



Research on the Digital Competency Improvement Path of Higher Vocational UAV Application Technology Professional Teachers Based on AI Technology

Jian Wu^{1*}, Zhifeng Mao¹

¹School of Information Engineering, Liuzhou City Vocational College, Liuzhou, Guangxi, China

*236073418@qq.com; 1225778151@qq.com

Abstract. With the rapid development of UAV technology, the digital competence of UAV application technology professional teachers in higher vocational colleges has become a key element of educational reform and development. This paper analyzes the current situation of digital competency of UAV application technology teachers in higher vocational colleges, and then discusses the improvement path based on AI technology, in order to provide new ideas and methods for the improvement of digital competency of UAV application technology teachers in higher vocational colleges.

Keywords: UAV Application Technology; Digital Competence; Artificial Intelligence; Higher Vocational Education

1 Introduction

In today's society, the application of UAV has been widely penetrated into various fields, such as agriculture, logistics, surveying and mapping, etc. As the main force of cultivating UAV application technology talents, the digital competency level of UAV application technology professional teachers in higher vocational colleges is of great significance for improving the teaching quality and cultivating applied talents. Digital teaching, the development and sharing of teaching resources, and the construction of online education platform are the important ways to improve the digital competence of UAV application technology professional teachers in higher vocational colleges. At the same time, in recent years, the wide application of artificial intelligence technology has also provided new ideas and means for the improvement of teachers' digital competence^[1-8]. This paper aims to analyze the current situation of digital competency of teachers majoring in higher vocational UAV application technology, and explore the path of using AI technology to improve their digital competency.

2 Analysis of the current situation of digital competency of higher vocational UAV application technology professional teachers

Digital competence refers to an individual's ability to work and learn from information technology in a digital environment. For teachers majoring in UAV application technology in higher vocational colleges, digital competency includes not only basic digital skills, but also the ability to integrate digital education resources, digital teaching design and evaluation ability. This paper analyzes the current situation of the digital competency of higher vocational UAV application technology professional teachers from the following three aspects.

2.1 Digital skill level

Digital skill level refers to the mastery of teachers in the use of digital tools and technologies. In the teaching of UAV application technology in higher vocational colleges, teachers need to have basic computer operation skills, network application skills and data analysis skills. We conducted a questionnaire survey and analysis on the digital capability and usage of 100 vocational college teachers in computer operation, internet usage, office software usage, and new technology application. Figure 1 shows that some teachers do not attach enough importance to their digital skills and have relatively backward technical levels. In particular, the average score for new technology application is 5.1 with a standard deviation of 1.9, indicating that the overall performance of the respondents in this area is average and there is a large difference in their performance. This suggests that the overall ability of teachers to use digital tools and technology for course design and teaching evaluation needs to be improved.

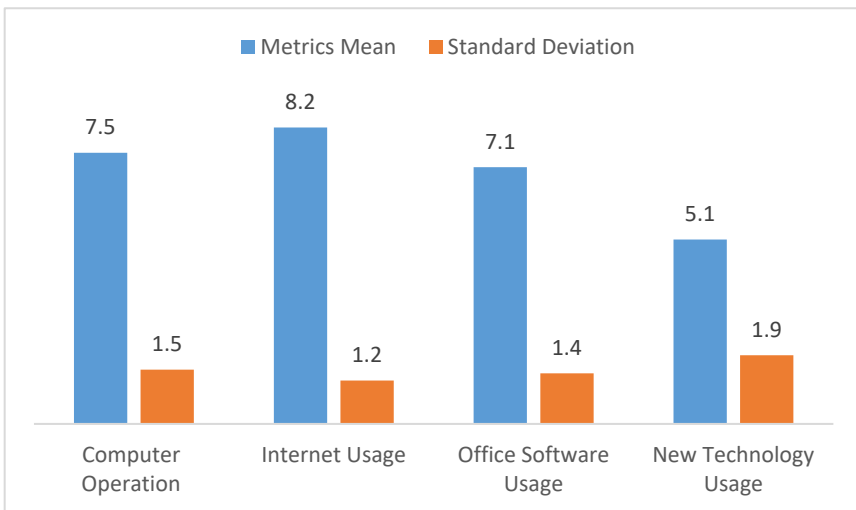


Fig. 1. Digital Capability and Usage Analysis Chart

2.2 Ability to integrate digital education resources

The ability to integrate digital education resources refers to the ability of teachers to integrate digital education resources. In the teaching of UAV application technology in higher vocational colleges, digital education resources include digital teaching materials, digital teaching AIDS, online courses, etc. There are gaps in teachers in the development, integration and utilization of digital education resources, which affect the teaching effect and quality. Digital education resources are the basis for teachers to carry out digital teaching, including digital teaching materials, digital teaching AIDS, online courses, etc. Teachers need to have the ability to integrate and optimize these resources. However, some teachers in the digital education resources integration ability is insufficient, for the development and utilization of digital education resources is not skilled, lack of integration and optimize the ability of these resources, at the same time for the digital education resources classification, screening and recommendation ability to improve, for the digital education resources update and maintenance ability is insufficient.

