Innovations

Impact on the Level of ICT Literacy Integration of Economic Management Teachers in Shijiazhuang Vocational Colleges

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Abstract
Improving the level of teachers' ICT literacy integration is the key to teachers' Digital transformation and an important component of promoting the implementation of digital education. Using a mixed qualitative and quantitative research method, Shijiazhuang Information Engineering Vocational College was selected as the research object. Through a questionnaire survey, Likert four level scale, and weighted average, it was determined that the integration level of ICT literacy among economic management professional teachers was high. Through interviews, it was determined that the main influencing factors included teacher subjectivity, educational and teaching environment, and school training system. This study provides reference for the research in the field of Digital transformation of China's higher vocational education, the improvement of teachers' ICT literacy integration level, and the practical experience of localized teaching in Shijiazhuang.
Keywords: *Vocational colleges; Economic Management Teacher; ICT literacy integration; Influencing factors; Digital transformation*

Introduction

The world is in a period of digital economy transformation, and digital technology is profoundly changing the way humans think, live, produce, and learn. Digital literacy and skills are the foundation of sustainable development of the digital economy. The development of the digital economy inevitably requires talents to have a high level of digital literacy, and talent cultivation cannot be separated from education. Teachers are the core and key to the implementation of the digital education strategy, and an important lever for the high-quality development of education.

In early December 2022, the Chinese Ministry of Education released the "Digital Literacy for Teachers" education industry standard, which specifies requirements for five dimensions: digital awareness, digital technology knowledge and skills, digital applications, digital social responsibility, and professional development. This also points out the direction for the development of the teaching staff in the digital transformation era from the perspective of improving digital literacy.

In the face of multiple challenges such as upgrading the industry empowered by digital technology, updating vocational education majors by over 70%, and nearly doubling the enrollment of vocational schools, studying the integration level and influencing factors of ICT literacy of economic management teachers can help improve the teaching level of vocational school teachers, thereby improving the quality of education and teaching, and cultivating high-quality composite technical talents.

Methodology

Sampling

The research object is Shijiazhuang Information Engineering Vocational College, a municipal public higher vocational college (junior college) in Shijiazhuang City, Hebei Province. The university is the first university in Shijiazhuang to apply for upgrading from a higher vocational

college to a vocational undergraduate. It has been publicized by the Education Department of Hebei Province and is in the application stage. Therefore, the research on the economic management teachers of the school is representative.

The school has 201 economic management teachers, who are distributed in nine majors, including Big data and accounting, financial services and management.

Data collection instruments

The questionnaire is designed based on the researchers' systematic combing of relevant theoretical achievements at home and abroad, according to the education industry standard of the Ministry of Education of China's "Digital Literacy of Teachers", referring to the requirements of the teaching ability contest scheme of the China Vocational College Skills Competition, and in combination with the characteristics of Shijiazhuang higher vocational colleges. The questionnaire includes two parts: respondents' basic information (teacher age, gender, professional title) and ICT literacy integration level (digital technology cognitive ability, application ability, and interdisciplinary integration ability). The respondents selected based on their actual situation and used the Likert Level 4 scale, with 4 points representing a very high level of ICT literacy integration, 3 points representing a high level, 2 points representing a medium level, and 1 point representing a low level.

According to the research purpose, three questions were designed for the interview, and the researchers invited three experts to review the reliability of the questionnaire.

Data collection program

The questionnaire is distributed through the Questionnaire Star online platform. The researchers first sent the questionnaire link to department leaders and asked them to share it with all respondents. Use SPSS for reliability and validity testing.

The interview conducted data collection through face-to-face, We Chat voice, We Chat video, and other methods.

After collecting questionnaires and interviews in Chinese, the researchers translated them into English.

Data processing

Quantitative research was conducted using the weighted average method, and the integration level of ICT literacy among economic management teachers was determined using the Likert Level 4 scale.

The Thematic analysis method was used for qualitative analysis and research, and the results were collected, transcribed, coded and determined.

Research findings and discussions

The results of this study come from an evaluation of 201 economic management teachers at Shijiazhuang Information Engineering Vocational College.

