Research on the Strategies for Improving and Cultivation Paths of the Information Literacy of Teachers and Students in Vocational Colleges from the Perspective of Artificial Intelligence

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ABSTRACT

In the era of rapid development of artificial intelligence, enhancing the information literacy of teachers and students in vocational colleges is of great significance for promoting the modernization of vocational education. By deeply exploring the key school-running capabilities of vocational colleges in the context of artificial intelligence, constructing a measurement model for the information literacy of teachers and students based on artificial intelligence, and then proposing strategies and key paths for improving the information literacy of teachers and students, this aims to provide useful references for vocational colleges to cultivate high-quality technical and skilled talents in the intelligent era.

Keywords: Artificial intelligence, Vocational colleges, Information literacy, Cultivation paths.

1. INTRODUCTION

In the context of the deep integration of a new round of scientific and technological revolution and industrial transformation, new-quality productive forces, as the core engine driving high-quality economic development, have become a key area in the national strategic layout. The report of the 20th National Congress of the Communist Party of China clearly states, "Promote the integrated cluster development of strategic emerging industries and build a number of new-quality productive forces such as new-generation information technology and artificial intelligence", listing artificial intelligence as an important direction for shaping new development momentum and advantages. As the core support for artificial intelligence technology innovation and application, information literacy is not only a basic ability for individuals to adapt to the digital society, but also an important foundation for cultivating talents with new-quality productive forces. Policy documents such as "China Education Modernization 2035" and the "Education Informatization 2.0 Action Plan" have repeatedly emphasized the need to comprehensively improve the information literacy of teachers and students and promote the in-depth integration of information technology and education and teaching to cultivate high-quality talents who meet the needs of the intelligent era.

The rapid iteration of artificial intelligence technology is reshaping the educational ecosystem. It not only brings new opportunities to education and teaching but also poses higher requirements for the information literacy of teachers and students. Facing challenges such as the acquisition and screening of massive amounts of information, the intelligent analysis of complex problems, and innovative practices of human-machine collaboration, teachers and students in vocational colleges urgently need to possess digital learning, critical thinking, and innovative application abilities to cope with the educational transformation in the intelligent era. Against this background, based on national policy orientations and the educational needs of the intelligent era, deeply analyzing the current development status of the information literacy of teachers and students in vocational colleges, exploring the construction of a systematic cultivation system, and seeking strategies for improving and cultivation paths of the

information literacy of teachers and students in vocational colleges from the perspective of artificial intelligence. This provides theoretical references and practical paths for the modernization reform of vocational education and the cultivation of high-quality technical and skilled talents. It is not only an important measure to implement the national education digitalization strategy and promote the high-quality development of vocational education but also an inevitable requirement for providing talent support for the development of new-quality productive forces.[1]

2. THE KEY SCHOOL-RUNNING CAPABILITIES OF VOCATIONAL COLLEGES IN THE CONTEXT OF ARTIFICIAL INTELLIGENCE

The key school-running capabilities of vocational colleges in the context of artificial intelligence mainly include digital-intelligent teaching support environments, interdisciplinary integrated curriculum systems, and high-level teaching staff, etc.

2.1 Building a Digital-intelligent Teaching Support Environment

A digital-intelligent teaching support environment is the foundation for vocational colleges to adapt to the era of artificial intelligence. Vocational colleges invest more in information technology infrastructure such as high-speed networks, high-performance servers, and intelligent teaching terminals to provide stable and efficient technical support for teaching activities. At the same time, artificial intelligence technology is used to build intelligent online teaching platforms, teaching management platforms, teacher big data platforms, and student evaluation big data platforms, creating a trinity teaching environment of "smart education + cyberspace + virtual training"[2]. This enables the intelligent scheduling of teaching resources, the accurate analysis of the learning process, and the real-time evaluation of teaching quality. Learning data of students is collected through the learning management system, and data analysis algorithms are used to understand students' learning habits and knowledge mastery levels, providing a basis for teachers to adjust teaching strategies.