2.3 Digital teaching design and evaluation ability

Digital teaching design and evaluation ability refers to the ability of teachers to use digital tools and technologies for curriculum design and teaching evaluation. In the teaching of UAV application technology in higher vocational colleges, digital tools and technologies include online classroom, intelligent teaching software, virtual experiments, etc. However, some teachers still have deficiencies in the aspect of digital teaching design and evaluation ability. Insufficient use of digital tools and technologies, lack of innovation and exploration spirit; lack of theoretical basis and practical experience of digital teaching design, lack of systematic and scientific; insufficient methods and indicators of digital teaching evaluation, and lack of science and objectivity.

3 Digital competency improvement path of higher vocational UAV application technology professional teachers based on AI technology

3.1 Optimize the teacher training system and improve teachers' digital skills

Combined with AI technology, higher vocational colleges can regularly organize digital skills training for UAV application technology professional teachers, so as to improve their cognition and application ability of emerging technologies. The following techniques can be used to improve teachers' digital skills.

1. Adaptive learning system: The adaptive learning system driven by AI technology can provide personalized training according to each teacher's digital skill level and knowledge level. These systems can identify deficiencies in teacher knowledge and provide targeted training modules and resources to remedy them. Adaptive learning

systems can also constantly adjust the training according to the speed and difficulty with which a teacher grasps a particular skill or concept. For example, an example of an adaptive learning system driven by AI technology is Knewton Adaptive Learning Platform, which is one of the leading adaptive learning systems. Knewton The platform uses machine learning algorithms and big data technology to analyze students' learning data, based on which it provides students with personalized learning paths and content.

On Knewton platform, teachers can according to their own digital skills level and knowledge level to create courses and learning content, students in the learning process, Knewton platform will collect and analyze the students 'learning data (such as learning speed, accuracy, reaction time, etc.), and then according to the students' learning performance and ability, to provide them with personalized learning path and content. Knewton The platform can automatically adjust the course difficulty and teaching methods according to the students' learning situation to adapt to the learning needs of each student and the ability level.

2. Chatbots: Chatbots such as ChatGPT can provide instant support and guidance to teachers to help them learn how to use digital tools and resources. Teachers can ask questions and get answers in natural language to learn and apply new digital skills more quickly. Chatbots can also provide personalized tools or resource recommendations according to teachers' specific needs or preferences.

Data analysis chatbots can talk and communicate through natural language processing and machine learning techniques, providing instant support and guidance for teachers. For teachers, the application of digital skills and digital teaching tools is a process of continuous learning and improvement. Chatbots can provide teachers with online question answering, explanation and guidance, help teachers more easily and quickly learn and apply new digital skills and tools, and can provide teachers with personalized tools or resource recommendations, so as to improve their digital literacy and digital teaching level.

For example, ChatGPT chatbots can provide instant answers and explanations based on their questions, helping teachers to better understand and master the use of digital teaching tools and resources. Chatbots can also recommend suitable digital tools and resources for teachers according to their specific needs or preferences, so as to improve the digital teaching effect of teachers. In general, chatbots can provide teachers with online q & A, explanations and guidance, and can provide personalized tools or resources according to their specific needs or preferences, so as to improve teachers' digital literacy and digital teaching level.

3. Data analysis can be used to assess the effectiveness of teacher training programs and to identify areas for improvement. By analyzing data on teacher fundamentals, teaching performance, training outcomes, and student engagement, AI technology-driven analysis tools can provide insight into which training methods and resources are most effective and how training programs can be adapted to better meet teacher needs. For example, Table 1 shows the situation of the teachers surveyed. In the field of UAV education, more men than women, mainly people aged 31-50. The overall educational background of the participants is inclined to graduate level or above. Data analysis was used to understand the basic information of participants,

such as male to female ratio, age distribution and educational level, so as to arrange training plans and resources reasonably. At the same time, data analysis can also be used to understand teacher participation, post-training performance and student participation data, so as to evaluate the effectiveness of the training program and identify areas for improvement. For example, if the data indicates that teacher participation is low or students are not satisfied with the teaching effect, then the data analysis and improving the training program can be used to improve the training effect and meet the needs of students.