The following is about the integration level of ICT literacy among economic management teachers at Shijiazhuang Information Engineering Vocational College. The discussion content is divided into three dimensions: cognitive ability, application ability, and interdisciplinary integration ability.

cognitive ability

Table 1 shows the level of ICT literacy integration in terms of cognitive ability

Table 1: Cognitive Ability

Indicators	Mean	**Description**
You understand the significance of the new generation of ICT to promote the digital transformation of education	3.07	High Literacy
You respect the new generation of ICT, recognize that it can promotes the innovative development of education	3.65	Very High Literacy
You understand the connotation, characteristics and usage of the new generation of ICT	2.73	High Literacy
You are constantly learning the latest ICT, and willing to use it in teaching	3.26	Very High Literacy
General Weighted Average	3.18	High Literacy

The results show that the level of ICT literacy integration and cognitive ability of economic management teachers in Shijiazhuang vocational colleges is high (3.18). This indicates that teachers have a good digital awareness, recognize the inevitability of the development of the new generation of digital technology, understand the connotation and characteristics of new technology, subjectively respect new technology, and are willing to continuously learn and use the new generation of digital technology.

This discovery confirms the views of Yi and Xue (2022). Based on an empirical analysis of 335 full-time teachers in Zhejiang Province, they conclude that current vocational teachers generally have a high awareness of digital teaching and fully recognize the importance of digital technology in teaching.

This discovery also confirms Wu(2023) is belief that digital awareness is a prerequisite for teachers to effectively carry out education and sustainable development, and the primary issue at this stage is to enhance teachers' understanding of the importance of digital literacy.

This also confirms T (1-13)'s viewpoint that teachers' digital awareness affects the level of ICT literacy organization. As T1 said, "I recognize the important value of the new generation of digital technology. Without good digital literacy, I will not be able to adapt to the requirements of the new stage of teaching positions. Only with digital awareness can I learn the new generation of digital technology and apply it to teaching

"You respect the new generation of ICT, recognize that it can promotes the innovative development of education. "The highest (3.65) indicates that most teachers recognize the role of the new generation of information technology and respect it.

This discovery confirms the view of Yuan(2022) that "to enhance teachers' digital awareness, it is necessary to first make them aware of the importance of digital teaching

This also confirms T2's "I think the first step is to have a digital awareness. The stronger the awareness, the greater the motivation to learn the new generation of information technology. I respect the new generation of digital technology such as major data, and I am willing to learn it."

Secondly, the score of 'You are constantly learning the latest ICT, and willing to use it in teaching.' is (3.26). This indicates that most teachers are constantly learning the new generation

of digital technology, and their subjective willingness is positive. Only by being willing to learn can they master it well.

This discovery confirms Liu(2023) is proposition that awareness and attitude are important and primary factors that significantly affect teachers' digital teaching abilities, and they largely directly determine whether teachers are willing to master a new technology.

The lowest score of "You understand the connotation, characteristics and usage of the new generation of ICT." is (2.73), indicating that teachers' mastery of the connotation, characteristics, and usage methods of the new generation of digital technology still needs further improvement. There are two reasons for this. Firstly, due to the limitations of the economics and management major, there is less exposure to computers. Although teachers have a subjective desire to learn, there is still a certain gap between proficiency and proficiency. The second is age or learning ability limitations. Some teachers are older, experiencing job burnout, or lack learning ability, making it difficult to accept new knowledge. When encountering more difficult problems, they retreat.

This is consistent with the viewpoint of Yuan(2022), who proposed that "liberal arts teachers have relatively less exposure to computers, which leads to relatively weak digital teaching abilities of liberal arts teachers

As T1 said, "I am also regularly participating in training and learning, and I am willing to learn new technologies. It differs greatly from my major and involves programming languages. My mastery is not very good.

T1, 7, 8, 9, 10, 12, and 13 all mentioned that "age factors constrain the improvement of teachers' digital literacy". Just as T10 mentioned, "I am 42 years old this year, and I face significant pressure from work, family, and life. However, learning new knowledge and technologies requires a lot of time and energy, and I feel like I am lacking in skills.

