

# **The Training Curriculum Development for Enhancing Digital Technology for Learning Management Abilities of Vocational College Lecturers in Jiangsu Province, People's Republic of China**

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## **Abstract**

Ability to manage the digital technology for teaching and learning is the first priority for vocational college lecturers in the present time. This study aimed: 1) to analyze current situations and needs on digital technology for learning management abilities of vocational college lecturers; 2) to design and develop the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers; 3) to implement the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers; and 4) to evaluate the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, Peoples' Republic of China. This study was divided into four phases: Phase 1 Studying and analyzing the current situations and needs on digital technology for learning management abilities of vocational college lecturers. The samples were 100 lecturers, 100 students and 100 graduates from Wuxi Vocational College of Science and Technology. A questionnaire was designed to assess the digital technology for learning management abilities of vocational college lecturers. The collected data were analyzed by using frequency, percentage, mean and standard deviation; Phase 2 Developing the training curriculum. The target group consisted of 20 stakeholders, including one director, one vice director, 8 department heads, and 10 employers. Content analysis technique was performed on the interview data; Phase 3 Implementing the training curriculum. The target group included 10 lecturers who volunteered to participate in the training curriculum in Wuxi Vocational College of Science and Technology. The instrument was training process module testing and post-training following-up survey. The collected data were analyzed by using frequency, percentage, mean and standard deviation; Phase 4 Evaluating the training curriculum. The target groups were 10 vocational college lecturers and five experts. The research instruments were satisfaction questionnaire and questionnaire for evaluating the quality of the training curriculum. The data were analyzed by using mean and standard deviation. The findings could be summarized as follows:

1. The digital technology for learning management abilities of vocational college lecturers included four factors: Digital application, Digital technology Knowledge and skills, Digital awareness, Professional development, which Digital awareness was at a high level while Digital application, Digital technology knowledge and skills, Professional development were at a moderate level.

2. The designed and developed training curriculum included three modules: Digital application, Digital technology knowledge and skills, Professional development. Each module spanned 16 hours, resulting in a comprehensive 6 days and 48 hours. The training curriculum comprised both theoretical learning and practical exercises.

3. The results of the training curriculum showed that the digital technology for learning management abilities of vocational college lecturers was higher after the training of Module 1 Digital application, Module 2 Digital technology knowledge and skills and Module 3 Professional development and the skill application rate reached 82.80%. The training curriculum was effective and feasible.

4. The lecturers from Wuxi Vocational College of Science and Technology were satisfied towards the training curriculum for enhancing digital technology for learning management abilities at a high level. In addition, the experts rated the quality of the training curriculum in overall was at a high level. When considering each quality component, it was found that the highest mean score was the quality of feasibility, followed by propriety, utility, accuracy, and comprehensiveness.

**Keywords:** Digital Technology; Learning Management Abilities; Training Curriculum; Vocation College Lecturers

## Introduction

Faced with the challenges that digitalization brings to economic and social development, many places around the world are actively exploring measures to cultivate skilled talents in the digital era to fully explore the advantages of human resources and enhance innovation-driven capabilities. The digitalization of education has risen to the level of strategic deployment by various countries. Our country also attaches great importance to the plan to improve lecturers' digital capabilities. In the "Ministry of Education's 2023 Work Points", "Implementing educational digital strategic actions" is listed as a key task, clearly leading the modernization of China's education with the support of educational digitalization. At the first World Digital Education Conference held on February 13, 2023, the Ministry of Education officially released the "Lecturer Digital Literacy" industry standard, which further combined with the latest requirements of the national education digitalization strategic action, and proposed lecturer education competency standards in the digital era (Ministry of Education of the People's Republic of China, 2022a).

Jiangsu is the major education province and the first province in the country to launch education information initiatives. In order to actively integrate into the national education digitalization strategic actions and explore the path for national education reform and development, at the end of June 2022, the Jiangsu pilot project of the national smart education platform was officially launched. In 2022, the "Implementation Plan of the

Provincial Department of Education on Accelerating the high-quality Construction of Digital Government” is formulated to clarify the goals and tasks of digital government construction in the education system, and effectively promote the reform and overall reshaping of the education digital governance system. In January 2023, the Jiangsu Provincial Department of Education issued the “Opinions of the Provincial Department of Education on Vigorously Promoting the Digitalization of Teaching in Colleges and Universities”, proposing to promote the deep integration of information technology and education and teaching, enrich the resources of digital teaching platforms, and accelerate the process of digitalization of teaching in colleges and universities (Jiangsu Provincial Department of Education, 2023).

With the rapid development of new digital economy formats, all walks of life have an increasing demand for high-quality technical talents, skilled craftsmen, and powerful craftsmen. As one of the important components of high education in China, vocational education bears the important task of cultivating front-line high-quality applied talents in production, management, operation and service. Therefore, vocational education should actively connect with the digital industry, actively explore how vocational education can better adapt to, serve, and support the healthy development of the digital economy, and provide decision-making case demonstrations and theoretical guidance for optimizing professional structures, curriculum settings, teaching material development, lecturer training; focusing on digitalization industry, creating a high-quality professional and innovative vocational teaching staff team; applying digital thinking to promote in-depth changes in education and teaching, and establishing a digital talent training system covering the entire process of "learning, teaching, training, and management"; connecting digital economy education chain, talent chain, industry chain, and innovation chain to create a new vocational education ecosystem in which multiple entities collaborate to educate people.

