

Research on the Improvement Path of Higher-Vocational Teachers' Teaching Competence from the Perspective of Digitalized Teaching

Wu Lei

Zibo Polytechnic University

Zibo, Shandong, China

Abstract: With the deepening of the strategy for educational digitalization, digital technologies such as artificial intelligence, big data and virtual simulation are deeply integrated into the whole process of vocational education, pushing higher-vocational education to a new stage of digital and intelligent transformation from traditional information-based construction. As core subjects for cultivating high-quality technical and skilled talents, higher-vocational teachers' digital teaching competence directly determines the talent-training quality of vocational education. At present, some teachers in higher-vocational colleges are confronted with practical problems including unbalanced digital literacy structure, insufficient adaptability of training modes, imperfect evaluation and incentive mechanisms, and weak awareness of digital ethics. Against the backdrop of digitalized teaching, this paper analyzes the profound changes in teaching logic brought by digital transformation to higher-vocational teachers, sorts out existing dilemmas in the development of teachers' teaching competence, and constructs a full-domain empowerment improvement path from the perspectives of stratified and categorized cultivation, industry-education collaborative practice, construction of smart teaching environment, multi-dimensional evaluation and incentive, and digital ethics development. It is expected to facilitate higher-vocational teachers' transformation from experience-oriented teaching to smart teaching, and contribute to the high-level operation of modern vocational education and high-quality development of industry-education integration.

Keywords: digitalized teaching; higher-vocational teachers; teaching competence; digital literacy; industry-education integration

1. Introduction

The new round of scientific-technological revolution and industrial transformation are evolving at an accelerated pace. Digital technologies have fully permeated all links of industrial production, and new business forms and new processes keep emerging, setting higher requirements for talent cultivation in vocational education. Educational digitalization has become a key strategic direction for the reform and development of vocational education in China. Digitalization is no longer merely a supplementary teaching tool; instead, it serves as a vital force for reshaping talent-training modes, reconstructing classroom forms, and connecting industry and education ends. Higher-vocational colleges shoulder the mission of delivering technical and skilled talents for regional industries. Teachers' teaching philosophies, technology application proficiency and instructional design competence determine how well vocational education aligns with industries.

The popularization of digital technologies creates brand-new possibilities for classroom reform in higher-vocational colleges, innovation in practical training teaching, and accurate learning-situation analysis. Meanwhile, it poses new challenges to teachers' comprehensive teaching competence. Many teachers can complete basic multimedia teaching operations, yet they are deficient in high-order capabilities such as analyzing learning situations with big data, developing virtual simulation training resources, and applying artificial intelligence tools for instructional design. How to resolve pain points in teachers' competence improvement via digitalized teaching and help teachers adapt to the new teaching ecosystem of "teacher-machine-student" collaboration has become an urgent practical issue for higher-vocational colleges. In accordance with the laws of vocational education and teaching, this paper analyzes the transformation of teaching logic under the digital background, explores practical

development dilemmas, and investigates systematic strategies for improving teachers' teaching competence.

2. Profound Changes in Higher-Vocational Teaching Logic Brought by Digitalized Teaching

Under traditional teaching modes, digitalization was mostly treated as an auxiliary classroom tool, mainly applied in PPT presentation and online teaching video playback, and the value of digital technologies was not fully unlocked. With the implementation of smart campuses, virtual simulation training and industrial data platforms, digitalized teaching is realizing the overall reshaping of educational ecology from tool-assisted status, bringing logical shifts in three dimensions: teaching decision-making, teachers' roles, and industry-education integration.

2.1 Teaching decision-making shifts from experience-based judgment to data-driven decision-making

In traditional classrooms, teachers mainly judged students' learning performance based on classroom observation and homework feedback. Learning-situation analysis was highly subjective, making it hard to address individual student differences. Relying on smart teaching platforms, virtual simulation training systems and intelligent classroom terminals, full-process learning data including students' pre-class preview, in-class interaction feedback and after-class practical training operations can be fully collected. Based on multi-dimensional data, teachers can build digital portraits of students' learning situations, accurately identify students' weak points in knowledge and skills, carry out differentiated instructional design, and rationally allocate teaching and practical-training resources. This enables the concept of teaching students in accordance with their aptitude to be put into practice, and enhances the pertinence of classroom and practical-training teaching.