2.2 Establishing an Interdisciplinary Integrated Curriculum System Based on Artificial Intelligence

The development of artificial intelligence has made the boundaries between industries increasingly blurred, and interdisciplinary integration has become an inevitable trend in the curriculum reform of vocational education. Vocational colleges should break down traditional professional barriers, integrate knowledge and skills from different majors around the application of artificial intelligence technology, and establish an interdisciplinary integrated curriculum system. Taking intelligent manufacturing-related majors as an example, an artificial intelligence micro-major can be set up, focusing on the application of key technologies to meet the diverse learning needs of students. Professional courses such as artificial intelligence application technology, mechanical manufacturing, automation control, and computer programming are organically integrated. Artificial intelligence general compulsory courses are offered to all students, and expansion-type public elective courses are developed. Professional elective courses and comprehensive professional courses that integrate artificial intelligence, such as "Intelligent Manufacturing Technology and Application", are constructed. This aims to cultivate students' cross-field knowledge and skills to solve complex practical problems and enable them to meet the needs of industrial development in the era of artificial intelligence.

2.3 Building a High-level Teaching Staff with Information Literacy

Teachers are the key force in education and teaching. In the context of artificial intelligence, teachers with information literacy are of great significance. Vocational colleges should enhance teachers' information literacy through various channels. They can organize teachers to participate in artificial intelligence technology training and academic exchange activities, and encourage teachers to conduct teaching research and practice based on artificial intelligence. At the same time, high-level talents with a professional background and practical experience in artificial intelligence should be introduced, and part-time lectures by artificial intelligence experts from enterprises should be invited[3]. This allows teachers and students to be exposed to cutting-edge industry knowledge and technologies, enriches the teaching

staff, and improves teachers' teaching and practical abilities.

3. MEASUREMENT MODEL FOR THE INFORMATION LITERACY OF TEACHERS AND STUDENTS BASED ON ARTIFICIAL INTELLIGENCE

In the context of the deep integration of artificial intelligence into the education field, enhancing the information literacy of teachers and students in vocational colleges has become a crucial task for promoting the high-quality development of vocational education. The following elaborates on the strategies and key paths for enhancing the information literacy of teachers and students from six aspects.

3.1 Construction of the Measurement Model

From the perspective of artificial intelligence, constructing a scientific and reasonable measurement model for the information literacy of teachers and students is the key to accurately assessing their levels. This research adopts the Analytic Hierarchy Process based on the Real-coded Accelerating Genetic Algorithm (RAGA-AHP). It constructs measurement indicators and an evaluation model around artificial-intelligence-related dimensions, standardizes the data processing process, and obtains more accurate evaluation index weights and a consistent judgment matrix to ensure the scientificity and reliability of the measurement results.

The measurement model for the information literacy of teachers and students in vocational colleges includes two aspects: one is the measurement of teachers' information literacy levels, and the other is the measurement of students' information literacy levels. The specific measurement index system is shown in "Table 1" below.

Table 1. Evaluation indicators for the information literacy of teachers and students in vocational colleges

Measurement Object	Primary Indicator	Secondary Indicator	Weight
Teachers	Information Awareness	Information Sensitivity	8.96%
		Information Value Judgment Ability	11.04%
	Information Knowledge	Basic Knowledge of Artificial Intelligence	14.38%
		Knowledge of Disciplinary Integration	10.62%
	Information Skills	Teaching Resource Utilization Skills	12.83%
		Teaching Design and Implementation Skills	23.19%
		Technical Innovation and Application Skills	3.98%
	Information Ethics	Information Security and Privacy Protection	8.04%
		Academic Integrity and Norms	6.96%
Students	Information Awareness	Active Learning Awareness	3.60%
		Information Needs Judgment Ability	6.40%
	Information Knowledge	Basic Knowledge of Information Technology	3.71%
		Knowledge of Artificial Intelligence Applications	16.25%
		Professional Information Knowledge	15.04%
	Information Skills	Information Acquisition and Screening Skills	12.89%
		Information Expression and Innovation Skills	14.51%
		Information Processing and Analysis Skills	17.60%
	Information Ethics	Network Behavior Norms	5.93%
		Intellectual Property Protection Awareness	4.07%