Table 1. Summary Table of Basic Information of Teachers

Category	Results
Gender	Male: 60%; Female: 40%
Age	20-30 years old: 20%; 31-40 years old: 40%; 41-50 years old: 30%; 51 years old and above: 10%
Education	Bachelor's degree or below: 25%; Master's degree: 75%; Doctoral degree or above: 5%
Years of Teaching Experience	1 year or less: 10%; 1-5 years: 30%; 6-10 years: 40%; 11 years or more: 20%
Years of Teaching Drone Courses	1 year or less: 30%; 1-5 years: 50%; 6-10 years: 20%; 11 years or more: 0%

4. Virtual reality (VR) and Augmented Reality (AR): VR and AR technologies can provide teachers with an immersive and interactive learning experience to help them develop digital skills. For example, teachers can use VR to simulate the classroom environment and practice using digital tools and resources in a real environment. AR can provide teachers with real-time guidance and feedback on how to use digital tools in a classroom environment. The "UAV +" Urban and Rural Building digitization is built in Guangxi in 2022, including two virtual centers: UAV installation and repair of virtual reality training center and UAV flight virtual reality training center. Virtual reality VR / AR technology is fully applied to UAV technology through the platform. The operation technology that cannot be presented in the real space of the existing classroom, such as UAV power inspection, UAV fire fighting and other scenes, can present its operation mode in the VR platform through resource development, so that students can experience the charm of UAV technology in class. Combined with the construction of UAV virtual reality training base, the operation scenes of UAV application technology in different regions are presented on the platform through virtual presentation technology, so that students can not understand relevant knowledge only through books or teachers' explanations, but also learn through immersive experience. Greatly improved the richness of teachers in teaching means.

3.2 Build a digital education resource platform to improve teachers' ability to integrate digital education resources

Higher vocational colleges can build a digital education resource platform, digitally integrate teaching resources, and use AI technology to optimize and intelligently recommend resources. Teachers can obtain teaching resources on the platform, or upload their teaching resources to the platform to share with other teachers, so as to improve the integration ability of digital education resources. Machine learning technology is used to automatically sort and classify digital educational resources to provide teachers with a more clear and accurate classification structure and search method of educational resources. By labeling and classifying resources, machine learning techniques can help teachers find the desired digital education resources faster. Natural language processing technology can realize intelligent search and recommendation, and provide teachers with personalized digital education resources recommendation based on the information of teachers' search history, interests and subject areas. In higher vocational colleges, we take the Wisdom tree platform as an example, which is mainly used to assist teachers in teaching, students' online learning and assessment. The Smart tree platform provides vocational colleges with rich online course resources and learning tools, including video courses, online exercises, homework submission, online quiz, exam monitoring and other functions. In 2021, the Smart tree platform has also been upgraded, using AI technology to provide data analysis and curriculum optimization services, to help vocational colleges better understand students' learning situation and curriculum effect, and further improve the teaching quality and effect. Data mining technology can evaluate and optimize digital education resources, and through data analysis and mining of the use and feedback of resources, it can provide teachers with feedback and improvement suggestions on the use effect of resources. Data mining technology can also help educational institutions to optimize the design and development process of digital education resources, and improve the quality and effectiveness of resources.

3.3 Innovate the digital teaching design and evaluation mode to improve teachers' ability of digital teaching design and evaluation

Combining AI technology to innovate digital teaching design and evaluation mode can improve teachers' digital teaching design and evaluation ability. Teachers should actively explore and apply AI technology to provide a more intelligent, personalized and efficient learning environment and evaluation methods for digital teaching, and further improve the teaching quality and level of digital teaching.

1. Use data analysis technology for learning behavior analysis and prediction

Data analysis technology can analyze students' learning behavior and feedback, provide teachers with real-time monitoring and prediction of students' learning situation, and help teachers to design and adjust digital teaching schemes more accurately. Data analysis technology can also provide teachers with in-depth analysis of student group characteristics and learning trends, and provide teachers with more accurate and effective basis for teaching decisions.

2. Use machine learning technology for personalized learning design and recommendation

Machine learning techniques can provide teachers with personalized learning designs and recommendations based on students' learning behavior and feedback. For example, teachers can use machine learning technology to recommend learning materials and tasks suitable for students' personalized needs according to their learning progress and understanding degree, so as to improve students' learning effect and interest.

3. Use deep learning technology to model and predict student behavior

Deep learning techniques can model and predict students' learning behavior, and provide teachers with more refined and personalized learning design and evaluation. For example, teachers can use deep learning techniques to model and predict students' learning interests and learning styles, providing personalized learning support and feedback to students.

