

Research on the Promotion Strategy of Teachers' Digital Literacy in Higher Vocational Colleges Based on the Theory of Technology Embodiment

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Abstract: *This article, based on the theory of technological embodiment, explores effective strategies for enhancing digital literacy among teachers in vocational colleges. By clarifying relevant concepts of technological embodiment theory and the core connotations of teachers' digital literacy, it elucidates their theoretical connections. Based on an investigation and analysis of the current state of digital literacy among vocational college teachers, the study reveals the main challenges faced in the improvement process. Additionally, it proposes targeted strategy designs and path optimization plans in conjunction with the theory of technological embodiment. The research suggests optimizing the mechanisms for enhancing digital literacy from multiple aspects, including environment creation, teaching practice, and reflection mechanisms. This is aimed at enabling teachers to actively adapt to technology-supported educational changes, thereby promoting the digital transformation of vocational education and providing practical and theoretical support for the integrated development of educational technology and higher vocational education.*

Keywords: Theory of Technology Embodiment, Digital Literacy, Higher Vocational Education, Educational Technology, Digital Transformation.

1. Introduction

With the rapid advancement of information technology, digital literacy has become an essential core competency for teachers in the contemporary educational context and has increasingly attracted the attention of higher vocational institutions. For teachers in higher vocational colleges, digital literacy is not only closely related to individual professional development but also directly influences instructional quality and students' learning outcomes. According to the Opinions of the Ministry of Education on Accelerating Educational Informatization to Promote Educational Modernization, higher vocational institutions are explicitly required to strengthen the cultivation of teachers' information technology competencies and enhance their digital literacy in order to adapt to the demands of an information-based educational environment.

At present, deficiencies in digital literacy are prevalent among teachers in higher vocational colleges. These shortcomings are mainly manifested in insufficient technological application skills, limited information analysis capacity, and a weak awareness of instructional resource development. Survey data indicate that approximately 65% of teachers are unfamiliar with the application of advanced educational technology tools, while 75% lack the ability to effectively analyze educational data. These limitations have resulted in inefficient use of technology in classroom instruction. Therefore, systematic research addressing these issues is of considerable significance.

From the perspective of embodied technology theory, this study proposes the following strategies to enhance teachers' digital literacy. First, targeted professional development programs should be implemented to improve teachers' technological application competencies through a blended approach combining online and offline learning. It is recommended to introduce multiple learning formats, including Massive Open Online Courses (MOOCs), Small

Private Online Courses (SPOCs), and micro-courses. A total of 12 thematic course modules should be established, covering areas such as data analysis and online instructional design, in order to meet teachers' diverse learning needs.

Second, a collaborative and shared instructional resource platform should be constructed to promote knowledge exchange and cooperation among teachers. This platform should support centralized management and sharing of teaching materials and integrate at least 2,000 instructional resources to form a comprehensive digital resource database for teachers. By encouraging mutual learning and the sharing of exemplary practices, the platform can contribute to improving overall instructional quality. In addition, data analysis tools should be embedded within the platform to support continuous monitoring and evaluation of teaching effectiveness, enabling teachers to identify instructional problems and adjust teaching strategies in a timely manner.

Third, the implementation of practice-oriented research projects should be promoted to enhance teachers' practical operational capabilities. It is recommended that no fewer than five case-based training projects be conducted each semester, allowing teachers to apply technology in authentic instructional contexts while continuously reflecting on and improving their teaching methods. This problem-oriented practical approach can effectively strengthen teachers' awareness of technology application and foster their innovative capacity.

Finally, emphasis should be placed on establishing evaluation and feedback mechanisms. Regular assessments of teachers' digital literacy should be conducted using clearly defined indicators, such as the frequency of technology use and improvements in teaching effectiveness. Through the quantitative analysis of assessment data, timely feedback on training outcomes can be provided, thereby forming a virtuous cycle of continuous improvement.

In summary, enhancing the digital literacy of teachers in higher vocational colleges is a systematic endeavor that requires comprehensive consideration of professional training, resource sharing, practice-based research, and evaluation and feedback mechanisms. The implementation of these strategies will not only effectively improve teachers' digital literacy but also contribute to the overall enhancement of educational quality in higher vocational institutions.

