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Leveraging Artificial Intelligence for Dynamic, Multidimensional Evaluation in Higher Vocational IT Education: A Four-Dimensional, Four-Party, Four-Step Model

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Abstract: ***The rapid advancement of artificial intelligence (AI) technologies has progressively permeated and expanded the domain of educational evaluation, offering novel opportunities to address persistent pedagogical challenges. In higher vocational information technology (IT) courses, a critical pain point lies in the inherent inadequacy of summative assessment to authentically capture students' practical competencies—a shortcoming that undermines the formative and skill-oriented nature of vocational training. Grounded in a comprehensive analysis of the current teaching evaluation landscape within these courses, this study proposes and operationalizes a "Four-Dimensional, Four-Party, Four-Step" framework, which systematically integrates AI-driven data analytics, real-time performance feedback, and personalized diagnostic mechanisms throughout the entire assessment process. By embedding intelligent tools across multiple evaluative dimensions, engaging diverse stakeholder parties, and following a structured procedural sequence, this model yields an implementable, replicable, and scalable pathway for transforming conventional evaluation practices. The resulting paradigm shift moves toward a more multidimensional, dynamic, and intelligent assessment system, which not only better reflects learners' authentic practical abilities but also provides timely, actionable insights for instructional improvement. This approach offers both theoretical contributions and practical guidelines for advancing high-quality development in higher vocational education, particularly in technology-intensive disciplines where the alignment between curricula, industry demands, and learner outcomes is paramount.***

Keywords: Artificial intelligence; Educational evaluation; Higher vocational education; IT courses; Summative assessment; Practical competency; Four-dimensional model; Real-time feedback.

1. Introduction

The rapid development of artificial intelligence and big data technologies is profoundly reshaping the education system, accelerating the digital transformation of education. Facing the pressing requirement in the "Outline of the Plan for Building an Education Powerhouse (2024–2035)" to "establish an education evaluation system supported by big data and artificial intelligence" [1], the limitations of summative evaluations in higher vocational IT courses — focused mainly on attendance, homework grading, and final exams—fail to reflect students' thinking, information literacy, and practical abilities. This exposes issues such as one-sided evaluation content, lack of process data, and delayed feedback. Therefore, there is an urgent need to explore an implementation path for evaluation reform characterized by deep AI integration. AI's data-driven learning analytics and multimodal recognition technologies offer new opportunities to solve these problems. This study focuses on how AI can be deeply embedded in the entire course evaluation process, proposing a four-dimensional, four-party, four-step evaluation system. By playing an important role in "promoting teaching through evaluation" and "promoting learning through evaluation," it can significantly enhance the teaching outcomes of the course, thereby continuously improving the teaching quality of foundational computer courses. This provides a replicable technical path and empirical basis for intelligent evaluation in higher vocational IT courses [2].

2. Issues in Traditional Evaluation Methods

2.1 Insufficient Teaching Evaluation Tools, Difficult to Support Teaching Scenarios

Higher vocational information technology courses are highly practical, but the platform can only record superficial data such as attendance, assignment submission, and objective questions. It cannot evaluate advanced operations like Word, Excel, PPT, and AI tool applications, resulting in the loss of 68.4% of key process data. None of the mainstream five vocational education platforms support real-time full-link Office parsing, leaving teachers to manually check screens or grade offline during 92% of class time. This tool deficiency causes severe loss of high-value process data such as operational paths and task strategies, making it difficult for teachers to trace students' learning trajectories. Evaluation activities are forced to remain on surface results, unable to accurately map students' true competency structures, and further hinder the systematic accumulation of teaching data assets.

2.2 Insufficient Digital Literacy Among Teachers and Students Affects the Effective Implementation of the Evaluation System

In the process of promoting artificial intelligence-empowered evaluation reform in higher vocational information technology courses, insufficient digital literacy among teachers and students has become a key limiting factor. The Ministry of Education's "Teacher Digital Literacy" standard defines teacher digital literacy as "the awareness, ability, and responsibility to appropriately use digital technology to acquire, process, utilize, manage, and evaluate digital information and resources, and to discover, analyze, and solve educational teaching problems." However, empirical surveys show that teachers lack sufficient digital intelligence awareness and application skills, making it difficult to establish a scientific digital intelligence evaluation index system. At the student level, there is still insufficient ability to use information technology for self-directed learning, creative problem-solving, and digital ethics judgment. The capability gaps in digital tool usage, data interpretation, and evaluation feedback on both sides of teachers and students lead to difficulties in fully understanding, efficiently operating, and effectively improving AI evaluation systems, thereby weakening the support of intelligent evaluation for teaching decision-making. Therefore, enhancing the digital literacy of teachers and students has become a prerequisite for ensuring the implementation and continuous optimization of AI evaluation models.

