validlity
		1	2	3	4	5		
69	Cultivate teachers' emotional	1	1	1	1	1		valid
	management ability	-	-	-	-	-		Valia
	Digital	teach	ning d	esign				1
	Digital instructional design							
70	ability into the teacher title	1	1	1	1	1		valid
	system							
	Encourage teachers to							
71	participate in the contest of	1	1	1	1	1		valid
	teaching ability							
70	Establish a reward							
(2	mechanism for digital	1	1	1	1	1		valid
	Instructional design							
73	Focus on learning excellent	1	1	1	1	1		valid
	digital teaching design cases							
74	Establish the evaluation							1. 1
74	mechanism of digital	1	1	1	1	1		valid
	Instructional design							
75	Establish the feedback and	1	1	1	1	1		
15	iteration mechanism of digital	1	T	1	T	I		valid
	Instructional design							
76	Regularly test the teachers	1	1	1	1	1		valid
	Establish management and							
77		1	1	1	1	1		valid
	Regularly evaluate teachers'							
78	excellent cases of digital	1	1	1	1	1		valid
10	teacher design	L L	T	1	T	T		valid
	Invite famous teachers							
79	lecture to promote teacher's	1	1	1	1	1		valid
	teaching ability		-		1	1		valia
	Establish the learning							
80	community of Digital	1	1	1	1	1		valid
	Instructional design							

			E	Expert				
NO	ltem	NO	NO	NO	NO	NO	IOC	Validlity
		1	2	3	4	5		
81	Provide financial support	1	1	1	1	1		valid
82	Peers listen to each other	1	1	1	1	1		valid
02	Visit the school digital	1	1	1	1	1		volid
00	construction results	1	Ţ	Ţ	Ţ	1		valiu
01	Participate in campus digital	1	1	1	1	1		volid
04	construction		L	L	1	1		valiu
05	Visit a multimedia production	1	1	1	1	1		valid
60	company		L	L	T	T		Valiu
	Digital teac	hing i	mpler	nenta	tion			
	Establish a reward							
0(	mechanism for the	1	1	1	1	1 1		, alial
00	implementation of digital	T	1	T				valiu
	teaching							
	Training teachers in data							
87	analysis and data assessment	1	1	1	1	1		valid
	capabilities							
00	Establish the implementation	1	1	1	1	1		, alial
88	plan of digital teaching	1	T	T	T	T		valid
	Carry out special training on							
89	the implementation of digital	1	1	1	1	1		valid
	teaching for teachers							
	Encourage teachers to carry							
00	out teaching reform research	1	1	1	1 1	1 1		valid
90	on the implementation of	L	T	T	T	T		Valid
	digital teaching							
01	Encourage teachers to use	1		1	1	1		valid
91	digital teaching materials	T	T	T	T	T		Valiu
	Invited famous teachers to							
92	give lectures on improving	1	1	1	1	1		valid
	digital teaching ability							
	Teachers are encouraged to							
93	experiment with VR/AR	1	1	1	1	1		valid
	teaching							
		Experts						
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NO	Item	NO	NO	NO	NO	NO	IOC	Validlity
		1	2	3	4	5		
94	Establish the evaluation	1	1	1	1	1		
	mechanism of digital							valid
	teaching effect							
95	Encourage teachers to carry	1	1	1	1	1		
	out individualized teaching							valid
	for students							
96	Establish the evaluation	1	1	1	1	1		
	mechanism of digital							valid
	teaching implementation							
97	Establish a teacher	1	1	1	1	1		valid
	elimination system							
98	Peers listen to each other	1	1	1	1	1		valid
	The strategic position of	1	1	1	1	1		valid
99	digital teaching							
	implementation should be							
	clarified							
	Carry out the evaluation of							
100	excellent cases of digital	1	1	1	1	1		valid
	teaching implementation							
101	Carry out the learn of	1	1	1	1	1		valid
	excellent cases of digital							
	teaching implementation							
102	Establish teaching group to	1	1	1	1	1		valid
	discuss and develop digital							
	teaching implementation							
	model							
103	Carry out regular digital	1	1	1	1	1		valid
	teaching implementation							
	exercises							
Digital leadership								
104	Strengthen teachers' ability	1	1	1	1	1		valid
	to guide students through							
	digital means							

		Expert	perts					
NO	Item	NO	NO	NO	NO	NO	IOC	Validlity
		1	2	3	4	5		
105	Strengthen teachers' data	1	1	1	1	1		valid
	teaching management ability							Valiu
106	Strengthen the exemplary							
	role of teachers' digital	1	1	1	1	1		valid
	literacy							
107	Rationalize and control	1	1	1	1	1		valid
	students' study time	Ţ	Ţ	Ţ	1	T		valiu
108	Strengthen the support of							
	teaching departments and	1	1	1	1	1		valid
	school leaders							
109	Cultivate teachers' reflection							
	consciousness of digital	1	1	1	1	1		valid
	education							
110	Strengthen the understanding							
	of teachers' data-based	1	1	1	1	1		valid
	leadership							
111	Strengthen the knowledge							
	base of teachers' digital	1	1	1	1	1		valid
	leadership							
112	Pursuit of disciplinary	1	1	1	1	1		valid
	integration	-	-	-	-	-		Valia
113	Organize training programs							
	specifically for digital	1	1	1	1	1		valid
	leadership							

Appendix E Certificate of English



Appendix F

The Document for Accept Research



# วารสาร RSU JET

วิศวกรรมและเทคโนโลยี มหาวิทยาลัยรังสิต RANGSIT UNIVERSITY JOURNAL OF ENGINEERING AND TECHNOLOGY

1 ตุลาคม 2567

- เรื่อง ตอบรับบทความเรื่อง "The Digital Literacy Development Model for Higher Vocational College Teachers in Guangxi" ลงตีพิมพ์ในวารสารวิศวกรรมและเทคโนโลยี มหาวิทยาลัยรังสิต (RSU JET)
- เรียน Feng Yu, Assoc.Prof.Dr.Pong Horadal, Asst.Prof.Dr.Kanakorn Sawangcharoen, and Asst.Prof.Dr.Prapai Sridama

กองบรรณาธิการวารสารวิศวกรรมและเทคโนโลยี มหาวิทยาลัยรังสิต (RSU JET) ขอเรียนแจ้งให้ ทำนทราบว่า บทความเรื่อง *"The Digital Literacy Development Model for Higher Vocational College Teachers in Guangxi*" ที่ท่านส่งมาเพื่อพิจารณาและตีพิมพ์กับวารสารฯ นั้น ขณะนี้ผ่านการ พิจารณาแล้ว โดยทางวารสารฯ จะนำบทความของท่านลงตีพิมพ์ในวารสารฯ เล่มปีที่ 27 ฉบับที่ 2 (กรกฎาคม-ธันวาคม 2567)

ขอแสดงความนับถือ

A.

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