From the Central Committee of the Communist Party of China and the State Council in January 2018, which proposed that “Lecturers should proactively adapt to new technological changes such as information and artificial intelligence, and actively and effectively carry out education and teaching”, to the 2018 “Education Information 2.0 Action Plan” which proposed “Improving lecturers’ information literacy, and promote lecturers to actively adapt to new technological changes such as information.” In March 2022, the Ministry of Education proposed to promote the digital upgrade of vocational education and continuing education, create a “1+5” system for vocational education digitalization, and be driven by digital transformation as a whole Changes in teaching models and governance methods. The promulgation of a series of documents shows that with the emergence and continuous development of educational technology, digital capabilities will be one of the essential qualities and core competitiveness of all lecturers. Especially, the outbreak of the COVID-19 epidemic has highlighted the important role of digital capabilities in teachers’ teaching and education. However, whether it is to achieve the task requirements put forward in the series of documents, or to meet the practical needs of online teaching and the sustainable development needs of lecturers’ future digital capabilities, what digital capabilities lecturers develop and how to improve these digital capabilities are the prerequisites that urgently need to be solved and basic issues (Ministry of Education of the People's Republic of China, 2022b).

Passed the “2022 Teacher Digital Learning Report”, it was found that the current problems of lecturers’ digital abilities in vocational colleges in Jiangsu Province are: 1)

Lecturers' gender, teaching experience, and corporate work experience have a significant impact on lecturers' digital abilities. Some lecturers' ability to quickly adapt to the digital environment needs to be improved. strengthen; 2) Lecturers in vocational colleges have a gap between their psychological expectations of the effects of applying digital technology in teaching, and the level of digital ethics is uneven; 3) Lecturers lack a guide to refer to, and there is no benchmark against which they can measure themselves, so they have little confidence in their own technology. There is a deviation in understanding of abilities; 4) Lecturers generally use digital technology in teaching activities, but only as an auxiliary measure for teaching. There are certain problems in the deep integration of technology and teaching content and the connection between all aspects of teaching; and 5) Vocational lecturers still have deficiencies in how to apply digital technology to promote their professional development and improve students' digital practice effects, and there are large differences in their mastery levels (Ministry of Education of the People's Republic of China, 2022).

In response to this situation and for the development of lecturers' abilities, the Ministry of Education has implemented two batches of "Artificial intelligence-assisted lecturer team building" action pilots to build and launch a national-level digital learning platform for lecturers. The national smart education platform has also been officially upgraded and launched, but in during implementation and training, there are the following challenges in improving the digital capabilities of vocational education lecturers: 1) Negative understanding of applicability and effectiveness and concerns about costs; 2) Lecturers' low enthusiasm for participating in professional training caused by various factors; 3) As a the lack of competency standards for types of vocational education lecturers; and 4) The neglect of the diversity of vocational education and the imbalance in the allocation of high-quality educational resources caused by insufficient investment.

Faced with the development of lecturers' digital capabilities, scholars from various countries have conducted in-depth research. Tondeur et al. (2012) summarized the six major learning strategies of lecturer modeling, reflection, design learning, collaboration, real experience and feedback, and integrated them into pre-service lecturer training; Huang (2013) built a "trinity" model of course learning, micro-training and educational internship based on the TPACK model; Liu (2015) proposed an ecological training model of experience, learning, practice and evaluation; Napal, Peñalva-Vélez and Mendióroz (2018) emphasized the need to pay special attention to the integration of digital technology into teaching methods when designing training programs. Howard et al. (2021) used association rule analysis methods to explore the relationship between six strategies in order to seek to develop pre-service lecturers' digital abilities; Wang and Wang (2021) emphasized problem solving and system design, computational thinking for understanding human behavior is integrated into digital ability improvement elements; Wang et al. (2022) proposed to promote the development of lecturers' digital competency through teaching reflection, student opinions, collective discussions, professional training, community and other paths; Zhai et al. (2022) stated that teachers in the future need to emphasize their virtual and real education and teaching abilities, human-computer interaction abilities, data management and other abilities in virtual societies and social networks.

Although there are currently many ways to cultivate lecturers' digital literacy, research on cultivating lecturers' digital abilities in vocational colleges mainly focuses on the enabling effects of technology. Based on the value connotation, characteristic trends and

digital transformation challenges faced by lecturers in vocational colleges, researchers asked how lecturers should enhance their own digital awareness, how to master digital teaching skills, how to use technology to match digital teaching needs, and how to evaluate and promote its professional development and other research directions carry out systematic research on strategies to improve lecturers' digital capabilities: 1) further clarify the connotation, standards and evaluation of integrating digital capabilities into vocational education; 2) take into account general knowledge, professionalism and specialization, and actively respond to the industry Enterprises' ability demands; 3) Coordinate and promote lecturers' digital ability training and practice, return to real classrooms and combine theory with practice; and 4) Excavate and integrate demonstration cases of digital ability improvement.