Application ability

Table 2 shows the level of ICT literacy integration in terms of application ability

Table 2: Application ability

Indicators	Mean	**Description**
You can use digital technology to accurately analyze your learning situation, realize personalized guidance	2.69	High Literacy
You can use digital technology to reasonably design the teaching process, fully reflecting the student-centered	2.81	High Literacy
You can skillfully use the teaching platform to design teaching activities and create a good learning atmosphere	2.91	High Literacy
You can skillfully implement online and offline teaching, and solve equipment problems, software problems and teaching platform problems in the course of class	2.79	High Literacy
You can accurately collect information, select or make micro-class, animation and other course resources	1.35	Low Literacy
You can use digital technology to reflect and constantly update traditional teaching content	2.97	High Literacy

The results show that the integration level of ICT literacy of economic management teachers in vocational colleges in Shijiazhuang is high in terms of application ability (2.59). Application ability refers to the ability to support the teaching and learning process of ICT technology. They are able to use the new generation of ICT technology for precise learning situation analysis, reasonable design of teaching processes, proficient use of teaching platforms, and implementation of online and offline teaching. The main reason is that on one hand, teachers' good digital awareness and positive attitude towards ICT encourage them to try using ICT technology, and on the other hand, teachers have the ability to use ICT technology reasonably in the teaching process.

This discovery also confirms Ma Anqi, Jiang&Zhao(2018) is statement that teachers' positive attitude towards the use of technology strengthens their intention to use ICT.

It is similar to the study conducted by BECTA(2016) reported that a negative attitude was the obstacle or a barrier toward integration ofICT in teaching and learning while . Rhoda and Gerald (2017) reported also that positiveattitudes toward ICT use are usually recognized as a necessary condition for effective use ofICT in teaching and learning " . Also , Kubiatko (2019) in their study recognized that attitudetowards ICT determines its adoption in teaching " . It is similar to the study conducted by BECTA (2016), which stated that negative attitudes are obstacles or obstacles to the integration of ICT in teaching. Rhoda and Gerald (2017) also reported that a positive attitude towards the use of ICT is often considered a necessary condition for effective use of ICT in teaching. In addition, Kubiatko (2019) recognized in their research that attitudes towards ICT determine its adoption in teaching.

“You can use digital technology to reflect and consistently update traditional teaching content "has the highest score (2.97), indicating that economic management teachers can keep up with the development of the times, use ICT technology, reflect through platform data, and update traditional teaching content based on students' characteristics and technological development. This is also due to the positive attitude of teachers towards ICT technology and their willingness to use ICT technology to improve teaching quality.

This finding is consistent with Mustafina's (2016) view that teachers play an important role in the teaching process and that their positive and negative attitudes play an important role in the effective integration of information and communication technology into the teaching process. The attitude of teachers towards using information and communication technology can be seen as an important factor in the educational process.

Mustafina（2016）,argue that the teachers play a significant part in the teaching process and suggested that teachers positive and negative attitudes can play amportant part in the effective integration of ICT into the teaching process. Teachers' attitudes on using ICT can beregarded as iman portant factor faction of ICT in the education process.

This discovery was also confirmed in interviews with T2, 3, 4, 5, 9, 10, 11, 12, and 13. T2 said, "The original name of the Chinese Teacher Teaching Ability Competition was the Informatization Teaching Competition, which demonstrates the importance of ICT technology in the teaching process. We actively utilize ICT technology to assist the teaching process in daily teaching, constantly reflect, and showcase successful experiences in the teaching competition, which is a virtuous cycle.

Secondly, the score of 'You can skillfully use the teaching platform to design teaching activities and create a good learning atmosphere' is (2.91). This indicates that most teachers realize that using teaching platforms to design teaching activities can create a better learning atmosphere.

As mentioned in T10, this semester I used "cloud class". After learning a certain knowledge point, I released exercises and tests through the teaching platform. The platform automatically summarizes students' answers and provides intelligent analysis, which can help me understand their mastery and adjust the teaching progress in a timely manner. Students can see their mastery and learning progress in the class while studying, encouraging each other and creating a positive and upward learning atmosphere.

