Research on Strategies and Methods of Improving Teachers' Digital Literacy in Classroom Teaching in Higher Vocational Colleges

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Abstract. With the continuous development and application of digital technology, higher vocational education is also facing the demand of digital transformation. The digital transformation of higher vocational education is the key to the high quality development of higher vocational education. In order to promote the digitization of education and enhance the adaptability of vocational education, it is necessary to continuously improve teachers' ability and literacy. In order to adapt to and lead the digital new normal, it is an important starting point for the high-quality development of vocational education to build a comprehensive and multi-channel digital literacy of higher vocational teachers and the digital improvement path of classroom teaching. The research of this paper will provide guidance and reference for the cultivation of teachers' digital literacy and the improvement of classroom teaching effect in higher vocational colleges.

1. Introduction

With the rapid development of emerging technologies such as artificial intelligence, big data and the Internet of Things, the digital age has arrived. Digital technology has been widely used in various fields. The traditional education ecology has been constantly impacted, and the digital transformation of education has begun[1,2].The digitalization of education has promoted the systematic reform of the way of education, the mode of running a school, the management system and the guarantee mechanism. It is of great significance to promote the fairness of education, improve the quality of education and build a high-quality education system[3]. The digital transformation of education puts forward new requirements for the professional competence of higher vocational teachers. Teachers are the first resource for the development of vocational education and the key force to support the reform of national vocational education in the new era. Teachers' digital literacy and skills are the key factors affecting teachers' practice[4,5]. As an important basis for promoting the digitization of education, how to effectively accelerate the development of teachers in the digital era has become a key task in the current education field. The successive release of a series of policy documents, such as the "Outline of Action for Improving Digital Literacy and Skills for All" and the "14th Five-Year" National Informatization Plan "2022 Key Points for Improving Digital Literacy and Skills for All" emphasizes the importance and necessity of digital literacy. In November 2022, the Ministry of Education issued the "Teachers' Digital Literacy" education industry standard (Teaching Letter [2022] No.58), which provides action-oriented guidance for promoting the national education digitization strategy and promoting teachers' use of digital technology, innovation and transformation of education and teaching activities. From the five dimensions of teachers' digital consciousness, digital technology knowledge and skills, digital application, digital social responsibility and professional development, "teachers' digital literacy" requires teachers to use digital technology resources to carry out learning, innovate teaching mode and improve teaching activities according to their personal development needs[6]. The high level of teachers' digital literacy can not only promote teachers to adapt to the development of the digital age and the reform of educational innovation, but also play a key role in cultivating students' digital literacy and cultivating high-quality talents. Improving the digital literacy of teachers themselves and classroom teaching has become an important task for the professional development and team building of teachers in China. This is the objective requirement of digitalization of higher vocational education, the inevitable need to cultivate digital high-skilled talents, and the necessary condition for the digital development of higher vocational teachers themselves.

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2. Connotation of teachers' digital literacy

Gilster first proposed "Digital Literacy" in 1997 and believed that it is a key ability to understand and use complex information presented by computers. Since the introduction of digital literacy, its concept has been widely concerned and disseminated around the world. With the further development of society and the update and change of digital technology, the concept and connotation of digital literacy have been widely discussed and studied by relevant institutions and scholars in China and abroad, and the connotation of digital literacy has been rapidly developed and deepened. Digital literacy has far exceeded the basic skills of processing computers. Although different institutions or scholars have different interpretations of digital literacy, they all emphasize its connotation from digital technology skills to the attitude, knowledge, ability, moral consciousness and other aspects needed to solve problems in the digital era. It can be seen that digital literacy is gradually evolving into a diversified and multi-level comprehensive concept with the development of the times[3,7]. In the key stage of digital transformation, the "Outline for Action to Enhance the Digital Literacy and Skills of the Whole People" points out that the current digital literacy in China is the comprehensive literacy that citizens in the digital society should have in their study, work and life. The "Outline" points out that digital literacy and skills are the collection of a series of qualities and abilities that citizens in the digital society should have in learning, working and living, such as digital acquisition, production, use, evaluation, interaction, sharing, innovation, security, ethics and so on. Improving the digital literacy and skills of the whole people is a strategic task to meet the requirements of the digital age, to improve the quality of the people and to promote the all-round development of people. It is the only way to realize the transformation from a big network country to a powerful network country, and also a key measure to bridge the digital divide and promote common prosperity[8].