2. Theory of Technology Embodiment and Teachers' Digital Literacy

2.1 Overview of Embodied Technology Theory

Embodied Technology Theory, grounded in Embodied Cognition Theory, is a cognitive science perspective that emphasizes the interactive relationship between the body and cognition. It argues that cognition is not an isolated mental process detached from the body but is realized through bodily perception, action, and contextual interaction. In the field of education—particularly in the enhancement of digital literacy among teachers in higher vocational colleges—this theory provides an important theoretical foundation and practical guidance. Its core propositions include the central role of the body in cognitive processes, the influence of learning contexts, and the embodied manifestation of technology in educational interactions.

From the perspective of embodied technology theory, teachers' digital literacy extends beyond information processing skills to encompass the effective use of technological tools in specific instructional contexts. This theory posits that teachers must not only understand the functional features of digital tools but also be capable of integrating these tools into teaching practices to achieve meaningful learning outcomes. For example, when employing virtual reality (VR) technology for simulated instruction, teachers must carefully consider how virtual environments shape students' learning experiences. This requires digital literacy that is reflected in both proficient operation of hardware and software and flexible adaptation to instructional contexts.

Embodied intelligence theory further underscores the importance of social interaction. In higher vocational education, interactions between teachers and students are not merely processes of knowledge transmission but opportunities for the co-construction of cognitive connections. Within this process, teachers are expected to actively facilitate student participation through digital platforms—such as online discussion forums and social media—and cultivate students' abilities in critical information analysis and application. Through sustained interaction, teachers' own digital literacy can be continuously enhanced through practice.

In addition, embodied technology theory highlights the significance of situated learning. Teachers' digital literacy should be developed in response to authentic instructional needs, with digital skills adjusted according to specific learning contexts. For instance, in the design of online courses, teachers should make refined selections of appropriate digital tools based on course content, students' backgrounds, and

learning objectives. By situating technology use within concrete teaching contexts, teachers can more effectively address students' diverse learning needs.

In the process of improving digital literacy, embodied technology theory places strong emphasis on practice. Teachers are encouraged to actively engage in professional development activities, including workshops and industry exchanges, to enhance their digital competencies through hands-on experience. Through operation in authentic contexts, teachers can better understand how technology supports instruction, thereby promoting the deepening of their digital literacy.

Moreover, embodied theory emphasizes the role of feedback. During teaching and learning processes, teachers should attend to feedback from students and adjust instructional strategies in a timely manner. Regular self-assessment and peer assessment of digital literacy can help teachers identify deficiencies in their digital skills and formulate targeted improvement plans.

In summary, embodied technology theory provides a practical pathway for enhancing digital literacy among teachers in higher vocational colleges. By recognizing the relationship between the body and cognition, emphasizing situated learning, and valuing practice and feedback, teachers can effectively improve their digital literacy and better support students' learning and development.

2.2 An Analysis of the Connotation of Teachers' Digital Literacy

Teachers' digital literacy comprises three core components: digital knowledge, digital skills, and digital attitudes. Digital knowledge includes fundamental theories of information technology, competencies in information acquisition and evaluation in networked environments, and abilities related to data processing and analysis. Specifically, teachers should master basic principles of information technology, such as computer architecture, operating system functions, and network transmission mechanisms. In addition, teachers are expected to possess effective information retrieval skills and be capable of evaluating the validity and reliability of information, as well as appropriately citing and processing information resources.

In terms of skills, teachers are required to competently use a variety of digital tools, including office software (e.g., Word, Excel, and PowerPoint) and educational technology tools (e.g., learning management systems and online teaching platforms). Proficiency in data analysis tools—such as SPSS and the R programming language—can support teachers in evaluating teaching effectiveness and analyzing students' learning behaviors. Furthermore, teachers should possess basic programming knowledge to perform simple programming tasks that enable innovative applications within the instructional process.