The above-mentioned evaluation index data is processed by standardization and dimensionless treatment. For data index items where the maximum value is the best, formula (1) is used for standardization treatment, and for data index items where the minimum value is the best, formula (2) is used for standardization treatment.

$$r(i,j)=x(i,j)/(x_{max}(i)+x_{min}(i)) \qquad (1)$$
$$r(i,j)=[(x_{max}(i)+x_{min}(i))-x(i,j)]/(x_{max}(i)+x_{min}(i)) \qquad (2)$$

In the formulas, the fuzzy matrix $R=(r(i,j))$, $x(i,j)$ represents the value of the evaluation index, $x_{max}(i)$, $x_{min}(i)$ respectively denote the maximum and minimum values of the *i-Th* evaluation index, where $i=1\sim n$, $j=1\sim m$. n represents the number of evaluation indicators, and m represents the number of secondary indicators or the number of schemes. Based on the fuzzy matrix R, the standard deviations of the secondary indicators and primary indicators are obtained, and the judgment matrix A is constructed using formula (3).

$$a_{ij}=\begin{cases} \dfrac{s(i)-s(j)}{s_{max}-s_{min}}(a_m-1)+1 \ , \quad s(i)>s(j) \\ \left[\dfrac{s(j)-s(i)}{s_{max}-s_{min}}(a_m-1)+1\right]^{-1}, \quad s(i)<s(j) \end{cases} \qquad (3)$$

3.2 Measurement of the Information Literacy Levels of Teachers and Students in Vocational Colleges

Taking the relevant data of three types of schools, namely, the schools under the "Double-High-level Plan" construction, provincial-level high-level vocational colleges, and ordinary vocational colleges in four provinces and municipalities including Jiangsu, Zhejiang, Shandong, and Chongqing as examples, by summing up the weights of the evaluation indicators and the standardized values, the evaluation results of vocational colleges in various regions can be obtained[4]. The specific measurement results are shown in "Table 2" below.

Table 2. Measurement results of the information literacy levels of teachers and students in vocational colleges

Measurement Object	Primary Indicator	Secondary Indicator	Weight	Jiangsu College A	Chongqing College B	Shandong College C	Zhejiang College D
Teachers	Information Awareness	Information Sensitivity	8.96%	8.18	6.34	6.93	5.86
		Information Value Judgment Ability	11.04%	9.13	6.38	7.06	9.80
	Information Knowledge	Basic Knowledge of Artificial Intelligence	14.38%	9.65	9.35	9.18	10.80
		Knowledge of Disciplinary Integration	10.62%	8.60	5.90	6.41	7.99
	Information Skills	Teaching Resource Utilization Skills	12.83%	11.12	10.07	8.25	9.66
		Teaching Design and Implementation Skills	23.19%	15.19	16.32	13.12	15.85
		Technical Innovation and Application Skills	3.98%	3.71	1.76	2.35	2.70
	Information Ethics	Information Security and Privacy Protection	8.04%	5.01	7.94	6.00	5.27
		Academic Integrity and Norms	6.96%	3.16	4.21	4.02	4.45
Total Score			100.00%	73.75	68.27	63.32	72.38
Students	Information Awareness	Active Learning Awareness	3.60%	2.07	2.76	2.87	2.89
		Information Needs Judgment Ability	6.40%	4.97	3.28	1.64	4.80
	Information Knowledge	Basic Knowledge of Information Technology	3.71%	2.60	3.46	2.63	3.13
		Knowledge of Artificial Intelligence Applications	16.25%	10.50	9.19	9.63	11.46
		Professional Information Knowledge	15.04%	9.49	7.52	12.09	9.34