Teachers' digital literacy is the expansion and extension of digital literacy in the field of education. It not only inherits the connotation concept and basic concept of digital literacy, but also fully considers the characteristics of education field such as teaching scene, teaching practice and teacher development. In the period of digital transformation to promote the development and reform of education, digital technology will be integrated into all levels of education, and promote the digital transformation of all elements, whole process and all aspects of education and teaching, which makes digital literacy become the key literacy of teachers in the digital age[9,10].

3. Main problems of vocational education digitization

With the rapid development of information technology, the application of information technology in education and teaching is very extensive. As the main participant and leader of educational practice, teachers' requirements in information literacy and digital literacy have been raised to a higher level[11,12]. Teachers' digital literacy requirements are no longer simple learning applications, but all-round deep integration and innovative practice. However, at present, there are still some problems in the digital literacy of teachers in China. Firstly, in the process of continuous integration of education and digitization, teachers are gradually facing problems such as insufficient application, insufficient systematization and prominent lag, which are mainly reflected in the difficulties in obtaining data for teachers. With the uneven quality of teaching resources, how to "choose the best from many" has become a real problem. Second, teachers' digital creation ability is insufficient. How to creatively construct and apply digital resources according to local conditions and circumstances is a problem that must be paid attention to. Third, teachers' application of digital technology is insufficient. How to give full play to the advantages of digital technology, integrate digital resources, and creatively carry out teaching activities needs to be focused on.

4. Research ideas on digitalization of classroom teaching for vocational college teachers

4.1 Building teachers' digital literacy based on the concept of future-oriented education

In the era of rapid development and continuous change of digital technology, teachers need to have a future-oriented concept consciousness in order to continuously provide nourishment and motivation for improving individual digital literacy. First, teachers need to maintain the habit of paying attention to the dynamics in the field of educational science and technology, adhering to lifelong learning and promotion. The second is to fully accept the rational optimization of educational products by intelligent technology and explore the potential of new technology to improve the quality and efficiency of existing teaching practice. The third is to adhere to the principle of co-construction and sharing to improve teachers' digital literacy for cooperation and exchange.

4.2 Accelerate digital transformation with the improvement of teachers' digital literacy as the key

Teachers play a core role in the digital transformation of vocational education. By combining subject knowledge, teaching methods, digital thinking and the application of scientific and technological tools, teachers have the ability to cultivate talents to adapt to the trend of digital transformation, and can also be self-promoted as a knowledge hub with both digital literacy and professional literacy. Thus it will have a positive impact on the overall teaching efficiency and accelerate the

qualitative change of digital transformation of vocational education.

4.3 Using tool development as a medium to promote the digital improvement of classroom teaching

Teachers' actions to improve the digitization of classroom teaching require specific tools or projects as carriers. Whether in teaching or professional development, tools and projects are media that materialize and concretize the policies and concepts of digital classroom teaching, and become a powerful weapon for teachers' digital transformation. In practice, teachers should choose appropriate tools to promote digital classroom teaching.

4.4 Promote the digitization of classroom teaching with the support of school-enterprise resource sharing

The digital improvement of classroom teaching can be combined with school-enterprise cooperation. Through school-enterprise cooperation and resource sharing, rich materials covering videos, audio, animations, virtual simulations, PPT, graphics and images can be constructed. These resources involve multiple application types such as courseware, animations, electronic textbooks, industry standards, course standards, teaching cases, exercises, and extended reading, including a diverse hybrid digital teaching resource library of course resources, material resources, training resources, and enterprise resources. Rich digital resources will drive the digitization of classroom teaching and provides quality assurance for the construction of teachers' digital ability and becomes a solid condition for teachers to cultivate digital ability.