### **Research Objectives**

1. To analyze current situations and needs on digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People's Republic of China
2. To design and develop the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People's Republic of China
3. To implement the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People's Republic of China
4. To evaluate the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People's Republic of China

### **Research Methodology**

This research employed the mixed method design divided into four phases, aiming to investigate, design, and develop the training curriculum development for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People's Republic of China. The research combined document analysis, questionnaire surveys, and interview analysis to ensure the comprehensiveness and scientific rigor of data collection and analysis. Each phase was structured around specific research objectives and implemented following theoretical frameworks and empirical methods, providing a solid foundation for the development and evaluation of the training curriculum.

#### **Phase 1: Studying and analyzing the current situations and needs digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People's Republic of China**

The researcher studied the documents, academic textbooks and previous studies related to digital technology for learning management abilities both in domestics and overseas. The research instrument was the documentary analysis form which includes the content summary.

The researcher constructed a set of questionnaires based on relevant theories and concepts, and it was used to study the current situation in digital technology for learning management abilities of vocational college lecturers. The samples for this research were 100

lecturers, 100 current students, and 100 graduates from Wuxi Vocational College of Science and Technology in Jiangsu Province, People's Republic of China. After trying out and conducting a reliability analysis of the questionnaire, the researcher organized the complete questionnaire in order to collect the data from the exact samples. The questionnaire data were analyzed by using mean and standard deviation.

**Phase 2: Designing and developing the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People's Republic of China**

The researcher constructed the interview questions for administering the 20 stakeholders, including one director, one vice director, 8 department heads who took care of digital technology for learning management abilities policies and 10 employers who employed the graduates or accepted the students for their internships with the results from Phase 1 and documentary and research review. The obtained data from the interview were analyzed by using content analysis technique.

After that the researcher used the interview results to design and develop the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People's Republic of China.

**Phase 3: Implementing the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People's Republic of China**

The researcher implemented the training curriculum for enhancing digital technology for learning management abilities with 10 vocational college lecturers who volunteered to participate in the training curriculum in Wuxi Vocational College of Science and Technology in Jiangsu Province, People's Republic of China.

After the training curriculum, a random classroom check was conducted on the 10 lecturers, and the expert group conducted teaching observations of the target group's classes to evaluate whether the training curriculum could help improve their skills. The post-training following-up survey scores were calculated to find out the mean and standard deviation.

**Phase 4: Evaluating the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People's Republic of China**

The researcher constructed and developed the satisfaction questionnaire to evaluate the satisfaction towards the training curriculum. The target participants were 10 lecturers who volunteered to participate in the training curriculum as the same groups as used in Phase 3. The quantitative data from the rating scale questionnaire were analyzed by using mean and standard deviation.

In addition, the researcher developed the questionnaire evaluating the quality of the training curriculum including five components: feasibility, propriety, accuracy, comprehensiveness and utility. The target group for evaluating training curriculum included five experts in the field of education. The collected questionnaire data were analyzed by using mean and standard deviation.

## **Conceptual Framework**

This study focused on the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People's

Republic of China. In the research, the researcher analyzed current situations and needs on using the digital technology for learning management abilities to design and develop the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, and then implemented the training curriculum to evaluate the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers. The research conceptual framework of this study is shown in Figure 1.