Information Skills	Information Acquisition and Screening Skills	12.89%	8.82	12.01	12.51	9.85
	Information Expression and Innovation Skills	14.51%	11.95	11.00	10.15	13.82
	Information Processing and Analysis Skills	17.60%	8.19	10.38	8.83	7.92
Information Ethics	Network Behavior Norms	5.93%	4.68	4.95	4.27	2.84
	Intellectual Property Protection Awareness	4.07%	3.81	1.34	3.35	3.41
Total Score		100.00%	67.08	65.89	67.97	69.46

From the measurement results, in terms of teachers' information literacy, College A in Jiangsu performs relatively outstandingly with a total score of 73.75. It has obvious advantages in teaching resource utilization skills and teaching design and implementation skills. However, College C in Shandong ranks relatively behind with a total score of 63.32, and there is room for improvement in capabilities in all dimensions.

In terms of students' information literacy, College D in Zhejiang takes the lead with a score of 69.46, and it performs excellently in knowledge of artificial intelligence applications and information expression and innovation skills. College B in Chongqing has a total score of 65.89. Compared with the leading colleges, it has gaps in aspects such as the ability to judge information needs and professional information knowledge.

4. STRATEGIES AND KEY PATHS FOR IMPROVING THE INFORMATION LITERACY OF TEACHERS AND STUDENTS IN VOCATIONAL COLLEGES

Improving the information literacy of teachers and students in vocational colleges is of vital importance. Through strategies such as optimizing the curriculum system, strengthening teacher training, and expanding practical platforms, it is possible to effectively enhance the information awareness, information skills, and information ethics of teachers and students. Key paths, including constructing a diversified and integrated curriculum system and creating an intelligent information application environment, will provide solid support for the continuous development of the information literacy of teachers and students in vocational colleges.

4.1 Establishing a Digital and Intelligent School Governance System

Vocational colleges should leverage technologies such as artificial intelligence and big data to build an integrated intelligent management platform. In terms of teaching management, based on teachers' professional skills, teaching tasks, as well as students' curriculum needs and learning characteristics, optimize the curriculum teaching process and improve the utilization efficiency of teaching resources. At the same time, use the learning analysis system to collect and analyze teaching and learning data such as teachers' and students' learning progress, assignment completion, examination results, and teaching effectiveness evaluation, providing data support for teaching decision-making[5]. According to the data analysis results, promptly adjust the teaching plan and teaching methods, provide students with personalized learning suggestions and tutoring, and help teachers improve their teaching strategies to enhance the teaching quality. In terms of school governance, by establishing a digital and intelligent school governance system, create a strong informatization atmosphere, provide a good learning and working environment for teachers and students, and encourage teachers and students to actively adapt to and use information technology, thereby improving their information literacy.

4.2 Establishing a Practice Teaching Platform for Industry-Education Integration

The practice teaching platform for industry-education integration provides teachers and students with opportunities to engage in actual projects and cutting-edge industry technologies, which is conducive to enhancing the information literacy and practical abilities of teachers and students. Vocational colleges should strengthen in-

depth cooperation with enterprises and jointly build practice teaching platforms such as internship and training bases and industrial colleges. Enterprises participate in the construction and management of the practice teaching platform, providing real project cases, advanced equipment, and technical support, enabling students to understand industry needs in practice and master the latest technologies and tools. At the same time, invite enterprise technical experts to conduct lectures, training, and guidance on the practice teaching platform, enabling teachers and students to understand the latest trends and development trends of the industry, broaden their horizons, and enhance their information awareness and information application abilities.[6]

4.3 Developing a Diversified and Integrated Curriculum System Based on Artificial Intelligence

Vocational colleges should break down the boundaries of traditional disciplines, organically integrate artificial intelligence technology with various professional courses, and develop interdisciplinary diversified and integrated curricula. In curriculum design, focus on cultivating students' ability to use artificial intelligence technology to solve professional problems, as well as innovative thinking and practical abilities. Incorporate content such as information ethics and security into the curriculum to cultivate students' awareness and ethical concepts of correctly using artificial intelligence technology. By developing a diversified and integrated curriculum system, teachers and students can improve their information literacy related to artificial intelligence while learning professional knowledge.