5. Digital improvement path for classroom teaching of vocational teachers

We should build an all-round and multi-channel approach to explore the diversified ways to improve the digital literacy of higher vocational teachers and the digitization of classroom teaching. The digital improvement path for classroom teaching of vocational teachers is shown in Figure 1.

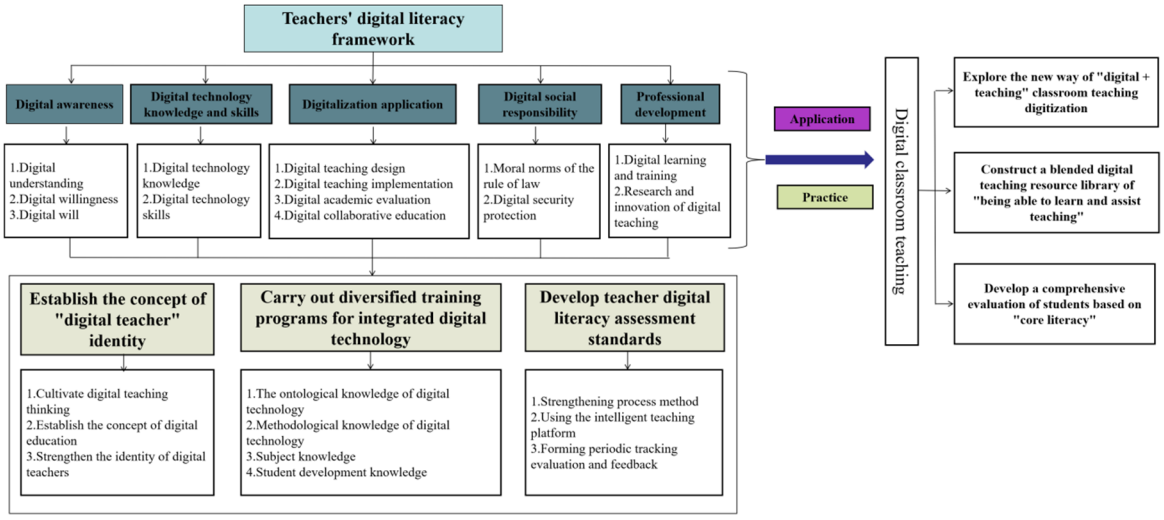

Figure 1. Digital improvement path for classroom teaching of vocational teachers

5.1 Formulate a digital literacy framework for higher vocational teachers based on the characteristics of teachers

The digital literacy framework provides a standardized measurement standard for evaluating the digital literacy level of higher vocational teachers. The "Teachers' Digital Literacy" standard promulgated by the Ministry of Education in November 2022 provides the direction for the development of teachers' digital literacy framework, which stipulates the requirements of five dimensions: digital awareness, digital technology knowledge and skills, digital application, digital social responsibility, and professional development. Therefore, on the basis of the characteristics of higher vocational teachers' work, we should draw lessons from the mature concept and development experience of teachers' digital literacy framework, combine with the current situation and needs of social development in China, comprehensively consider the level of digital literacy of higher vocational teachers, and formulate a framework of teachers' digital literacy in line with the educational objectives of higher vocational colleges. In this way, we can clarify the development direction and standards of teachers' digital literacy.

5.2 Strengthen the concept of digital education and establish the identity of digital teachers

At present, higher vocational teachers have generally possessed a high sense of digitization, and fully realized the importance of digital technology in teaching.

Therefore, it is necessary to further realize the internalization of digital literacy[13]. First of all, on the basis of the current good digital attitude and consciousness, we should cultivate digital teaching thinking, improve the sensitivity, initiative and creativity of digital solution to teaching problems, establish digital ethics, form a systematic digital education concept, and break the old concept that information technology is only an auxiliary means of teaching. Secondly, it is necessary to establish the concept of "digital teacher" identity for teachers and strengthen the identity of "digital teacher" for higher vocational teachers. That is to say, it is necessary to form a unified value concept and cognitive model under the background of digital teaching reform, strengthen the sense of identity and psychological attribution, and make teachers consciously improve digital literacy and digital teaching skills.

