Education Reform and Development, 2026, Volume 8, Issue 7
https://ojs.bbwpublisher.com/index.php/ERD
Online ISSN: 2652-5372
Print ISSN: 2652-5364

Exploration of Digitalization-Driven Teaching Innovation Pathways for the Photogrammetry and Remote Sensing Technology Program in Higher Vocational Education

Qian He*

Hubei Land Resources Vocational College, Wuhan 430090, Hubei, China

Author to whom correspondence should be addressed.

Abstract: Against the backdrop of the ongoing advancement of the Digital China and 3D Real Scene China strategies, the Photogrammetry and Remote Sensing Technology major in higher vocational colleges, as the core platform for cultivating frontline surveying and mapping technical talents, should embrace the empowering effect of digital technologies on professional education, reshape the teaching system, innovate teaching modes, strengthen practical education, and improve teaching quality. On this basis, this paper briefly analyzes the necessity and current state of digitalization empowering the teaching of the Photogrammetry and Remote Sensing Technology major and discusses innovative teaching pathways under digital empowerment.

Keywords: Digitalization; Photogrammetry and remote sensing technology major; Teaching innovation

Online publication: August 13, 2026

1. Introduction

With the rapid development of artificial intelligence, big data and other digital technologies, photogrammetry and remote sensing technology has evolved from the integrated mode of surveying & observation to a new mode featuring digital collection, intelligent processing and precise application, which is widely applied in land surveying and mapping, urban planning, environmental protection, disaster monitoring and other fields. The Photogrammetry and Remote Sensing Technology major in higher vocational colleges undertakes the important task of cultivating frontline surveying and mapping technical talents with solid professional foundations, proficient operational skills and sound digital literacy. Digitalization-driven teaching innovation serves as an effective way to help professional education adapt to industrial digital transformation, improve students' employability, and promote the connotative development of the major.

2. The necessity of digitalization empowering teaching of photogrammetry and remote sensing technology major in higher vocational education

2.1. Adapt to the digital transformation of the industry

At present, the photogrammetry and remote sensing industry has shifted from the traditional "surveying + observation" mode to a new mode of "digital collection, intelligent processing and precise application". Job requirements in fields such as land surveying, urban planning, disaster monitoring and agriculture have transformed from traditional surveying skills to digital capabilities including UAV operation, remote sensing image interpretation, 3D modeling and GIS application. As the main training base for frontline technical personnel, higher vocational Photogrammetry and Remote Sensing Technology majors should keep pace with the times and introduce digital technologies to enhance the practicability and pertinence of professional teaching and narrow the gap between teaching and industry [1]. By continuously improving students' professional digital skills, colleges can help them quickly adapt to post requirements after graduation, shorten the post adaptation period and realize synchronized development between talent cultivation and industries.

2.2. Improve students' employability

Higher vocational education is employment-oriented and competency-based. Digital empowerment can better focus on cultivating students' core vocational abilities and digital literacy so as to enhance their competitiveness in the job market. On the one hand, digital teaching attaches importance to training students' project practice ability and innovative thinking. By participating in real digital projects of enterprises, students can accumulate on-the-job experience and strengthen teamwork and communication skills. On the other hand, students can repeatedly practice skills such as UAV operation, remote sensing image processing and 3D modeling in digital training, improving their practical operation and problem-solving abilities. This overcomes the limitation of insufficient practice opportunities in traditional teaching, and students equipped with solid digital skills gain greater advantages in employment [2].

2.3. Promote connotative development of the major

Digital teaching reform helps update and upgrade the curriculum system of higher vocational Photogrammetry and Remote Sensing Technology majors, and improves the effectiveness of teaching methods and resources. Meanwhile, teachers' continuous improvement of digital literacy and digital teaching capabilities further optimizes the overall level of the teaching team and boosts steady improvement of school-running quality. Upgrading the curriculum system integrated with digital technologies can enhance its forward-looking nature and practicability; building virtual simulation training platforms and digital teaching resource libraries can improve teaching conditions [3]; strengthening teachers' digital literacy cultivation can build a "dual-qualified" teaching team with solid professional knowledge and strong digital capabilities, so as to comprehensively improve teaching and talent cultivation quality and help the major align with the national digital transformation strategy of vocational education.