4.4 Implementing the Reform of the Curriculum Teaching Model Based on Artificial Intelligence

The reform of the curriculum teaching model based on artificial intelligence is an important means of improving the information literacy of teachers and students. Schools should actively promote the innovation of the teaching model and use artificial intelligence technology to create an intelligent teaching environment[7]. Adopt an online-offline hybrid teaching model, and with the help of tools such as online learning platforms and intelligent teaching software, achieve the sharing of teaching resources and personalized learning support. Teachers release course materials, assign homework, organize discussions, and conduct tests through the intelligent teaching platform. Students learn independently through the platform. According to students' learning behaviors and learning data, the platform provides students with personalized learning paths and learning suggestions, achieving teaching according to students' aptitudes. In classroom teaching, use technologies such as virtual reality (VR) and augmented reality (AR) to create immersive teaching situations, improving students' learning interest and participation. At the same time, carry out teaching activities such as project-based learning and inquiry-based learning, enabling students to use artificial intelligence technology to obtain information, analyze problems, and solve problems during the process of solving practical problems, cultivating students' autonomous learning ability and information application ability.

4.5 Conducting a Series of Artificial Intelligence Training

Schools should formulate stratified and classified training plans according to the different needs and foundations of teachers and students. For teachers, the training content includes basic knowledge of artificial intelligence, the application of artificial intelligence in education and teaching, and the use of artificial intelligence tools. By organizing teachers to participate in artificial intelligence education application workshops and inviting experts to conduct lectures and hands-on training, help teachers master artificial intelligence technology, use intelligent teaching software for teaching design, classroom interaction, and teaching evaluation, and integrate it into teaching to improve teaching quality.

For students, the training content focuses on the basic concepts of artificial intelligence, common application scenarios, and the operation skills of related tools. By offering basic artificial intelligence courses and adopting a project-driven teaching method, enable students to learn and master the use methods of artificial intelligence tools during the process of completing actual projects. At the same time, encourage students to participate in artificial intelligence-related competitions and club activities to further improve their information literacy through practical exercises.

4.6 Constructing a Teaching Team with Dual Tutors from Schools and Enterprises

Constructing a teaching team with dual tutors from schools and enterprises can integrate the advantageous resources of schools and enterprises, provide more professional guidance for teachers and students, and promote the improvement of the information literacy of teachers and students. School teachers have solid theoretical knowledge, and enterprise tutors have rich practical experience and cutting-edge industry information. Dual tutors jointly participate in the teaching process, which can provide students with more comprehensive learning guidance.

In practical teaching, enterprise tutors guide students to participate in actual projects, helping students apply theoretical knowledge to practice, understand the latest technologies and development trends of the industry, and improve students' practical abilities and information application abilities. School teachers are responsible for the theoretical knowledge teaching and learning process management of students to ensure that students have a solid theoretical foundation. At the same time, enterprise tutors can also provide practical guidance and industry information for school teachers, helping teachers update teaching content and improve practical teaching abilities.

5. CONCLUSION

Improving the information literacy of teachers and students in vocational colleges is a continuous and dynamic process. With the iterative updates of artificial intelligence technology, the educational environment and requirements are also constantly changing. In the future, vocational colleges need to maintain a keen sense of observation, continuously pay attention to the development trends of technology, and promptly adjust and improve the enhancement strategies. On the one hand, it is necessary to further deepen the integration of industry and education, strengthen close cooperation with enterprises, and ensure that teachers and students can be exposed to the most cutting-edge technologies and industry information. On the other hand, it is essential to strengthen the construction of the teacher training system, improve teachers' ability to master and apply new technologies, and enable them to better guide students' growth. At the same time, education authorities and all sectors of society should also provide more support to jointly create a favorable ecosystem conducive to improving the information literacy of teachers and students.

AUTHORS' CONTRIBUTIONS

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