You can accurately collect information, select or make micro classes, animation and other course resources "has the lowest score (1.35), indicating a low level of literacy in selecting and producing digital teaching resources. There are two reasons: firstly, there are not many high-quality online courses for economic and management teachers, and the proportion of teachers participating in the development and recording of online courses is very low. There are very few related professional training, and most of the training is paid services, limiting the number of participants; The second is that the digital teaching environment needs to be further improved.

This finding was supported by Wang(Qingdao University, research on the influencing factors and promotion strategies of digital ability of university teachers). She mentioned that the more complete the construction of digital hardware and software resources in schools, the higher the efficiency of teachers using digital software and hardware resources for teaching, and the more times teachers use digital resources. Therefore, the higher the level of digital ability of teachers.

This discovery is also consistent with Wang&Cheng&Li(2023), who mentioned that "currently, the digital literacy training for vocational college teachers lacks specificity and still stays at some simple operational levels, resulting in low effectiveness

T8, 9, and 13 mentioned that although vocational colleges have basically built multimedia classrooms, fully covered Wi Fi, campus networks, electronic databases, data center computer rooms, etc., policy support and financial support for the construction of smart classrooms, smart teaching management, and the normalization of digital teaching resources are not yet perfect.

T11 and 12 mentioned that the use of digital teaching facilities and resources in schools plays a very important supporting role in improving teachers' digital teaching abilities. The equipment in Big data and accounting professional training room is updated slowly, and multiple softwares of one machine are prone to incompatibility.

T2, 4, 5, 7, and 8 mentioned that the number of smart classrooms in schools is too small, and the normalization of digital teaching resources lacks financial and policy support

Inter-disciplinary knowledge integration ability

Table 3 shows the integration level of ICT literacy and the level of interdisciplinary integration ability

Table 3: Inter-disciplinary knowledge integration ability

Indicators	Mean	**Description**
You have the ability to learn interdisciplinary knowledge	2.88	High Literacy
You have the initiative to implement the integration of digital technology and economic management teaching	3.07	High Literacy
Through training and learning, you have mastered the relevant courses of the integration of new technology and management specialty, such as python, RPA, etc	1.32	Low Literacy
You can integrate data analysis, machine learning and management expertise to help enterprises with school-enterprise cooperation solve technical problems	1.19	Low Literacy
You can use interdisciplinary knowledge to participate in teaching ability competitions and win awards	2.29	Moderate Literacy
General Weighted Average	2.15	Moderate Literacy

The results show that the level of ICT literacy integration of economic management teachers in vocational colleges in Shijiazhuang is medium (2.15). There are three reasons: firstly, although the concept of interdisciplinary education has been widely recognized, a teaching team that integrates interdisciplinary knowledge has not yet been formed. Secondly, there is a lack of interdisciplinary teaching resources. Thirdly, the targeted nature of interdisciplinary training and the universality of participation need to be improved.

This viewpoint is consistent with the viewpoints of Wei&Gu(2021) and Wang&Yin(2022). They mentioned that "the lack of interdisciplinary teaching teams fundamentally restricts the effectiveness of interdisciplinary education in undergraduate accounting." They also mentioned that "accounting textbooks and management textbooks do not intersect or supplement each other in content, which is not conducive to the integration of students' interdisciplinary knowledge." This indicates that interdisciplinary teaching resources such as interdisciplinary teams and textbooks are also a problem that troubles interdisciplinary education in undergraduate schools.

As T3 and T4 said, "the interdisciplinary education of finance and taxation Big data application specialty in our school has the problem of" no overlapping of personnel and knowledge ". Professional teachers are proficient in financial and tax professional knowledge, but they know too little about the subject knowledge of Data and information visualization based on Power BI or Python. There is no computer related discipline staff to join the teaching team, and the progress of interdisciplinary integration education is slow. "

T5 also mentions this viewpoint. He mentioned that "the accounting profession should be renamed Big data and accounting, and interdisciplinary integration should be achieved in teaching content, such as strategic management+accounting theory integration, business model innovation, value creation, and value evaluation".

“You have the initiative to implement the integration of digital technology and economic management teaching.”The highest score (3.07) indicates that teachers are willing to actively implement the integration of ICT and economic management teaching. The teacher's attitude is positive and consistent with the previous survey results.