3. Current situation of digitalization empowering teaching of photogrammetry and remote sensing technology major in higher vocational education

3.1. Curriculum system lags behind industrial digital technology development

The traditional curriculum system of higher vocational Photogrammetry and Remote Sensing Technology majors centers on conventional surveying and mapping technologies, with relatively few contents covering cutting-edge industrial technologies such as UAV aerial survey, intelligent remote sensing image processing, 3D

modeling and GIS application. The curriculum lacks systematic and targeted design, featuring weak integration between theories and practices as well as insufficient integration of posts, courses, competitions and certificates. This leads to mismatches between teaching contents and industrial post demands. After graduation, students need to spend a long time learning and adapting to work tasks, which hinders their career development [4]. In addition, restricted by funds and venues, training resource libraries are updated slowly, and most higher vocational colleges cannot be fully equipped with industrial mainstream equipment. Students have few opportunities to operate oblique photography, LiDAR, InSAR deformation monitoring and other technical devices in practice.

3.2. Insufficient digital application in teaching modes

Many higher vocational colleges still adopt the teaching mode of theoretical lectures, classroom demonstrations and off-campus training. The application of digital technologies and digital teaching tools mostly stays at the basic level of multimedia courseware presentation and online course playback, without truly integrating virtual simulation, artificial intelligence, big data and other technologies into teaching. Meanwhile, situational teaching and project-driven teaching are rarely applied, leaving students in a passive knowledge-receiving state with limited development of autonomous learning ability and innovative thinking. Moreover, as an important part of the major, practical teaching is restricted by training venues and equipment, making it hard to simulate complex surveying and mapping scenarios such as mountainous areas, water areas and dense urban zones. Off-campus training is greatly affected by weather, venues and safety factors, resulting in unsatisfactory training effects [5].

3.3. Teachers' digital literacy and teaching capabilities need to be improved

Teachers' digital literacy and teaching capacity serve as an important guarantee for digital teaching innovation of the major. However, the current teaching team has a low proportion of dual-qualified teachers. Professional teachers lack industrial practical experience and in-depth understanding of the application of current industrial digital technologies, making it difficult to carry out targeted practical teaching. In addition, some teachers only master basic operation of digital teaching tools and cannot develop digital teaching resources or organically integrate digital technologies with professional teaching [6]. For example, teachers only use virtual simulation platforms for basic practical teaching instead of building training scenarios matching teaching demands via virtual simulation technology, so digital teaching only exists in form and fails to deliver its empowering value.

4. Innovative paths of digitalization empowering teaching of photogrammetry and remote sensing technology major in higher vocational education

4.1. Optimize the curriculum system and deepen integration of digital technologies with "posts, courses, competitions and certificates"

The curriculum system is the core of talent cultivation. To realize digitalization-driven teaching innovation, colleges must first optimize and upgrade the curriculum system integrated with digital technologies and industrial demands, realize in-depth integration between digital technologies and "posts, courses, competitions and certificates", and keep teaching contents synchronized with industrial technologies and post demands [7]. Teachers shall conduct in-depth research in enterprises to figure out digital post demands in the photogrammetry and remote sensing industry, sort out required knowledge, skills and literacy for relevant posts, clarify digital skill training objectives, and integrate UAV operation, intelligent remote sensing image

processing, 3D modeling, GIS application and digital surveying & mapping data processing into talent training programs, so as to realize precise alignment between talent cultivation goals and industrial post demands. For instance, colleges can add teaching modules or elective courses such as "Application of Artificial Intelligence in Surveying and Mapping", "Virtual Simulation Surveying and Mapping Technology" and "Big Data Processing and Analysis" on the basis of the existing curriculum system, adapting to industrial trends and meeting students' personalized development needs [8]. Meanwhile, teachers shall strengthen the integration of posts, courses, competitions and certificates. Convert digital assessment contents of vocational skill certificates such as UAV Surveying and Mapping Operator and Remote Sensing Image Processor into curriculum contents to realize integration of courses and certificates. Integrate contents of national college surveying and mapping skill competitions and UAV surveying and mapping skill competitions into teaching, promote learning and teaching through competitions, and effectively improve students' digital skills and innovative capacity [9].