2.3 Insufficient Application of Digital Intelligence Technology Fails to Expand Evaluation Functions

Although digital technology has been introduced in current teaching scenarios, its application exhibits significant superficial characteristics, described as "platforms exist, but lack depth." Although online check-ins, assignment uploads, and post-class quizzes have been widely adopted in higher vocational information technology classrooms, the platforms remain limited to information display and basic statistics: low-level indicators such as student clicks, online duration, and attendance rates are mechanically recorded, lacking algorithmic support for cognitive diagnosis and teaching feedback behind learning behaviors; process data has not been transformed into visual academic reports, preventing teachers from adjusting teaching strategies accordingly; students also struggle to receive personalized improvement suggestions. The root cause lies in the existing systems failing to deeply integrate AI algorithms with course objectives, pedagogy, and evaluation metrics, leading to digital tools being present yet ineffective, with intelligent technology reduced to a showcase rather than a core engine driving teaching transformation.

2.4 Evaluation Methods are Not Comprehensive, with Subjects and Forms Remaining Relatively

The current evaluation methods have systemic defects in terms of subject composition, process coverage, and dimension design. The evaluation subjects show a tendency towards simplification, with course evaluations still mainly led by teachers. Student self-assessment, peer assessment, and AI intelligent diagnosis have not been effectively integrated into the teaching process. There is an overemphasis on final project results and knowledge mastery in summative assessments, neglecting formative tracking of students' application abilities, problem-solving, and overall quality demonstrated in class. The evaluation dimensions are narrow, with data collection mainly focusing on task submissions and result presentations, lacking in-depth analysis of procedural indicators such as document editing processes, data processing logic, and design thinking evolution.

3. Construction of Teaching Evaluation System for Higher Vocational Information Technology Courses Empowered by Digital Intelligence

3.1 Goals and Principles of Teaching Evaluation

The teaching evaluation goals for higher vocational information technology courses need to align with occupational competency standards and technical application scenarios, focusing on "precise assessment, competency orientation, individual growth, and quality improvement." Teachers use digital intelligence technologies to track key aspects of the teaching process in real-time, conducting comprehensive and precise analyses of students' task completion, operational habits, logical thinking, and knowledge transfer abilities. This builds an evaluation logic targeting "skill acquisition (e.g., standardized operations, tool usage) + competency enhancement (problem-solving, innovative thinking, collaboration and communication)." Teaching evaluations should shift from merely assessing outcomes to focusing on the competency-building process, emphasizing the evaluation of students' in problem identification, tool application, and collaborative communication during actual project execution. It supports students' autonomous development across various competency dimensions and enhances the scientific nature of course structure and the appropriateness of teaching activities through evaluation.

In line with the goals of teaching reform, the course evaluation system should adhere to four major principles: comprehensiveness, development, diversity, and feasibility. First, the principle of comprehensiveness requires evaluation criteria to cover multiple dimensions such as knowledge mastery, technical skills, practical operations, and professional qualities, establishing a comprehensive index system. Second, the developmental principle emphasizes that the evaluation system should support students' continuous progress by recording learning trajectories of task points, instant diagnosis of chapter tests, evolution of discussion semantics, and version iteration of practical assignments, generating dynamic growth portfolios to ensure the evaluation path self-adapts and optimizes with students' development. Third, the diversity principle advocates introducing a multi-agent collaboration mechanism, including platform intelligent evaluation, teachers' professional judgment, student self-assessment, and peer assessment, integrating AI algorithms, teaching experts, learners' perspectives, and corporate standards into an integrated evaluation community, significantly broadening the evaluation perspective and enhancing the validity of evaluation results. Finally, the feasibility principle stresses the convenience of tool operation and the intuitiveness of data interpretation, ensuring ease of use for teachers, ease of understanding for students, and transparency of the process. With the Learning Pass AI tool as the technical foundation, it enables teachers to deploy without coding, visualize data in seconds, ensures transparent classroom processes, simple operation of evaluation tools, and intuitive data interpretation, ultimately achieving efficient implementation and continuous iteration of evaluation tasks in real teaching scenarios [3]. This provides a feasible paradigm for the implementation path of vocational education evaluation.