This discovery was confirmed in teacher interviews. T6 mentioned, "I mainly teach courses in finance, and I am very willing to share knowledge related to blockchain and finance with students. They love it very much. I also hope to receive professional training in blockchain finance

Secondly, the score of "You have the ability to learn interdisciplinary knowledge" (2.88) indicates that teachers believe they have the ability to learn interdisciplinary knowledge and have a strong sense of self-efficacy.

As Yuan(2022) mentioned, "Teachers' self-efficacy affects their digital teaching ability by influencing their awareness and attitude towards digital teaching. Both awareness and attitude, as well as knowledge and content, are related to their digital teaching ability

The score of 'You can integrate data analysis, machine learning and management expertise to help enterprises with school enterprise cooperation solve technical problems' is the lowest (1.19), indicating that the ability and literacy level of interdisciplinary knowledge integration among management teachers to help enterprises solve technical problems is low. The main reason is that the ways to improve the interdisciplinary integration ability of management teachers are limited, and professional training is not only limited in quantity, but also mostly paid training. The source of training funds is not guaranteed, resulting in a limit on the number of people who can participate in training each time, and the participation population is not universal enough. The speed of improving interdisciplinary knowledge integration ability cannot match the development of enterprises in the digital economy era.

This finding is also mentioned in the research of Wei&Gu(2021). In terms of interdisciplinary knowledge application, there is a lack of organic integration of accounting theory and corporate strategic scenarios.

Interviewed teachers also generally expressed the hope of having more opportunities to

participate in interdisciplinary integration professional training, not just for training computer related software knowledge or basic theories, but for interdisciplinary integration training that can be closely combined with actual cases of enterprises.

Table 4 describes the integration level of ICT literacy among economic management teachers in Shijiazhuang vocational colleges

Table 4: Summary Table of ICT Literacy Integration Level

Indicators Mean		**Description**
Cognitive ability	3.18	High Literacy
Application ability	2.59	High Literacy
Inter-disciplinary knowledge integration ability	2.15	Moderate Literacy
General Weighted Average	2.60	High Literacy

As shown in Figure 4, among the three elements studied, the highest level of literacy is Cognitive ability, followed by Application ability, and the lowest level of Inter-disciplinary knowledge integration ability. This discovery is in line with the laws of things' development. Teachers have a high level of ICT cognitive ability, indicating their strong ICT awareness and willingness to learn and use the new generation of ICT technologies. Only when the teacher fully utilizes their subjective initiative will they actively use ICT technology to assist teaching in the teaching process. At this time, the teaching environment and teaching equipment will affect the teacher's initiative in using ICT technology. Inter disciplinary knowledge integration ability refers to learning interdisciplinary knowledge based on one's own professional foundation, such as blockchain, RPA, Python, etc. The learning of new subject knowledge requires professional training. However, due to the shortage of training resources and lack of guarantee of training funds, the number of trainees is relatively small, which affects the improvement of inter disciplinary knowledge integration ability of teachers.

There are three factors that affect the integration level of ICT literacy of management teachers in Shijiazhuang vocational colleges:

Firstly, the teacher's subjective consciousness. The stronger the teachers' awareness of Digital transformation, the higher the level of ICT literacy integration. The traditional teaching philosophy of the teacher body is difficult to change, and if they are unwilling to learn the new generation of ICT technology, the lower the integration level of ICT literacy. The stronger the learning ability of the teacher body, the higher the integration level of ICT literacy. Although teachers are willing to learn new technologies subjectively, their learning ability is relatively weak, resulting in a slow improvement in the integration level of ICT literacy.

Secondly, the educational and teaching environment. The use of digital teaching facilities and resources in schools plays a very important supporting role in improving teachers' digital teaching abilities. The more abundant smart classrooms and diversified teaching resources are, the more willing teachers are to apply ICT technology to assist teaching in the teaching process, and the higher the level of ICT literacy integration.

Thirdly, the school training system. The opportunities, approaches, and effects of participating in digital education training are important factors that affect the improvement of teachers' digital literacy level. The more opportunities to participate in ICT literacy integration related training, the higher the level of ICT literacy integration.