4.2. Innovate teaching modes to realize in-depth integration of digitalization and teaching processes

Teachers of the major shall rely on virtual simulation, big data, artificial intelligence and other digital technologies to break the time and space limitations of traditional classrooms, build online-offline blended teaching modes and create integrated smart classrooms combining theories and practices. Firstly, adopt the "online + offline" blended teaching mode. Based on online learning platforms such as Vocational Education Smart Platform and Chaoxing Fanya, build digital online courses and upload digital resources including theoretical materials, teaching videos, training guidance and exercises to the platform for students' autonomous online learning. Offline classes focus on practical operations, case analysis, group discussions and project guidance. For example, when learning remote sensing image processing, teachers can require students to preview basic theories and software operation tutorials online, and provide targeted operational guidance and solve learning problems in offline classes to improve teaching quality [10]. Secondly, teachers shall actively explore the application of digital teaching tools to raise teaching efficiency. With the help of 3D modeling software and virtual simulation platforms, abstract surveying principles and remote sensing interpretation logic can be transformed into visual, interactive dynamic scenarios, helping students intuitively understand professional knowledge and solve the difficulty of comprehending concepts and restoring scenarios in traditional teaching [11]. For example, teachers can build simulated scenes of UAV flight and remote sensing image processing on virtual simulation platforms, allowing students to conduct repeated operations in virtual environments and improve practical skills.

4.3. Enrich practical teaching and strengthen cultivation of students' post adaptability

Practical teaching is the core link to consolidate students' skills and match post demands. Relying on digital technologies, the major shall build diverse practical carriers, enrich practical teaching scenarios and break the venue, equipment and safety restrictions of traditional practical teaching. Teachers shall make full use of virtual simulation training platforms to expand the coverage of training scenarios [12]. Various complex surveying and mapping scenarios and operation processes such as UAV aerial survey, remote sensing image processing, 3D modeling and land surveying can be simulated on the platforms for students to conduct immersive practical training in virtual environments, solving the problems of insufficient venues, expensive equipment and high safety risks in traditional training. Virtual simulation platforms feature interactivity, authenticity and practicability. They can simulate real operations and fault scenarios to cultivate students' problem-solving

abilities during training. For example, build a UAV virtual simulation training system to simulate UAV flight, data collection and fault handling procedures, enabling students to practice repeatedly and upgrade operation skills [13]. Besides, higher vocational colleges shall strengthen the construction of digital training hardware, guarantee sufficient practical opportunities for students. Keep pace with industrial technological progress and introduce the latest digital training equipment and software such as oblique photography UAVs and AI remote sensing image processing software to comprehensively upgrade the hardware level of practical teaching, so that students can operate mainstream industrial digital equipment, get familiar with industrial workflows and technical requirements and realize seamless connection between professional education and industrial practice.

4.4. Improve teacher team building and boost teachers' digital literacy and teaching capacity

In the digital era, higher vocational colleges shall strengthen digital skill training for teachers of the major and improve their digital literacy and teaching capabilities. On the one hand, formulate systematic digital skill training plans and organize regular training covering the application of digital teaching tools, development of digital teaching resources and innovation of digital teaching modes. On the other hand, invite digital teaching experts and technical personnel from surveying and mapping enterprises to deliver special lectures and practical training, helping teachers master the latest industrial digital technologies and digital teaching methods [14]. Meanwhile, encourage professional teachers to take temporary posts in surveying and mapping enterprises on a regular basis, participate in frontline projects, learn cutting-edge digital technologies such as UAV aerial survey, intelligent remote sensing interpretation and 3D real-scene modeling, figure out actual post demands of enterprises and accumulate practical experience in digital projects, so as to address the disconnection between practical teaching and industrial practice. Higher vocational colleges shall also establish sound incentive mechanisms for teachers' digital teaching innovation. For instance, include digital courses, virtual simulation projects and teaching reform papers in teacher assessment and professional title evaluation, and offer corresponding rewards and support to encourage teachers to carry out digital teaching reform research and apply for relevant projects, so as to improve teachers' teaching innovation and research capacity [15]. Rewards shall be given to teachers who develop high-quality digital courses and virtual simulation experimental projects, and priority shall be offered in professional title evaluation to those who have outstanding achievements in digital teaching reform.