5.3 Carry out diversified training programs based on mixed training methods

Higher vocational teacher training is an important way to promote the professional growth of teachers. It is the professional development direction of higher vocational teachers in the digital age to continuously improve their digital literacy. The training of higher vocational teachers should make full use of the advantages of digital technology, adopt the flexible use of "online + offline" mixed training methods, give full play to the demonstration and leading role of national teaching teams and famous teachers, give full play to the advantages of digital resource sharing and interaction, carry out digital teaching ability training, improve the training of higher vocational teachers' data privacy and the importance of digital identity, and constantly improve the digital teaching ability of higher vocational teachers.

5.4 Formulate the evaluation standard of digital literacy for higher vocational teachers

In the era of educational informatization 2.0, it is urgent for vocational education to formulate evaluation standards for teachers' digital literacy in line with the actual situation of education, which will guide teachers to learn and improve in a planned and targeted way in stages and in different fields, so as to fully improve the digital literacy with teaching as the core. Therefore, it is necessary to develop the evaluation index of digital literacy, highlight the comprehensive evaluation of teachers' digital literacy, strengthen the process evaluation method, embed the evaluation into the teaching and learning process, and take digital literacy as the teaching goal of the subject. At the same time, the intelligent teaching platform is used to collect the behavior, cognition, emotion and other behavior data of teachers and students in the information-based teaching activities in an all-round and whole process, so as to realize the process evaluation and form a set of objective, standardized, mature and fair implementation process of digital literacy evaluation, which will realize the long-term tracking evaluation and feedback of teachers' digital literacy[14].

5.5 Explore the new path of "digital + teaching" classroom teaching digitization

In the era of digital learning, educators' teaching is no longer a simple superposition of technology and teaching methods, but an integrated innovation of technology and teaching for more complex learning environments[15]. We guide teachers to get rid of the time and space constraints of the original traditional teaching mode, and construct digital teaching practice and research based on digital teaching resources and digital teaching environment. Based on the "four learning" mode of "pre-class self-study, in-class guidance, after-class supervision and whole-course companion learning", the teaching process is extended from pre-class to in-class and after-class with the help of digital learning platform. The mixed teaching mode of online and offline double-line parallel is adopted to improve the digital practical teaching skills in the teaching process.

5.6 Construct a blended digital teaching resource library of "being able to learn and teach"

Taking students as the center and empowering students as the starting point, we help students take the initiative to use digital technology for autonomous learning. We build a wealth of material resources, covering video, audio, animation, virtual simulation, PPT, graphics and images, involving courseware, animation, electronic teaching materials, industry standards, curriculum standards, teaching cases, exercises, expanding reading and other application types, including curriculum resources, material resources, training resources and enterprise resources and other resources of the diversity of hybrid digital teaching resource library. It is necessary to improve teachers' digital literacy of using digital technology to process, transform and store teaching content, using digital technology to innovate, create and reconstruct teaching content, and using digital technology to share, diffuse and integrate teaching content.

5.7 Develop a comprehensive evaluation of students based on "core literacy"

We make full use of the big data of normalized teaching and learning digital classroom. Through the online learning platform, students' learning behaviors are recorded, tracked, detected and analyzed, such as students' attendance, courses, achievements and so on. We design pre-class, in-class and after-class self-evaluation, group evaluation, inter-group mutual evaluation, teacher evaluation and other process evaluation. At the same time, the final results of the course, the status database, and the result evaluation of the third-party evaluation are summarized. According to the data of process evaluation, we calculate the value-

added rate of each student at each stage, pay attention to the progress of students, so as to realize the value-added evaluation and construct the comprehensive evaluation of students. It is necessary to give full play to the role of guidance, diagnosis, regulation and improvement of evaluation results, so as to realize "promoting education by evaluation".

6. Conclusion

On the basis of studying the connotation of digital literacy and analyzing the main problems faced by the digitization of vocational education, the research ideas of classroom teaching digitization of higher vocational teachers have been given. We also explored the digital promotion path of higher vocational teachers' classroom teaching from seven aspects, namely, formulating digital literacy framework, strengthening digital education concept, carrying out diversified training projects, formulating digital literacy evaluation standards, carrying out "digital + teaching" classroom teaching digital model, constructing digital teaching resource library, and students' comprehensive evaluation. This is helpful to the cultivation of teachers' digital literacy and the improvement of classroom teaching effect in higher vocational colleges.