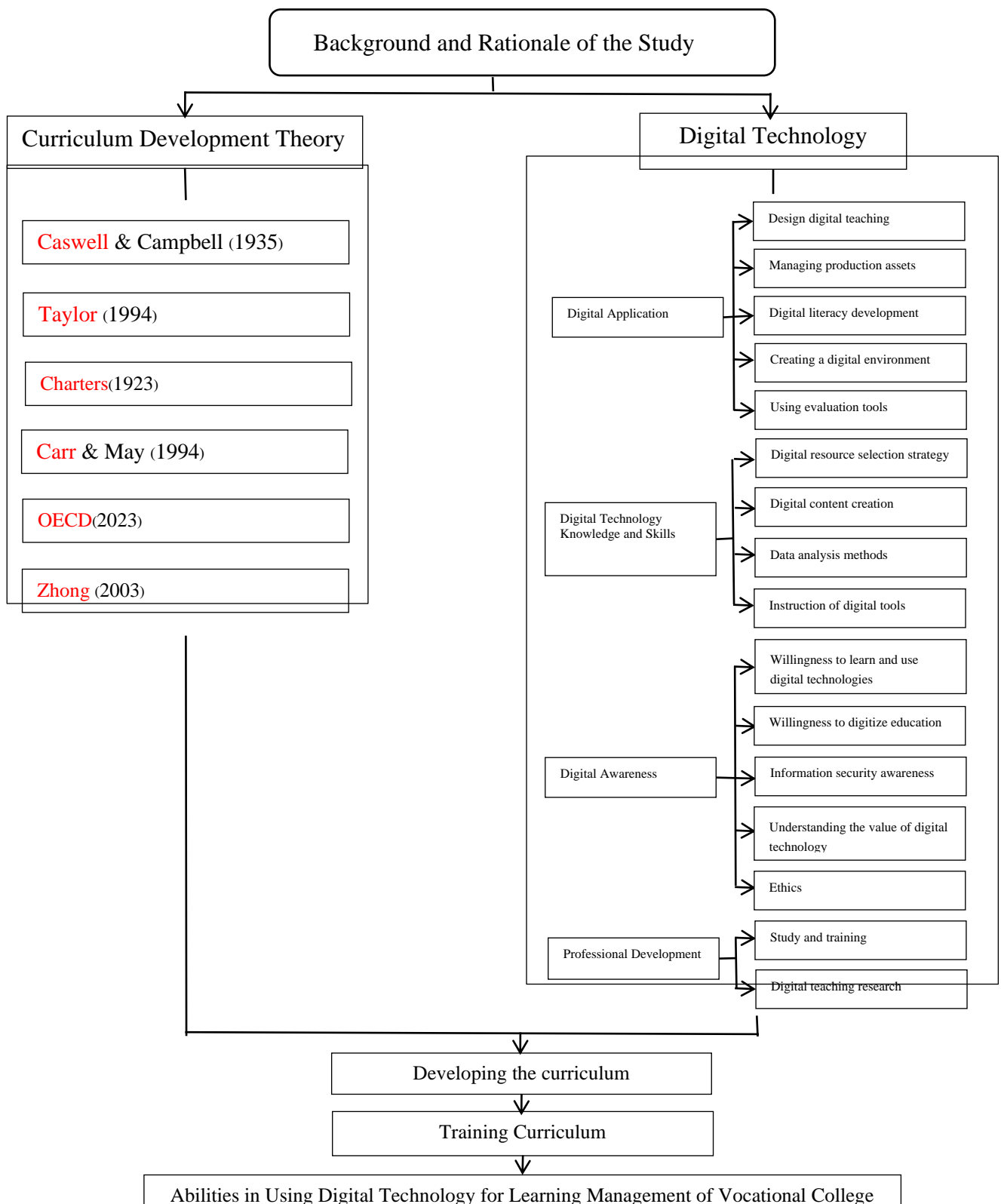


Figure 1 Conceptual Framework

## Research Results

### Phase 1: Current Situations and Needs on Digital Technology for Learning Management Abilities of Vocational College Lecturers

The research results from the documentary analysis form and sample data on the level of digital technology for learning management abilities of vocational college lecturers in Jiangsu Province are shown in Table 1.

**Table 1** Mean, Standard Deviation, Level, and Rank of Digital Technology Abilities (n=300)

Digital Technology for Learning Management Abilities	$\bar{X}$	S.D.	Level	Rank
<b>1. Digital Application</b>	<b>3.39</b>	<b>1.03</b>	<b>Moderate</b>	
1.1 Designing digital teaching	2.88	0.84	Moderate	14
1.2 Managing production assets	3.56	1.00	High	11
1.3 Digital literacy development	3.96	0.95	High	4
1.4 Creating a digital environment	3.76	0.97	High	8
1.5 Using evaluation tools	2.82	0.84	Moderate	15
<b>2. Digital Technology Knowledge and Skills</b>	<b>3.30</b>	<b>1.07</b>	<b>Moderate</b>	
2.1 Digital resource selection strategy	4.00	0.89	High	3
2.2 Digital content creation	2.70	0.94	Moderate	16
2.3 Data analysis methods	3.71	0.90	High	9
2.4 Instruction of digital tools	3.00	0.94	Moderate	12
<b>3. Digital Awareness</b>	<b>3.90</b>	<b>1.02</b>	<b>High</b>	
3.1 Willingness to learn and use digital technologies	3.77	0.99	High	7
3.2 Willingness to digitize education	3.79	1.01	High	6
3.3 Information security awareness	3.84	1.08	High	5
3.4 Understanding the value of digital technology	4.03	0.97	High	2
3.5 Ethics	4.23	0.92	High	1
<b>4. Professional Development</b>	<b>3.26</b>	<b>1.12</b>	<b>Moderate</b>	
4.1 Studying and training	3.63	1.03	High	10
4.2 Digital teaching research	2.90	1.08	Moderate	13
<b>Total</b>	<b>3.46</b>	<b>1.08</b>	<b>Moderate</b>	

According to Table 1, the overall of digital technology for learning management abilities of vocational college lecturers in Jiangsu Province showed that although it was generally at a moderate level ( $\bar{X} = 3.46$ , S.D.= 1.08), there were significant differences between different ability factors and indicators. Among them, "Digital Application" was generally at a moderate level, with Manage production assets, Digital literacy development, Create a digital environment at a high level, Designing digital teaching and Use evaluation tools at a moderate level; "Digital Technology Knowledge and Skills" was at a moderate level overall, with the indicators Digital resource selection strategy and Data analysis methods at a



high level, Digital content creation and Instruction of digital tools at a moderate level; “Digital Awareness” was at a relatively high level overall, with indicators such as Willingness to learn, use digital technologies, Willingness to digitize education, Information security awareness, Understanding the value of digital technology, and Ethics all at a relatively high level; “Professional Development” was at a moderate level overall, its indicators Study and training were at a high level, and Digital teaching research was at a moderate level.