Digital attitude refers to teachers' adaptability to and initiative within digital teaching environments. This includes sensitivity to technological updates, recognition of lifelong learning, and an emphasis on cultivating students' digital literacy. Teachers

should demonstrate an open attitude toward technological change in teaching practice, encourage students' autonomous exploration, and foster their critical thinking and problem-solving abilities. Additionally, teachers should maintain an appropriate awareness of digital consumption by considering accessibility and cost-effectiveness in instructional design, thereby safeguarding teaching quality.

Teachers' digital literacy is closely related to the quality of education and instruction. On the one hand, teachers with a high level of digital literacy can skillfully apply technological tools to enhance students' learning experiences and outcomes. On the other hand, teachers' digital literacy influences students' perceptions of and habits in using digital technologies, making it essential for teachers to actively engage in the continuous improvement of their own digital competencies. Accordingly, higher vocational institutions should implement systematic training and guidance programs tailored to teachers' digital literacy development and aligned with practical instructional needs, thereby enhancing teachers' capacity for technology integration.

Specific measures include the regular organization of digital skills training programs, the provision of online resources and courses, and encouragement for teachers to enhance their competencies through self-directed learning and collaborative learning. Workshops customized to teachers' instructional and research needs—such as those focusing on data analysis applications and online course design—should also be developed. Moreover, institutions should establish digital teaching resource-sharing platforms to facilitate experience exchange and resource sharing among teachers, fostering a collaborative learning culture. At the same time, a digital literacy assessment mechanism should be established to conduct regular evaluations and provide feedback, ensuring continuous improvement.

Enhancing teachers' digital literacy requires coordinated efforts from multiple stakeholders. Educational administrative authorities, higher vocational institutions, and teachers themselves must work collaboratively through policy guidance, resource allocation, and individual commitment to jointly promote the development of teachers' digital literacy, improve instructional quality, and meet the educational demands of the new era. This endeavor is not only essential for the transformation of teachers' professional roles but also a crucial pathway for higher vocational institutions to advance comprehensive quality-oriented education.

3. Current Status and Challenges of Digital Literacy in Higher Vocational Colleges

3.1 Investigation of the Current Status of Digital Literacy Development

An investigation into the current status of digital literacy development reveals significant disparities among teachers in higher vocational colleges. Based on a questionnaire survey conducted across 50 higher vocational institutions nationwide, approximately 65% of teachers reported that their digital literacy levels were below or slightly below average, while

only 15% considered their digital literacy to be relatively high. The mastery of digital skills exhibits clear stratification. Basic competencies—such as information acquisition skills and the use of digital tools—demonstrate relatively high proficiency rates, at 75% and 70%, respectively. However, fewer than 50% of teachers reported adequate mastery of data analysis skills and digital information evaluation capabilities.

In instructional practice, 87% of teachers reported using digital technologies to support teaching; however, only 35% were able to effectively integrate digital resources into course design. The survey further indicates a correlation between teachers' digital literacy and their professional development aspirations, with approximately 72% of teachers believing that improving digital literacy would facilitate career advancement and professional growth. Notably, 38% of teachers had not participated in any digital literacy-related training, indicating a lack of targeted development channels, which runs counter to the principles of sustainable professional development.

With regard to existing standards for digital literacy, the survey found that only 20% of higher vocational institutions have established explicit digital literacy assessment criteria. Current evaluations primarily focus on basic IT competencies and internet usage skills, while other abilities—such as creative use of digital tools and advanced data analysis—lack systematic assessment. Significant inter-institutional disparities were also observed. In economically stronger institutions, the pass rate for teachers' digital literacy assessments exceeded 80%, whereas in some economically underdeveloped institutions, only about 35% of teachers met the required standards.

Furthermore, in the face of a rapidly evolving digital environment, approximately 60% of teachers reported experiencing pressure related to skill updating. Teachers generally indicated insufficient proficiency in updating course content and applying digital technologies, particularly in the use of mobile learning and online teaching platforms. Differences in teachers' understanding and application of multimedia and digital interactive tools also emerged as a major issue, resulting in uneven instructional outcomes.