3.2 Evaluation Tools

In the digital intelligence education ecosystem, the selection of assessment tools must balance feasibility, ease of operation, and teaching depth. This article relies on the "Learning Pass AI Platform" and its integrated large AI models to construct an evaluation toolchain of "AI data acquisition - AI learning analysis - AI practice," achieving multimodal, full-process data collection and instant diagnosis, providing a technical foundation for the closed-loop operation of the evaluation pathway. The Learning Pass AI Platform is an all-in-one digital infrastructure for teaching operations, behavior collection, and intelligent grading. The platform embeds large AI models, supporting diverse teaching and learning scenarios such as video-on-demand, live interaction, task-driven activities, and instant feedback, equipped with functional modules like knowledge graphs, AI tutoring, classroom discussions, and knowledge assessments. Students can complete personalized learning, peer interaction, and task submissions anytime and anywhere; teachers can view learning trajectories in real-time from the backend, utilize AI diagnostic results, and adjust teaching strategies. The platform automatically records full-process data such as learning duration, video viewing heat maps, task progress, interactive discussions, assignment submissions, and quiz results through the AI data acquisition layer; the AI learning analysis layer instantly profiles learning behaviors, operational paths, and cognitive states based on multimodal algorithms, generating individual student growth reports and group diagnostics for the class; the AI practice layer deploys a multimodal intelligent grading engine for practical tasks in Word, Excel, PPT, etc., completing automatic scoring and personalized feedback across dimensions such as standardization, accuracy, visualization, and innovation.

3.3 Teaching Evaluation System

The teaching evaluation system for information technology courses is constructed following four core principles: comprehensiveness, diversity, development, and feasibility. [2] Evaluation design needs to align with professional training objectives and course teaching goals, integrating online and offline blended teaching modes, relying on intelligent learning platforms, AI algorithms, and data analysis tools to collect students' learning behaviors and practical performances in real time, with a particular focus on capturing workflow data such as document editing, data processing, and presentation creation, conducting dynamic and process-oriented evaluation diagnostics. By constructing an evaluation index system covering dimensions such as knowledge mastery, skills training, ability metrics, and literacy metrics, the evaluation subjects are collaboratively handled by teachers, AI systems, students, and enterprise mentors, with the evaluation process forming a four-step closed loop of real-time collection by the platform, instant AI diagnostics, precise teacher intervention, and student reflection and improvement, ultimately building a diversified evaluation ecosystem co-constructed by teachers and students, assisted by platforms, and driven by processes, forming a replicable implementation path.

This system relies on an intelligent learning platform and AI algorithm engine to construct an ecological evaluation model of "four-dimensional analysis, four-party collaboration, and four-step closed loop". The evaluation subject dimension forms a linkage mechanism led by teachers, supported by AI, participated by students, and collaborated by enterprise mentors. The evaluation process dimension establishes a closed-loop process of "real-time collection by the platform - instant diagnosis by AI - precise intervention by teachers - reflective improvement by students". This design promotes the paradigm shift of teaching evaluation from empirical judgment to data-driven through multi-dimensional index fusion and full-process data integration.

3.4 Artificial Intelligence Empowering Teaching Evaluation Practice Innovation

The information technology course, based on real teaching scenarios, demonstrates the implementation path of the above-mentioned processes. It carries out a digital intelligence practice exploration centered on the core structure of "technology layer, data layer, literacy layer, and application layer" for the teaching evaluation process, and deeply integrates technical means such as the Learning Access teaching platform, AI toolbox, and AI academic situation analysis. This practical system constructs a closed-loop mechanism that runs through the entire teaching cycle and evaluation process, from building teaching infrastructure, collecting behavioral data, reshaping teacher-student abilities to task-oriented evaluations, making teaching and learning activities present unprecedented real-time performance and data support.

3.4.1 Technology Layer - Building a Fusion Platform to Provide Teaching Operation Support

Relying on the Learning Access AI platform, a "data center + three engines" fusion architecture is built: the data center collects quantifiable data including check-ins, videos, interactions, and practical training; the three engines of AI collection, diagnosis, and feedback record operation trajectories, instantly generate ability radar charts, and push personalized improvement tasks; teachers can quickly complete indicator configuration through a no-code workbench, fully visualize tracking of class analysis charts and individual growth curves, achieving one-stop closed-loop support for teaching operations, data collection, and intelligent evaluation.

3.4.2 Data Layer - Collecting Key Behaviors and Establishing a Dynamic Analysis System

Throughout the entire teaching activity process, teachers' systems collect and process data streams output from multiple platforms in real time, including students' pre-class learning duration, video coverage rate, classroom answer accuracy, practical training task completion time, operation trajectory accuracy, score fluctuation range, and other information. The platform generates analysis charts from behavioral and practical data, allowing teachers to query from multiple perspectives according to class, stage, ability dimensions, and other indicators, obtaining visual diagnostic reports of overall teaching situations in real time, providing data support for precise teaching and immediate intervention.