Conclusions

This study conducted an empirical study on 201 economic management teachers at Shijiazhuang Information Engineering Vocational College. The questionnaire survey focused on three dimensions: teachers' cognitive ability, application ability, and interdisciplinary knowledge integration ability, and determined that the school's teachers had a high level of ICT literacy integration. Subsequently, 13 teachers from different majors were interviewed and surveyed, and it was determined that there are three main factors that affect the integration level of ICT literacy, namely teacher subjectivity, educational and teaching environment, and school training system. This study provides reference for the research in the field of Digital transformation of China's higher vocational education, the improvement of teachers' ICT literacy integration level, and the practical experience of localized teaching in Shijiazhuang.

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Appendix A

Questionnaire on ICT Literacy Integration of Teachers of Economics and Management

Dear teachers：

Hello!Thank you for participating in the survey of the ICT literacy integration level of teachers in the Economics and management profession! This questionnaire is anonymous, does not involve personal privacy, and will be strictly confidential. Please fill in according to your real idea, thank you for your support and cooperation!

Part I Basic Information

1. What is your age? ()
A. Less than 30 years old B. Between 31 and 40 years old
C. Between 41 and 50 years old D. More than 50 years old
2. What is your gender? () A. Male B. Female
3. What is your professional title? ()
A. Professor B. Associate Professor
C. Lecturer D. Assistant Professor E. No title

Part II Evaluation of ICT literacy integration level

The likert Scale for the Level of ICT literacy integration

Score	Qualitativ	Description
4	Very High Literacy	Have a good understanding of the new generation of ICT and take the initiative to learn, can skillfully apply and guide daily teaching, and have strong interdisciplinary integration ability
3	High Literacy	Relatively understand and actively learn the new generation of ICT, can skillfully apply and guide daily teaching, and has strong interdisciplinary integration ability
2	Moderate Literac	General understanding of the new generation of ICT, basic application and guidance of daily teaching, and general ability of interdisciplinary integration
1	Low Literacy	Lack of understanding and application of the new generation of ICT, and poor ability of interdisciplinary integration

No.	Item	4	3	2	1
Cognitive ability					
1	You understand the significance of the new generation of ICT to promote the digital transformation of education				
2	You respect the new generation of ICT,recognize that it can promotes the innovative development of education				
3	You understand the connotation, characteristics and usage of the new generation of ICT				
4	You are constantly learning the latest ICT,and willing to use it in teaching				
Application ability					
5	You can use digital technology to accurately analyze your learning situation,realize personalized guidance				
6	You can use digital technology to reasonably design the teaching process, fully reflecting the student-centered				
7	You can skillfully use the teaching platform to design teaching activities and create a good learning atmosphere				

8	You can skillfully implement online and offline teaching, and solve equipment problems, software problems and teaching platform problems in the course of class				
9	You can accurately collect information, select or make micro-class, animation and other course resources				
10	You can use digital technology to reflect and constantly update traditional teaching content				
Inter-disciplinary knowledge integration ability					
11	You have the ability to learn interdisciplinary knowledge				
12	You have the initiative to implement the integration of digital technology and economic management teaching				
13	Through training and learning, you have mastered the relevant courses of the integration of new technology and management specialty, such as python, RPA, etc				
14	You can integrate data analysis, machine learning and management expertise to help enterprises with school-enterprise cooperation solve technical problems				
15	You can use interdisciplinary knowledge to participate in teaching ability competitions and win awards				

Appendix B

Questionnaire reliability and validity testing

A total of 201 questionnaires were collected and distributed and collected through Questionnaire Star, with an effective rate of 100%. Subsequently, the reliability and validity of the questionnaire were tested through the SPSSAU data science platform.

CronbachReliability Analysis		
Number of items	sample size	Cronbach α
18	201	0.922

Questionnaire reliability Cronbach's α The coefficient is 0.922, which is greater than 0.9, indicating a high reliability quality of the research data.

KMO 和 Bartlett 的检验		
KMO值		0.858
Bartlett 球形度检验	近似卡方	3351.423
	df	153
	p 值	0.000

The validity of the questionnaire was verified using KMO and Bartlett tests, and the KMO value was 0.858, which indicates that the research data is very suitable for extracting information (indicating good validity from the side).