### **Phase 2: Designing and Developing the Training Curriculum for Enhancing Digital Technology for Learning Management Abilities of Vocational College Lecturers**

Combined with the questionnaire and expert interview, the training curriculum structure for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People’s Republic of China is shown in Table 2.

**Table 2** Training Curriculum Structure

Training Modules	Training Units	Training Contents
Module 1: Digital Application	Unit1: Designing digital teaching	Lesson1: The basic theory and design process of instructional design Lesson2: Key points of blended instructional design Lesson3: Smart classroom teaching design
	Unit 2 : Using evaluation tools	Lesson4: Application of teaching evaluation tools Lesson5: Data visualization practice Lesson6: Digital Portraits
Module 2: Digital Technology Knowledge and Skills	Unit3: Digital content creation	Lesson7: Teaching content design Lesson8: Integration and optimization of digital teaching resources Lesson9: Making mobile micro-lessons
	Unit4: Instruction of digital tools	Lesson10: Interactive Electronic Whiteboard design teaching application Lesson11: Teaching and learning applications of virtual reality technology Lesson12: Teaching applications of artificial intelligence
Module 3 : Professional Development	Unit5: Digital teaching research	Lesson13: New progress in digital technology research Lesson14: New technology and teaching innovation Lesson15: Teaching reflection and teaching research Lesson16: Cultivation of digital teaching innovation ability of vocational college lecturers

As shown in Table 2, the training curriculum is divided into three modules with a total of 5 units. Each module spanned 16 hours, resulting in a comprehensive 6 days and 48 hours. The entire training was conducted in a hybrid online and offline mode. Each module contained a detailed training plan and additional resources used during the implementation process. The evaluation results of the training curriculum component further verified the comprehensiveness and effectiveness of the curriculum design.

### Phase 3: Implementing the Training Curriculum Development for Enhancing Digital Technology for Learning Management Abilities of Vocational College Lecturers

After training, a random classroom check was conducted on 10 lecturers from Wuxi Vocational College of Science and Technology who volunteered to participate in the training curriculum. The expert group conducted teaching observation and evaluation on the training lecturers. Results of the post-training following-up survey are shown in Table 3.

**Table 3** Post-training Following-up Survey Results after Training (n=10)

Post-training Following-up Survey	Summary	$\bar{X}$	S.D.	%
1. Ability to apply the theory of instructional design	45	4.50	0.53	90
2. Hybrid teaching design capabilities	45	4.50	0.71	90
3. Smart classroom teaching design ability	41	4.10	0.88	82
4. Ability to apply teaching evaluation tools	42	4.20	1.03	84
5. Data visualization skills	38	3.80	0.92	76
6. Digital portrait application capabilities	39	3.90	0.74	78
7. Ability to create teaching content	44	4.40	0.52	88
8. Digital teaching resource integration capabilities	41	4.10	0.74	82
9. Mobile micro-course production capabilities	40	4.00	0.67	80
10. Ability to use Interactive Electronic Whiteboard	41	4.10	0.88	82
11. Application of Virtual Reality Technology	41	4.10	0.88	82
12. Artificial intelligence teaching application ability	39	3.90	0.99	78
13. New technologies and teaching innovation capabilities	42	4.20	0.63	84
14. Teaching reflection and research ability	41	4.10	0.88	82
15. Digital teaching innovation capabilities	42	4.20	1.03	84
<b>Total</b>	<b>621</b>	<b>62.1</b>	<b>8.81</b>	<b>82.80</b>

According to Table 3, the results showed that the classroom observation score was 62.10 (out of 75 points), and the skill application rate reached 82.80%, which showed that the training effect was significant. The developed and designed training curriculum in this study has achieved the expected results.

### Phase 4: Evaluating the Training Curriculum Development for Enhancing Digital Technology for Learning Management Abilities of Vocational College Lecturers

The researcher evaluated the satisfaction towards the training curriculum development for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province, People's Republic of China. The evaluation results are shown in Table 4.

**Table 4** Evaluating the Satisfaction towards the Training Curriculum Development for Enhancing Digital Technology for Learning Management Abilities of Vocational College Lecturers in Jiangsu Province, China (n = 10)

Evaluation Contents	$\bar{X}$	S.D.	Level	Rank
1. Curriculum content	4.23	0.64	High	2
2. Teacher performance	4.23	0.73	High	3
3. Training methods and effects	4.28	0.64	High	2
<b>Total</b>	<b>4.24</b>	<b>0.66</b>	<b>High</b>	

From Table 4, the 10 vocational college lecturers were highly satisfied with the training curriculum for enhance digital technology for learning management abilities ( $\bar{X}$ =4.24, S.D.=0.66), among which "Training methods and effects" scored the highest, and "Curriculum content" and "Teacher performance" scored the same.

The evaluation of curriculum quality included five components, namely feasibility, propriety, accuracy, comprehensiveness and utility verified by five experts. The evaluation results are shown in Table 5.