2.2 Teachers' identity transforms from mere knowledge imparters to designers of learning activities

Artificial intelligence can undertake repetitive teaching work such as imparting basic knowledge, correcting assignments and providing basic Q&A, which has changed the previous classroom mode featuring one-way knowledge delivery by teachers and formed a new ternary collaborative teaching pattern of "teacher-intelligent machine-student". Higher-vocational teachers should no longer merely focus on knowledge lecturing; they are more engaged in designing learning scenarios, developing practical-training projects, analyzing data, and conducting value-oriented education. Emphasizing practical skill training, vocational education allows teachers to restore real industrial production scenarios with digital twin technology, build virtual-real integrated practical-training environments, and guide students to complete on-the-job skill training. Meanwhile, artificial intelligence cannot realize emotional guidance and value shaping. Teachers should adhere to the fundamental task of fostering virtue through education and make up for the deficiencies of intelligent technologies in cultivating craftsmanship, work ethic and ideological-political education.

2.3 Industry-education integration evolves from physical-level cooperation to digital interconnected collaboration

In the past, industry-education integration mostly adopted physical forms such as offline visits, part-time work in enterprises and students' post internships. Teaching updates in colleges lagged behind enterprise technological iterations. Digitalization breaks physical barriers between colleges and enterprises. Depending on cloud-based teaching-research platforms and industrial data platforms, enterprises' latest production processes and post technical standards can be converted into digital teaching resources and quickly imported into colleges. Teachers can deeply participate in enterprises' digital

upgrading projects, and transform real enterprise production cases and technological renovation projects into course content. This opens up channels for converting industrial technical resources into teaching resources, narrows the gap between talent cultivation and post requirements, and improves the matching degree between talent supply and industrial demands.

3. Practical Dilemmas in the Development of Higher-Vocational Teachers' Teaching Competence under Digitalized Teaching

While digitalization brings opportunities for teaching innovation among higher-vocational teachers, many practical dilemmas exist in teachers' competence growth and institutional guarantee of colleges in practical implementation, hindering the effective application of digital teaching.

3.1 Teachers are deficient in high-order digital competence

Many higher-vocational teachers only master basic operational capabilities for office software and multimedia courseware production to satisfy conventional classroom teaching. Nevertheless, they lack competence in coping with new teaching demands such as generative artificial intelligence, big-data-based learning-situation analysis, virtual training resource development and intelligent teaching evaluation. Some teachers apply digital tools merely in a formal manner by simply digitizing paper-based courseware, without reconstructing teaching procedures with digital technologies. Thus, the value of digital technologies in empowering teaching is not fully exerted. Obvious competence gaps exist among teachers of different ages and majors. Young teachers can quickly adapt to new technologies but lack industrial practical experience; middle-aged and senior teachers boast rich teaching experience yet are slow to accept new digital tools.

3.2 Prominent disconnection between teachers' learning and practical application

Most higher-vocational colleges have launched training on digital teaching. However, most trainings adopt extensive centralized lectures that focus on theoretical preaching with insufficient practical exercises. Training contents are highly homogenized without stratified design for teachers with different teaching years and majors. Specialized training for engineering majors on virtual simulation development and for service-oriented majors on digital-scenario instructional design is insufficient. There is no follow-up guidance after trainings, so digital methods acquired by teachers can hardly match their own courses. This leads to separation between training content and actual classroom teaching, greatly undermining training effects.

3.3 Imperfect evaluation and incentive mechanisms

The current teacher assessment and evaluation system still lays excessive stress on scientific research achievements and traditional class hours. Standards for recognizing and converting achievements of digital teaching such as blended course construction, virtual training resource development and digital teaching reform projects remain ambiguous. Teachers devote substantial time to developing digital teaching resources, yet such work cannot be fully acknowledged in performance distribution, professional title evaluation and merit assessment. The lack of special incentive policies results in low enthusiasm among many teachers to participate in digital teaching reform and insufficient internal motivation for proactive teaching innovation.

3.4 Weak awareness of digital-technology risk prevention

While digital technologies bring convenience to teaching, they also give rise to new risks. Some teachers rely excessively on AI-generated teaching materials and neglect content review, which may trigger problems such as intellectual property infringement and content distortion. When collecting students' learning data, they tend to ignore the protection of students' personal privacy. Some teachers one-sidedly pursue digital classroom forms and blindly pile up diverse digital tools, falling into the trap of technology worship that prioritizes technological forms over educational effectiveness and weakens value-oriented education such as curriculum-based ideological-political education and craftsmanship cultivation.

4. Full-domain Empowerment Improvement Path for Higher-Vocational Teachers' Teaching Competence from the Perspective of Digitalized Teaching

To address challenges in improving higher-vocational teachers' digital teaching competence, short-term technical training alone is far from enough. A full-domain empowerment system covering cultivation modes, practical carriers, hardware resources, evaluation incentives and ethical norms should be constructed to systematically boost teachers' competence iteration.