The report of the 20th National Congress of the Communist Party of China clearly proposed that it is necessary to "promote the digitization of education". Teachers are the main force to improve the level of education. They should keep up with the pace of the development of the times, constantly improve the ability and quality. At the same time, teachers need to adapt to and lead the new normal of digitization, empower the all-round systematic reform of classroom teaching digitization with digital transformation, continuously promote the process of classroom teaching digitization transformation, promote the high-quality development of classroom teaching, and cultivate high-quality talents with global competitiveness to adapt to the future society.

References

1. Liu Y, Li S. (2023) Research on the strategy of improving college teachers' digital literacy in the digital age. China Adult Education, 12: 72-76. https://kns.cnki.net/kcms2/article/abstract?v=3uoqIhG8C44YLTlOAiTRKu87-SJxoEJu6LL9TJzd50lU5qk5BeW2azmHgqH6z30tzeOqUrfA7QH-gutLEK64yuE6h61KBLTE&uniplatform=NZKPT
2. Dan WG, Li YT, Wang HF. (2022) Construction and Prospect of Digital Literacy Framework for College Teachers. Education and Teaching Research,36 (09): 41-53. https://kns.cnki.net/kcms2/article/abstract?v=3uoqIhG8C44YLTlOAiTRKibYlV5Vjs7iJTKGjg9uTdeTsOI_ra5_XY9khMDRFgXQdETkDBbxRnGuRZsP5hB4rAkB6qThqT-Q&uniplatform=NZKPT
3. Wu D, Gui XJ, Zhou C, etc. (2023) Teachers' digital literacy: connotation, standard and evaluation .Electrified education research, 44 (08): 108-114 + 128. https://kns.cnki.net/kcms2/article/abstract?v=3uoqIhG8C44YLTlOAiTRKu87-SJxoEJu6LL9TJzd50l6XkxdbtVGufuzkg_w4TFaQsvg19nIsnrqmNvGP9yqyPIUFe7QLEvV&uniplatform=NZKPT
4. Niu XY. (2022) Who teaches in higher vocational colleges? Analysis of the typical image and push-pull factors in the career choice of young teachers in higher vocational colleges. Vocational and technical education, 36: 51-57. https://kns.cnki.net/kcms2/article/abstract?v=3uoqIhG8C44YLTlOAiTRKibYlV5Vjs7ioT0BO4yQ4m_mOgeS2ml3UL-OVG6ZmWptbfXvJLJHnIz7VQnm2OS9LDfKTOZYXEsD&uniplatform=NZKPT
5. Yang XZ, Wang RX. (2023) Dilemma and Breakthrough: The Next Step in the Digital Transformation of Education. Journal of East China Normal University (Education Science Edition), 3: 82-90. https://kns.cnki.net/kcms2/article/abstract?v=3uoqIhG8C44YLTlOAiTRKibYlV5Vjs7ioT0BO4yQ4m_mOgeS2ml3UDDSqfDuXzPrbSkI4DexsR_2bpoZiod9boCqQeuZdGRm&uniplatform=NZKPT
6. Chen H. (2023) The development dilemma and countermeasures of teachers ' digital literacy from the perspective of comprehensive development theory. Education Science Forum, 21: 22-25. https://kns.cnki.net/kcms2/article/abstract?v=3uoqIhG8C44YLTlOAiTRKu87-SJxoEJu6LL9TJzd50mvwyAY0fG8cyvG4GhUwSsY1bsmIeNQrcIsHFTj6ST_8neDydTdGZdg&uniplatform=NZKPT
7. Wang H,BAEK J. (2023) A Systematic Review on Teacher Digital Literacy in Higher Education[J]. World Journal of Social Science Research,10(1). https://kns.cnki.net/kcms2/article/abstract?v=LeQIq0pPraN7z56UFBXYmp5cqSpFXzXCFpgvv08RLM-paCwYX2_gXezyhmEWfsj2GhEQwXx5QUr_raJrkXI-HVRcQATweLOGwYNmYl4gIVcXA9-SewyUZft4-_RcK11q&uniplatform=NZKPT
8. Central Network Security and Information Committee.(2021) Outline of Action to Improve National Digital Literacy and Skills. http://www.cac.gov.cn/2021-11/05/c_1637708867754305.htm
9. Zhu ZT, Hu J. (2022) The practical logic and development opportunities of digital transformation of education. Electrified education research, 43 (1): 5-15. https://kns.cnki.net/kcms2/article/abstract?v=3uoqIhG8C44YLTlOAiTRKibYlV5Vjs7iJTKGjg9uTdeTsOI_ra5_XfUx5Jh4MJyDXD8Dgzyu52PtukSb3BsCfxL6LsaTsR_i&uniplatform=NZKPT