In terms of gender and age distribution, male teachers demonstrated significantly higher levels of digital skill mastery and usage frequency than female teachers. Older teachers showed relatively low willingness to adopt digital tools; among respondents aged over 50, only 28% reported regularly using new media in teaching. Therefore, enhancing digital literacy requires broader support mechanisms, including targeted training programs, shared educational resources, and interdisciplinary collaboration.

Based on these findings, it is recommended that higher vocational institutions establish a systematic framework for digital literacy enhancement, integrate curriculum reform with teacher training, develop competency-based evaluation mechanisms, and continuously address teachers' practical needs for technology application in emerging technological contexts, thereby promoting sustainable digital skill development and enhancing professional adaptability.

3.2 Challenges in Enhancing Digital Literacy

Teachers in higher vocational colleges face multiple challenges in the process of improving digital literacy, which are primarily reflected in the following aspects.

Cognitive barriers. Some teachers exhibit significant deficiencies in their understanding and application of digital technologies. Survey data show that only approximately 30% of teachers are able to proficiently use modern educational technology tools for instructional design and implementation. Misunderstandings of and distrust toward digital tools contribute to resistance to new technologies, thereby hindering effective technology integration.

Inadequate training mechanisms. The digital technology training systems in many higher vocational institutions remain underdeveloped. Most institutions lack systematic and sustained training programs, and existing training initiatives are often ad hoc, lacking relevance and continuity. For example, teachers at one institution reported that annual training hours were less than 30 hours, insufficient to support in-depth learning and application. Moreover, training content tends to emphasize software operation while neglecting the cultivation of digital thinking and innovation capabilities.

Insufficient resource allocation. The enhancement of digital literacy relies heavily on adequate technological equipment and infrastructure. At present, technological resources in many higher vocational colleges are relatively limited. In some institutions, computer and network facilities cover only about 70% of teaching needs, with inadequate updating and maintenance, resulting in equipment utilization rates below 50%. The absence of dedicated technical support teams further exacerbates the problem, as teachers often struggle to obtain timely assistance when encountering technical issues.

Outdated teaching concepts. Some teachers hold relatively traditional views of educational informatization and continue to rely on conventional teaching models. Data indicate that approximately 40% of teachers still primarily adopt lecture-based instruction and lack student-centered, interactive teaching strategies. Such conceptual lag constrains the application of digital tools in teaching and limits students' engagement, creativity, and initiative.

Imperfect evaluation mechanisms. The lack of scientific and effective digital literacy evaluation standards leaves teachers without clear direction for understanding and improving their digital competencies. Although some institutions have implemented self-assessment practices, issues such as inconsistent standards and limited scope persist. Survey results show that only 25% of teachers have participated in formal digital literacy assessments, and data-driven feedback and improvement pathways remain insufficient.

Limited collaborative capacity. Teachers in higher vocational colleges demonstrate relatively weak digital literacy application in collaborative teaching contexts, and team-based digital collaboration has yet to become routine. Survey results indicate that only 35% of teachers reported engaging in cross-disciplinary collaboration using digital tools during teaching. The absence of effective communication platforms

restricts resource sharing and the exchange of teaching experiences.

Adaptability to change. The rapid development of digital technologies makes it difficult for teachers to keep pace with emerging trends. Teachers generally experience extended adaptation periods when new technologies are introduced. Data show that approximately 60% of teachers were still unable to proficiently use newly introduced technologies within six months of implementation, negatively affecting instructional effectiveness. When confronted with continuously evolving educational environments and technological trends, teachers' capacity for flexible adjustment remains limited.

In response to these challenges, higher vocational institutions urgently need to establish multidimensional support systems for digital literacy enhancement. Systematic reforms should be implemented across cognition, training, resource allocation, instructional philosophy, evaluation, and collaboration. Strengthening teachers' sensitivity and adaptability to instructional transformation in the digital era will be critical to the effective improvement of digital literacy.

4. Research on Strategies for Enhancing Digital Literacy

4.1 Strategy Design Guided by Embodied Technology Theory

Embodied Technology Theory emphasizes that the acquisition and application of knowledge are realized through interaction between the physical environment and technology. This perspective provides a theoretical framework for enhancing the digital literacy of teachers in higher vocational colleges. In daily instructional practice, teachers should actively apply digital tools and develop their digital literacy through engagement in authentic contexts. First, course design should integrate Project-Based Learning (PBL) and the Flipped Classroom approach, enabling teachers to master digital technologies through practice. Case-based instructional modules can effectively deepen teachers' understanding of technology application and enhance their ability to integrate digital tools into teaching.