4.1 Innovate stratified and categorized cultivation modes

A step-by-step research and training system of "popularization-deepening-innovation" shall be built according to teachers' existing digital foundations to realize targeted empowerment. The popularization level targets all teachers, focusing on practical operation of basic digital teaching tools to solve entry-level digitalization problems. The deepening level is for teachers with certain foundations, emphasizing capabilities including blended curriculum design, learning-situation big-data

analysis, and instructional design for integrated online-offline classrooms. The innovation level is oriented toward backbone teachers and professional leaders. Adopting project co-creation modes, teachers cooperate with enterprise technicians to develop AI teaching cases and virtual simulation training courses, and produce reusable teaching outcomes.

The dual-track college-enterprise training mechanism shall be deepened. Enterprise-based practical stations for teachers' digital practice shall be established. Teachers are organized to get involved in real projects of enterprises' digital transformation and process upgrading in enterprise R&D departments and digitally-enabled production workshops. Enterprise engineers shall be hired as external technical mentors to convert cutting-edge industrial digital technologies such as BIM, industrial big data and numerical-control simulation into teachers' teaching competence, realizing the digital upgrading of higher-vocational teachers' dual-qualification credentials.

The integration of competition and teaching shall be promoted. Teaching competitions and vocational-skill competitions for vocational colleges shall play a guiding role, and the practical application effect of digital technologies shall be incorporated into competition evaluation indicators. Teachers can break through their technical comfort zones and polish digital instructional design through competition preparation. Excellent competition teaching cases can be transformed into internally shared teaching resources after competitions, promoting learning and reform via competitions.

4.2 Optimize the supporting environment for smart teaching

The construction of smart teaching spaces shall be improved. Existing practical-training classrooms shall be upgraded to build smart classrooms equipped with data perception and edge-computing capacities. Operation procedures of digital tools shall be simplified so that teaching data can be naturally collected in classroom teaching and practical-training

operations, lowering teachers' operational barriers to applying digital technologies. Meanwhile, relying on the national smart-education public service platform, school-level multi-modal teaching resource libraries covering micro-lectures, 3D simulation models and enterprise production cases shall be built. An automatic resource review mechanism shall be introduced to eliminate outdated teaching resources in a timely manner. Teachers shall be encouraged to develop teaching materials with AIGC tools, so as to construct a co-constructed, shared and dynamically updated teaching-resource ecosystem and reduce teachers' burden of resource development.

4.3 Improve multi-dimensional evaluation and incentive mechanisms

Single-dimensional assessment shall be abandoned, and a diversified dynamic evaluation system driven by data shall be established. Multi-dimensional data such as the quantity of teachers' curriculum-resource construction, practical effects of digital classroom application and improvements in students' learning situations shall be comprehensively collected to generate growth archives for teachers' digital teaching competence and objectively reflect their competence changes. Institutional guarantees shall be perfected. Achievements of blended courses, virtual training projects and digital teaching reform shall be included in assessment for professional title evaluation, performance distribution and merit assessment. The conversion ratio of workload for digital teaching achievements shall be reasonably raised. Special funds and reward funds for digital teaching reform shall be set up to offer both material and honorary rewards for teachers with outstanding achievements, so as to effectively enhance teachers' professional sense of gain and mobilize their initiative in digital teaching reform.

4.4 Consolidate the fundamental task of fostering virtue through education

That technologies serve talent cultivation is the basic principle of digital teaching. Colleges shall carry out regular special training on digital ethics to enhance teachers' ability to identify algorithmic bias, data-privacy risks and intellectual-property issues. Teachers shall be guided to treat digital tools rationally and reject blind pursuit of technological forms. They should strike a balance between technology application and value-oriented education, integrate craftsmanship, labor education and curriculum-based ideological-political education into digital instructional design throughout the process, avoid risks of technology alienation, and ensure that digital teaching always serves the fundamental task of fostering virtue through education.

5. Conclusion

Enhancing higher-vocational teachers' teaching competence empowered by digitalized teaching is not a simple superposition of digital technologies and classroom teaching, but a systematic reform involving teaching philosophies, cultivation modes and institutional mechanisms. Faced with the wave of industrial digital transformation, higher-vocational colleges should address practical shortcomings of teachers in digital literacy, training supply, institutional evaluation and ethical awareness. They should adhere to industry-education collaboration, implement targeted stratified and categorized research and training, improve the supply of smart teaching hardware and resources, establish scientific evaluation and incentive systems, and stick to the bottom line of digital-ethics-oriented talent cultivation. In this way, more higher-vocational teachers can complete the transformation from experience-oriented teachers to data-driven smart teachers. Only by continuously

consolidating higher-vocational teachers' digital teaching competence can we steadily improve the talent-training quality of vocational education and provide solid faculty guarantee for the high-quality development of modern vocational education.

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