5. Conclusion

In summary, digitalization-driven teaching innovation for the Photogrammetry and Remote Sensing Technology major in higher vocational education serves as an effective measure to realize high-quality development of the major and cultivate applied technical talents meeting the demands of the surveying and mapping industry. In the future, professional teachers shall deepen the integration of digitalization and professional teaching, continuously optimize the curriculum system, innovate teaching modes, enrich practical teaching and improve teacher team building, so as to provide strong talent support for the innovative development of the photogrammetry and remote sensing industry.

Funding

School-level Teaching and Research Project of Hubei Land Resources Vocational College (Project No.: 2024-2026xyjky-10)

Disclosure statement

The author declares no conflict of interest.

References

[1] Yang J, Shang Z, Dong X, 2025, Research on Teaching Problems and Strategies of Remote Sensing under the Background of Spatial Intelligence. Surveying and Spatial Geographic Information, 48(11): 1–3, 10.

[2] Hu T, Feng J, Li Z, 2025, Research on Teaching Design of Remote Sensing Image Interpretation Inspired by Flipped Classroom. Industrial and Information Education, (09): 84–88.

[3] Guo H, Zhang J, Yang J, et al., 2025, Research on Teaching Innovation of Photogrammetry and Remote Sensing Based on Project-based Learning. Science and Innovation, (16): 186–188, 192.

[4] He Y, Liu T, Yan H, 2025, Teaching Reform and Practice of Microwave Remote Sensing in the Era of Artificial Intelligence. Marine Surveying and Mapping, 45(04): 66–71.

[5] Zhang R, Zhang X, Xiao L, 2025, Research on Teaching Reform of Remote Sensing Image Interpretation under the "Intelligence + Information" Background. University Education, (07): 75–79, 98.

[6] Zhao Q, Liu J, Sun B, 2024, Research on Practical Teaching of Remote Sensing Courses for Aerospace Information Industry. Journal of Chaohu University, 26(06): 114–117.

[7] Qi Q, Li S, Gao F, 2024, Analysis on the Influence of Virtual Simulation Technology on Students' Spatial Cognition Ability in Photogrammetry Teaching. Modern Vocational Education, (33): 57–60.

[8] Gu J, Huang C, 2024, Teaching Reform of Hydrological Remote Sensing Based on Flipped Classroom. Journal of Higher Education, 10(13): 126–129, 134.

[9] Zhang G, Zhang R, 2023, Exploration on Teaching Mode Reform of Remote Sensing Courses under New-generation AI. Shanxi Architecture, 49(21): 183–187.

[10] Chen J, Deng M, Hou D, 2023, Reform and Exploration of Practical Teaching Mode of Remote Sensing Courses in the Era of Big Data Intelligence. Bulletin of Surveying and Mapping, (06): 176–179.

[11] Tang Y, Zou B, Feng H, 2023, Output-oriented Online-offline Blended Teaching Reform of Hyperspectral Remote Sensing Course. Surveying and Spatial Geographic Information, 46(04): 5–7, 12, 16.

[12] Zhang L, Zhang Y, Liu J, 2022, Exploration on Practical Teaching Reform of Remote Sensing Major under the Background of Emerging Engineering Education. Surveying and Spatial Geographic Information, 45(10): 44–47.

[13] Huang X, Li J, 2022, Teaching Design and Reflections on Intelligent Interpretation of Remote Sensing in the Era of Artificial Intelligence and Remote Sensing Big Data. Surveying and Geographic Information, 47(S1): 219–222.

[14] Liu D, Lou A, Zhang M, 2022, Research on the Talent Cultivation Mode of Dual Guidance and Industry-University Linkage—A Case Study of Higher Vocational Photogrammetry and Remote Sensing Technology Major. Journal of Liaoning Higher Vocational Education, 24(07): 69–71.

[15] Zhao J, Lu X, Qi L, 2022, Teaching Reform Practice Based on VR Technology—Taking Hydraulic and Hydropower Engineering Survey Course as an Example. Journal of Higher Education, 8(18): 138–141.