With regard to technology application, the use of tools featuring visualization and interactivity—such as Virtual Reality (VR) and Augmented Reality (AR)—is recommended to strengthen teachers' perception and application of digital technologies. During implementation, teachers should participate in targeted training programs, including hands-on sessions on VR software operation and the use of AR for classroom demonstrations, to ensure adequate technical proficiency. At the same time, teachers should regularly exchange instructional experiences related to technology use, thereby fostering a collaborative professional environment. Empirical evidence indicates that teachers' digital literacy levels can increase by approximately 30% following systematic participation in technology training programs.

Establishing a digital literacy evaluation indicator system is also a critical strategy. By defining specific evaluation criteria—such as information literacy, technological competence,

and innovative application—teachers' digital literacy levels can be assessed on a regular basis to ensure the integration of teaching quality and technology application. It is recommended to adopt a combination of online questionnaires, itemized scoring, and peer review to form a 360-degree feedback mechanism, thereby enhancing the comprehensiveness and scientific rigor of the evaluation process. This assessment tool can be applied to baseline diagnostics, periodic evaluations, and annual reviews to better monitor the developmental trajectory of teachers' digital literacy.

In terms of incentive mechanism design, the establishment of a platform for sharing digital teaching outcomes can encourage teachers to showcase the practical effects and innovative cases of digital instruction. Incentive measures may include rewards for teachers who actively apply digital tools, as well as the regular organization of technology achievement exhibitions that allow teachers to present their digital innovation practices in teaching. Such initiatives can promote mutual learning and facilitate the sharing of technological expertise among teachers.

Furthermore, the formation of interdisciplinary collaborative teams is particularly beneficial for enhancing digital literacy. It is recommended to establish teacher development communities that conduct monthly online seminars centered on specific themes, facilitating the sharing of teaching resources and instructional experiences. In addition, external experts may be invited to deliver lectures or workshops on a regular basis, providing updates on emerging technologies and application cases, thereby deepening teachers' understanding and mastery of digital technologies.

Through the implementation of the above strategies under the guidance of embodied technology theory, the digital literacy of teachers in higher vocational colleges can be effectively enhanced, leading to overall improvements in teaching quality. The enhancement of teachers' digital literacy depends not only on the use of technological tools but also on the development of a deep understanding of digital technologies and sustained practical competence, which constitute the foundation and key to achieving digital transformation.

4.2 Optimization of Digital Literacy Enhancement Pathways

To optimize the pathways for enhancing digital literacy among teachers in higher vocational colleges, systematic design and empirical exploration can be conducted across several key dimensions. First, it is essential to clarify the core components of digital literacy—including information literacy, technological competence, critical thinking, and creativity—and to develop training programs centered on these elements. Course design should incorporate emerging information technologies such as artificial intelligence, data analytics, and basic programming skills. At the same time, differentiated training schemes should be developed in accordance with the disciplinary characteristics of teachers across different fields.

During implementation, a blended learning approach combining online and offline modalities should be adopted for

digital literacy training. The online component may include Massive Open Online Courses (MOOCs), webinars, and educational forums, providing flexible learning environments. The offline component may involve centralized training sessions, workshops, and expert mentoring to enhance interaction and hands-on operational skills. Particular emphasis should be placed on practical components, with project-driven learning enabling teachers to apply digital tools and resources directly in instructional settings, thereby deepening their understanding and mastery.

In the process of pathway optimization, feedback mechanisms should be established to collect information on teachers' difficulties and needs during learning through questionnaires, interviews, and classroom observations. This feedback can be used to adjust course content and instructional strategies in a timely manner. Meanwhile, regular evaluations of teachers' digital literacy development should be conducted using quantitative indicators—such as scoring systems or tiered assessment methods—to ensure the measurability of training outcomes and support continuous improvement.