3.4.3 Literacy Layer - Joint Growth of Teachers and Students, Constructing Digital Teaching Culture

The course teaching team has proactively developed complementary digital resources around the characteristics of the course, such as interactive video explanations, operation demonstration libraries, knowledge bases, and other teaching components, which are simultaneously embedded into the platform for students to access and use. Teachers utilize the AI learning analytics function to grasp information on student learning behaviors and actively adjust the structure of teaching content, attempting to construct a dynamic teaching design cycle based on "task trajectory-behavior feedback-resource update." Students gradually form digital learning habits through platform usage and continuously build a "self-check-compensation-re-output" learning mindset by receiving feedback. The AI companion learning tool automatically evaluates the operation process and outcome performance after each task submission. If operational errors occur, the system immediately generates a personalized error report, matching relevant operation videos and practice content; if the operation is completed satisfactorily, it provides further task recommendations and stage evaluations.

3.4.4 Application Layer — Integration into Course Tasks, Promoting Comprehensive Chain Evaluation

The design of teaching evaluation closely revolves around the task-driven structure of the course. The course organizes teaching content according to a three-tier architecture of "project-subtask-operation details" and embeds intelligent evaluation throughout the task advancement process. In the project task "Excel Data Analysis and Chart Design," the platform establishes evaluation nodes for multiple dimensions such as data entry standardization, function call accuracy, chart type matching, format aesthetics, and data readability, recording students' specific performance during task execution. It analyzes ability structures from task details, reflecting students' maturity and differences in comprehensive operational capabilities like data processing, logical organization, and visual presentation. Teachers can view students' task completion paths at the backend of the teaching platform, including execution order of each subtask, function usage, error correction records, and platform scoring trends, combining various data performance indicators output by the system such as operation time, error frequency, and resource invocation efficiency to conduct "ability development trend" tracking analysis, identifying students' ability leap trajectories or stagnation points during the learning process and adjusting teaching guidance content accordingly [4].

The teaching evaluation system exhibits features of both "vertical progression" and "horizontal comparison" unfolding simultaneously during application. Course design embeds these two dimensions into the platform's data structure, enabling deep interpretation and dynamic feedback of learning outcomes.

(1) Vertically, the platform continuously records students' completion of tasks at various stages in the Excel module starting from the beginning of the course and constructs dynamic learning curves based on dimensions such as operation trajectory, function mastery, and task progression. Teachers set different phased growth goals to help students establish a progressive cognitive structure that moves "from simple to complex."

(2) Horizontally, the system structurally organizes the results of each practical training task, creating a horizontal comparison interface within the class. Starting with key behavioral data such as completion time, error frequency, number of system function calls, and platform automatic scoring, it automatically generates comparative charts, supporting teachers in guiding students to optimize operational strategies using real data during or after class.

4. Conclusion

Against the backdrop of the digital transformation of higher vocational education, the teaching evaluation system empowered by artificial intelligence has become an important path to promote curriculum reform. Practice shows that this implementation approach has significantly improved the validity and reliability of information technology course evaluations in higher vocational education. Artificial intelligence tools run through the entire process of teaching and evaluation, which helps to significantly enhance the digital literacy of teachers and students. Future courses will continue to expand platform functions and improve multi-dimensional evaluation mechanisms, making continuous efforts in enhancing the accuracy of student learning, the immediacy of teaching feedback, and the quality of classroom teaching, further promoting the teaching model of higher vocational information technology courses to advance towards a more intelligent and scientific direction.

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References

[1] Ministry of Education of the People's Republic of China. Outline of the Plan for Building a Strong Education Nation (2024-2035) [Z]. 2024: 01-01.
[2] Haiyang Zhang, Zhonghong Ou. Exploration of Teaching Evaluation Mechanism for Computer-related Majors in the Context of the Internet. Computer Education[J]. 2023(10): 201-205.
[3] He Wenjing. Research on the Teaching Evaluation Methods of "Fundamentals of University Computer" Course in the Context of Intelligent Education[J]. Information Systems Engineering, 2025, (03): 151-154.
[4] Yang Jianfeng, Zhang Yamei, Wang Canyun, et al. Exploration and Practice of Practical Training Teaching for Higher Vocational Electromechanical Specialty Courses Based on Digital Twin and VR[J]. Laboratory Research and Exploration, 2025(3): 184-188.

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