10. Huang RH, Yang JF. (2022) The connotation and implementation path of digital transformation of education.China Education Daily, 2022-04-06(004). http://paper.jyb.cn/zgjyb/html/2022-04/06/content_607611.htm?div=-1
11. Cristina S,Raúl C S,Teresa M S. (2021) Teacher Digital Literacy: The Indisputable Challenge after COVID-19[J]. Sustainability,13(4). https://kns.cnki.net/kcms2/article/abstract?v=LeQIq0pPraN7z56UFBXYmp5cqSpFXzXCuHWwXcD0GD7FZVCfulIp0CF20E2gi6VwzjsC1i97tiFdxIR2xOVSd1-a-YQ0J0Ql3oHFO3SbdU3z9IkjMjYBEbL3R5Z6h9Mj&uniplatform=NZKPT
12. Güneş E,Bahçivan E. (2018) A mixed research-based model for pre-service science teachers' digital literacy: Responses to “which beliefs” and “how and why they interact” questions[J]. Computers & Education,118. https://kns.cnki.net/kcms2/article/abstract?v=LeQIq0pPraN7z56UFBXYmp5cqSpFXzXCNDjRNn3ZagE_xBW8dTIDEyG2AfWnuuHrLrJXQ7L9qhDAi_XVm93VKI423lTZe6b0dYIImBALETV946_4TbtIzLiNyOxIv1eB&uniplatform=NZKPT
13. Yi Y, Xue F. (2022) A Study on the Improvement of Digital Literacy of Teachers in Higher Vocational Colleges under the Background of "Digital Economy": An Empirical Analysis Based on 335 Full time Teachers in Zhejiang Province. China Vocational and Technical Education, 05: 55-61. https://kns.cnki.net/kcms2/article/abstract?v=3uoqIhG8C44YLTlOAiTRKibYlV5Vjs7iJTKGjg9uTdeTsOI_ra5_XX4_AhAwGgT96ybw-lt33M-fD0qGmyECqPo_ZqvZnXOU&uniplatform=NZKPT
14. Wang YZ, Cheng Y, Li LJ. (2023) The rich connotation, realistic dilemma and practical approach of teachers' digital literacy in vocational colleges in the era of digital intelligence. Education and Occupation, 09: 87-90. https://kns.cnki.net/kcms2/article/abstract?v=3uoqIhG8C44YLTlOAiTRKibYlV5Vjs7ioT0BO4yQ4m_mOgeS2ml3UIcGsj5O9nUu3j-z7H467yJK_bm25hJufhmP-bxwZF1X&uniplatform=NZKPT
15. Shi W, Li H. (2017) Reflection and improvement of teachers ' teaching technology literacy in the digital age. Curriculum. Textbooks. Teaching Method, 37 (11): 95-100. https://kns.cnki.net/kcms2/article/abstract?v=3uoqIhG8C44YLTlOAiTRKibYlV5Vjs7i0-kJR0HYBJ80QN9L51zrP1b_Zp99IO8CfGreYUeHiOQDKnGgg4tpwhXirJIXd7AX&uniplatform=NZKPT