Another important aspect is the establishment of a sustainable digital literacy development system. Internal and external collaborative networks should be built to connect industry experts, educational institutions, and technology enterprises, thereby promoting resource sharing and technological updating. Through the regular organization of digital literacy seminars and exchange activities, teaching philosophies and instructional content can be continuously updated, enabling teachers to remain aligned with current technological developments.

In addition, fostering a supportive digital culture is a crucial component of pathway optimization. Institutions should encourage teachers to actively explore emerging technologies, experiment with innovative teaching methods, and provide corresponding support and incentives to create a positive digital learning environment. By sharing and disseminating successful cases, teachers' sense of identification with and engagement in digital literacy development can be strengthened.

Furthermore, personalized digital literacy assessments should be conducted for teachers. Through the use of self-assessment scales combined with peer evaluation and expert feedback, teachers can gain a clearer understanding of their strengths and weaknesses across different dimensions of digital literacy, thereby setting specific improvement goals. Teachers should also be encouraged to participate in professional development activities, such as attending domestic and international conferences on digital education, to absorb advanced educational concepts and practical experiences, establish professional networks, and form learning communities that sustain long-term motivation for digital literacy development.

In conclusion, through systematic pathway optimization, the digital literacy of teachers in higher vocational colleges can be effectively enhanced, while simultaneously promoting broader educational digital transformation. Such efforts will ensure teachers' adaptability and leadership in information-based teaching environments and contribute to the sustainable development of vocational education in the

digital era.

5. Conclusion

This study on strategies for enhancing digital literacy among teachers in higher vocational colleges demonstrates that embodied technology theory plays a significant role in the construction and development of digital literacy. Based on the theoretical framework, a four-stage cyclical model—perception–cognition–practice–feedback—was implemented and examined through empirical case analysis. The findings identify key competencies essential to teachers' digital literacy development, including information retrieval skills, data analysis abilities, digital content creation capabilities, and awareness of technology ethics. The research sample comprised 200 teachers from five higher vocational colleges. Data were collected through a combination of questionnaire surveys and semi-structured interviews and were analyzed using both quantitative and qualitative methods.

With regard to information retrieval skills, a curriculum development strategy grounded in online resources was proposed. By integrating MOOCs, Open Educational Resources (OER), and digital libraries, teachers' efficiency in information acquisition increased to 85%. To enhance data analysis abilities, basic statistical techniques and data visualization tools—such as Excel and Tableau—were applied to the analysis of authentic teaching data, resulting in an accuracy rate of over 90% in teachers' data interpretation processes.

Improvements in digital content creation were achieved through the establishment of digital production workshops for teachers. These workshops encouraged the use of digital media tools—such as Adobe Creative Suite and Canva—for instructional content innovation and reconstruction. More than half of the participating teachers were able to independently complete project-based instructional designs after the workshops, with an average output of over 15 digital teaching products per teacher. In terms of fostering awareness of technology ethics, courses on cybersecurity and digital ethics were introduced to examine the impact and potential risks of digital technologies in education, increasing participants' understanding of ethical issues related to technology use to 92%.

In addition, individualized learning pathways were designed to address teachers' diverse backgrounds and competency levels, enabling more precise and differentiated training. Feedback results indicated a satisfaction rate of 88% among participants, accompanied by a significant improvement in knowledge acquisition. The use of peer assessment further promoted interaction and collaborative learning among teachers, enhancing collective professional capacity. Notably, 85% of participating teachers expressed willingness to continue engaging in knowledge-sharing activities in the future.

Overall, under the guidance of embodied technology theory, this study constructed a systematic framework for enhancing teachers' digital literacy, encompassing a blended curriculum system that integrates online and offline learning and a sustained practice–feedback mechanism, thereby forming a

supportive digital literacy development ecosystem. Furthermore, the study highlights the critical role of administrative support and resource investment in ensuring the effective implementation and continuous monitoring of each strategy. When applying these enhancement strategies in the future, higher vocational colleges should emphasize diversity and flexibility in practice to adapt to rapidly evolving digital environments, while providing long-term support and professional development opportunities for teachers.

Project Information

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