**Table 5** Experts' Evaluation of the Quality of the Training Curriculum

Evaluation Contents	$\bar{X}$	S.D.	Level	Rank
1. Feasibility	4.40	0.58	High	1
2. Propriety	4.37	0.67	High	2
3. Accuracy	4.10	0.64	High	4
4. Comprehensiveness	3.93	0.80	High	5
5. Utility	4.24	0.44	High	3
<b>Total</b>	<b>4.24</b>	<b>0.63</b>	<b>High</b>	

Similarly, the experts' evaluation of the quality of the training curriculum was generally at a high level ( $\bar{X}$ =4.24, S.D.=0.63) with the mean scores from high to low were feasibility, propriety, utility, accuracy and comprehensiveness.

Overall, the trained vocational college lecturers and experts gave high evaluations of the training curriculum, indicating that the overall effect of the training curriculum was very good. This means that the curriculum content was very close to actual needs and could be effectively used to improve vocational college lecturers' digital technology for learning management abilities.

## Discussion

### 1. Current Situations and Needs on Digital Technology for Learning Management Abilities of Vocational College Lecturers

The results showed that the digital technology for learning management abilities of vocational colleges lecturers in Jiangsu Province were generally at a moderate level. Analysis of various factors shows that: Digital Awareness was at a high level; Digital application, Digital technology knowledge and skills, Professional development were at a moderate level. Analysis of various indicators showed that: Understanding the value of digital technology and Ethics were at a very high level; Managing production assets, Digital literacy development, Creating a digital environment, Digital resource selection strategy, Data analysis method, Willingness to learn and use digital technologies, Willingness to digitize education, Information security awareness, Studying and training were at a high level; Designing digital teaching, Using evaluation tools, Digital content creation, Instruction of digital tools, Digital teaching research were at a moderate level. This imbalance highlights areas where the lecturers' training curriculum should be targeted. To address these gaps, the training curriculum should focus on strengthening these specific competencies. The research findings provided an important reference point for the design and develop the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers.

The survey and analysis of training needs showed that the training topics most needed by lecturers were to improve the ability to design and practice digital teaching methods, improve the ability to evaluate and analyze digital teaching, and improve the ability to reform and innovate digital teaching. This reflects the core needs of lecturers to adapt to educational changes in the digital era; the training content prioritized digital teaching concepts and teaching content production, digital teaching design and implementation, which reflects the urgent needs and focus of lecturers on improving theoretical understanding, practical operation and curriculum design abilities in digital teaching; the model based on case analysis and discussion was the most popular training model among lecturers, and electronic teaching plans and software instruments were the most popular learning resources among lecturers, which reflected that lecturers preferred practical and interactive training models, especially solving practical teaching problems through case analysis. The training duration for each module was 16 hours. Saturdays and Sundays were the most suitable training times. Two days a week for three weeks was the ideal training duration. This reflected that lecturers preferred to concentrate their time on in-depth training and attached importance to flexible and efficient learning arrangements. These preferences were consistent with Pinar, Reynolds, Slattery and Taubman (2008) who emphasized that curriculum development was not isolated and decisions must be made under the influence of multiple forces (such as national policies, social needs, academic development, etc.).

However, there were significant differences among students and graduates. Students attach great importance to whether vocational college lecturers have the ability to use digital instrumentation and use digital technology to improve teaching. They believed that lecturers should master artificial intelligence 5G technology and were able to provide intelligent virtual education resources, were proficient in using simulation software, Chat GPT and other digital instruments, and understood the talent training direction of core literacy education; Graduates emphasized that vocational college lecturers with excellent digital technology for learning

management abilities should also pay attention to big data and artificial intelligence technologies, were proficient in operating digital devices, used digital teaching materials and digital portraits for education and teaching, and at the same time kept pace with the times to strengthen their own digital learning and improve professional development. These performances were consistent with the research findings of Zhao (2012) who emphasized that curriculum development needs to pay more attention to students' actual experience, contextual learning and interdisciplinary integration.

## **2. Developing the Training Curriculum for Enhancing Digital Technology for Learning Management Abilities of Vocational College Lecturers**

The experts' evaluation of the training curriculum for enhancing digital technology for learning management abilities of vocational college lecturers in Jiangsu Province showed that the overall average score level was high. This shows that:

2.1 The expert evaluation results of the training curriculum content outline showed that its content design was highly appropriate. The three modules "Digital Application", "Digital Technology Knowledge and Skills" and "Professional Development" and all curriculum have reached a "relatively high" or "the highest" level, which showed that the application value and improvement space of the curriculum content of these three modules in actual teaching have been highly affirmed and recognized by lecturers, and the curriculum outline met the needs of vocational college lecturers to improve their digital technology for learning management abilities. The first module "Digital Application" divided two teaching units: "Designing digital teaching" and "Using evaluation tools", included six lessons; The second module "Digital Technology Knowledge and Skills" divided two teaching units: "Digital content creation" and "Instruction of digital tools", included six lessons; The third module "Professional Development" divided one teaching unit: "Digital teaching research", included four lessons. Based on their evaluation scores, the sixteen lessons were ranked from high to low as follows: "Digital portraits" ranked first, followed by "Smart classroom teaching design" ranked second, "Application of teaching evaluation tools", "Data visualization practice", "Interactive electronic whiteboard design teaching application", "Teaching and learning applications of virtual reality technology", "Teaching applications of artificial intelligence", "Teaching reflection and teaching research" ranked third "The basic theory and design process of instructional design", "New progress in digital technology research", "New technology and teaching innovation" ranked fourth; "Key points of blended instructional design", "Teaching content design", "Integration and optimization of digital teaching resources", "Cultivation of digital teaching innovation ability of vocational college lecturers" ranked fifth; "Make mobile micro-lessons" ranked last. It was worth noting that "Digital portraits" and "Smart classroom teaching design" scored the highest, which showed that experts pay attention to the application of cutting-edge teaching technologies in the design of training curriculum, reflecting that experts believed that keeping up with the forefront of teaching technology could effectively improve lecturers' teaching ability and practical effects in a digital environment and met lecturers' needs for teaching innovation. This was consistent with the smart education theory proposed by Shang (2018: 53-58) who emphasized that smart education should focus on the use of technologies such as big data, artificial intelligence and

the Internet of Things to provide personalized and intelligent teaching experience.

2.2 The evaluation results of the training curriculum components further verified the comprehensiveness and effectiveness of the curriculum design. Curriculum objectives scored the highest, and the curriculum has an accurate positioning, reflecting the curriculum's pertinence and practicality. This is consistent with Alvi and Gillies' s (2020: 147-167) proposal of "Setting clear learning goals in education to promote students' active learning and deep understanding." The content selection score was high. The teaching content must meet the requirements of the actual work tasks of the occupation and incorporate the latest academic achievements and cutting-edge knowledge of digital technology. This is consistent with Kane's (2021) theory of integration of vocational education and technical training. He emphasized that educational content and training methods should be constantly updated to reflect the latest academic achievements and industry trends. The curriculum outline scored high, especially the complete knowledge structure and the specific regulations on teaching content, class time allocation, and teaching methods. This showed that the curriculum design was systematic and comprehensive, which helped to improve teaching effectiveness. This is consistent with Farina (2021)'s proposal that "Curriculum design should ensure the integrity of the knowledge structure and the effectiveness of teaching." The learning resources score was high, and the learning resources provided were rich and reliable, which was consistent with the "learning resources richness theory" proposed by Anderson (2019) who emphasized that effective learning resources should be diverse and reliable to support the needs and learning styles of different learners. The high score of curriculum planning indicated that curriculum planning was consistent with curriculum goals and could help lecturers implement teaching strategies effectively, which is consistent with the "Curriculum and teaching integration" proposed by Li (2017: 61-65). This theory emphasized that curriculum design should be closely integrated with teaching practice, focusing on the coordination and consistency of teaching goals, content, methods and evaluation. The teaching methods score was relatively high, considering the diverse requirements of teaching methods, which is consistent with the view proposed by Zhang (2021: 51-54) that "a sense of participation and learning motivation should be stimulated through diversified teaching methods." Although the evaluation method ranks last, it still scored high, considering that it was necessary to comprehensively evaluate the method of enhancing digital technology for learning management abilities of lecturers. This is consistent with the "Curriculum quality assurance theory" proposed by Li (2022: 15-22) which emphasized ensuring the effectiveness and adaptability of the curriculum through multi-dimensional evaluation.

To further verify the feasibility and effectiveness of the curriculum, the researcher invited five lecturers from Wuxi Vocational College of Science and Technology to participate in the pilot training. The pilot training received a high overall rating, with an average score of 4.39, which indicated that the training course was strongly supported by the participants. This positive result not only confirms the experts' evaluation, but also showed that the curriculum was very suitable to meet the actual needs of vocational college lecturers in real educational and teaching environments.

### **3. Implementing the Training Curriculum Development for Enhancing Digital**

### **Technology for Learning Management Abilities of Vocational College Lecturers**

A random classroom check was conducted on 10 lecturers from Wuxi Vocational College of Science and Technology, and the expert group conducted teaching observation and evaluation on the training lecturers. The results showed that the classroom observation score was 62.10 (out of 75 points), and the skill application rate reached 82.80%, which showed that the training effect was significant. Lecturers were able to effectively apply the learned digital teaching theories and instruments, improved their teaching design, classroom interaction and evaluation capabilities, and various digital teaching methods were effectively implemented. This meant that the developed and designed training curriculum achieved the expected results, which is consistent with the "Training evaluation model" proposed by Kirkpatrick (2016) which emphasized that the success of a training curriculum lies not only in the delivery of content, but also in ensuring its impact and value to learners through actual effect evaluation. These teaching observation and evaluation results showed that the curriculum content could effectively help lecturers master the key skills and methods of digital teaching. Through systematic training, lecturers have made significant progress in teaching design, application of digital tools, data analysis and teaching innovation. The rationality and pertinence of curriculum design and development effectively met the actual teaching needs of vocational college lecturers. The flexible teaching methods, rich learning resources and effective feedback mechanism during the implementation of the curriculum further enhance the training effect. The curriculum played an important role in improving the digital capabilities of lecturers and promoting educational modernization. Overall, this study provided a valuable reference for instructor training in vocational college and had the potential to inform other capacity building or similar training curricula in other regions.