4. Use the intelligent auxiliary teaching system to provide personalized teaching support

Intelligent assisted teaching system can provide personalized teaching support for teachers. For example, teachers can use intelligent assisted teaching system to provide students with real-time learning feedback and suggestions, or conduct intelligent course design and evaluation according to students' learning behavior and feedback.

5. Use big data technology to evaluate and optimize the teaching effect

Big data technology can evaluate and optimize the teaching effect of digital teaching. For example, teachers can use big data technology to make statistics and analyze students' learning results, and provide teachers with feedback and improvement suggestions on the teaching effect^[9-11].

At present, some domestic teaching platforms such as Xueersi online school is such a model. By collecting students' learning behavior data, such as learning time, learning content, learning progress, answers, etc. The collected data is cleaned and processed to remove duplicate and abnormal data and ensure the accuracy and reliability of the data. Using data analysis technology to make statistics and analyze the data of students' learning behavior, such as the distribution of learning time, the preference of learning content, the accuracy of answering questions, etc. By analyzing students' learning behavior data, students' learning behavior patterns, such as learning habits, learning preferences, learning speed, etc. Based on students' learning behavior patterns and historical data, a prediction model is established to predict students' learning status and ability, such as learning performance, learning progress, learning difficulties, etc. Finally, according to the prediction results and students' learning behavior patterns, we can provide students with personalized teaching suggestions and guidance, such as focusing on students' learning difficulties, and providing students with suitable learning resources and tests.

4 Conclusion

In an era of surging digital knowledge, teachers' digital competence is crucial. Digital competency includes not only the ability to use and understand digital tools, but also the ability to search for, capture, understand, create, disseminate, and manage information in a digital environment. Higher vocational drones application technology professional teachers by learning new technology tools and platform, digital competency, can improve the effect of teaching of the teachers and students 'learning effect, strengthen students' understanding and grasp of drone application technology, to cultivate applied talents to provide more powerful support, to cultivate applied talents and improve the quality of teaching is of great significance. This paper puts forward the improvement path based on AI technology, including the optimization of teacher training system, the construction of digital education resource platform, and the innovation of digital teaching design and evaluation mode. These paths can provide new ideas and methods for the digital competency improvement of higher vocational UAV application technology professional teachers.

References

1. Zhao Huijuan. The challenges faced by higher vocational teachers in the era of artificial intelligence and teaching promotion strategies. *Journal of Beijing Vocational College of Finance and Commerce*. 2021, 37 (03)
2. Shang Yongqiao. Pan Weiwei. Tong Tiger. Shi Donglei. Zhou Yaqin. Research on the Essential Literacy and Realization Path of Higher Vocational Teachers in the Era of Artificial Intelligence. *Scientific Consultation (Educational Research)*, 2021 (05)
3. How stove. Zhao Leilei. Research on the Development Dilemma and Strategy of Teachers ' Digital Competency in the Intelligent Era. *Journal of Guizhou Normal University*, 2021, 37 (03)
4. Wang Chao. Tian Xiaohong. Teachers ' professional identity in the era of artificial intelligence : challenges and construction. *Journal of Teacher Education*, 2021,8 (02)
5. He Biyi. Li Qinghai. Discussion on the quality evaluation system of vocational education personnel training in the era of artificial intelligence. *Hebei Vocational Education*, 2021,5 (01)
6. Zhang Chong. Zhang Rui. Exploration on the improvement of information-based teaching ability in modern vocational education in Ting. *Journal of Beijing Vocational College of Finance and Commerce*, 2018, 34 (05)
7. Fang Haiguang, Kong Xinmei, Li Haiyun, et al. Research on the theory of human-machine collaborative education in the era of artificial intelligence [J]. *Modern educational technology*. 2022, 32 (7) .
8. Shi Hongfa. Liu Linshan. The re-examination and promotion of higher vocational education and teaching from the perspective of artificial intelligence. *Vocational and technical education*. 2021,42 (20)
9. Zhen Kuang , Chaoyang Chen, Research on smart city data encryption and communication efficiency improvement under federated learning framework, *Egyptian Informatics Journal*, Volume 24, Issue 2,2023,Pages 217-227, <https://doi.org/10.1016/j.eij.2023.02.005>.

10. Zhu Aiqun, An IT Capability Approach to Informatization Construction of Higer Education Institutions, *Procedia Computer Science*, Volume 131, 2018, Pages 683-690, <https://doi.org/10.1016/j.procs.2018.04.312>.
11. Daniyar Sapargaliyev, Kamila Shulenbayeva, Informatization of Kazakhstani Higher Education, *Procedia-Social and Behavioral Sciences*, Volume 83, 2013, Pages 468-472, <https://doi.org/10.1016/j.sbspro.2013.06.092>.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