#### **4. Evaluating the Training Curriculum Development for Enhancing Digital Technology for Learning Management Abilities of Vocational College Lecturers**

The results of the lecturers' satisfaction survey and the experts' evaluation of the quality of the developed training curriculum were generally good. In the lecturers' satisfaction survey, the average scores from high to low were "Training methods and effects", followed by "Curriculum content" and "Teachers' performance", with overall satisfaction being high. Among them, "The organization and arrangement of curriculum contents are reasonable." and "These training methods effectively stimulated my interest in learning" received the highest level." The organization and arrangement of curriculum contents are reasonable." highlights that the structure of the training curriculum was scientific, the arrangement of the content met the learning needs and teaching practice of the learners, and could effectively help the learners systematically understand and master the relevant knowledge and skills of digital teaching. This is consistent with Bates (2015)'s emphasis that "Curriculum design requires a scientific and reasonable structure, and the content must be systematically organized according to the actual needs of learners and teaching objectives in order to better promote teaching effectiveness and learning experience." These training methods effectively stimulated my interest in learning received the highest level. The training forms were flexible and diverse, focusing on interactivity and practice, which stimulates the enthusiasm of lecturers to apply what they have learned in actual teaching. This is consistent with the view of "Practice-oriented teacher training model" proposed by Miu (2017: 87-90). Similarly, the experts' evaluation of the quality of the training curriculum was generally at a high level, with the average scores from high to low being feasibility, propriety, utility, accuracy and

comprehensiveness. This is consistent with Li (2020: 75-78)'s statement that "The development and design training curriculum of digital technology for learning management abilities needs to be flexible and constantly updated in the rapidly changing digital environment to enhance teachers' digital literacy and teaching ability."

The experts also rated various aspects of the curriculum highly, further confirming its strong overall quality. It was noteworthy that the curriculum was highly implementable, indicating that the curriculum content was targeted at the characteristics of vocational colleges, fully considered the actual needs of lecturers, and was highly suitable for the educational and teaching needs and talent training needs of vocational college lecturers. At the same time, the curriculum highly ensured the scientific and cutting-edge nature of the technology, with accurate content and comprehensive coverage of all aspects of the improvement of digital technology for learning management abilities. The skills trained could be directly applied to teaching practice, meeting the needs of vocational college lecturers to solve specific problems, and ensuring the practicality of the curriculum. This is consistent with the view of Zhai et al. (2022) that "In the future, lecturers need to emphasize their virtual and real education and teaching abilities, human-computer interaction abilities, data management abilities, etc. in virtual society and social networks, and the content of lecturers' digital technology for learning management abilities also needs to be continuously updated according to the development of technology."

In future curriculum design, these advantages should be maintained while further improving the comprehensiveness and diversity of the contents. The high evaluations from lecturers and experts not only reflect the high quality of the curriculum but also provided valuable insights for the improvement of the curriculum. Through personalized training path design, targeted problem-solving solutions, interdisciplinary integrated practices, and continuous evaluation and feedback mechanisms, we continuously optimize curriculum content and teaching methods to ensure that the training curriculum can always maintain a high level of effectiveness and improve vocational college lecturers' digital technology for learning management abilities.

### **Suggestions for Further Research**

1. Further research should aim to include a broader sample by including more schools and regions. This will help increase the generalizability and applicability of the findings across different educational contexts and ensure that the conclusions drawn are representative of a wider group of vocational college lecturers.

2. In the future, a flexible curriculum module framework will be established, allowing curriculum contents to be freely assembled and combined like puzzle pieces. teachers can independently choose appropriate training modules based on teaching objectives, the shortcomings of digital technology for learning management abilities and subject characteristics to avoid "stereotyped" training content. At the same time, personalized assessment instruments are introduced to provide lecturers with customized feedback and teaching guidance, ensuring that each lecturer achieves continuous improvement and progress in the areas of concern based on specific circumstances and learning progress. This design will improve the pertinence and effectiveness of training and help the comprehensive development of digital technology for learning management abilities.

3. In the future, we will develop interdisciplinary teaching design cases to encourage



lecturers to collaborate in developing digital teaching solutions based on multidisciplinary knowledge, enhance lecturers' awareness of interdisciplinary cooperation, establish a teaching case resource library, and include various types of real teaching problems and their solutions. Through case sharing and situational simulation, lecturers can refer to other people's experiences and analyze problems and adjust strategies according to their own classroom environment.

4. In the future, a personal teaching portfolio will be established for each lecturer participating in the training to record their materials on teaching design, curriculum implementation and teaching reflection. At the same time, the teaching platform used in the training is used to regularly generate progress reports on lecturers in different teaching dimensions, and based on these data, an improvement portrait of lecturers' digital technology for learning management abilities is generated, thereby providing lecturers with personalized improvement suggestions and supporting their continuous development.

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