

A Learning Evaluation Model of Higher Vocational Professional Courses

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Abstract: How to evaluate students' learning quality scientifically and objectively has always been a focal topic in the field of education. Based on the national official document for promoting the reform of evaluation systems and the current status of curriculum learning evaluation in higher vocational colleges, the study constructs a theoretical model for course learning evaluation termed the "Five-Assessment Dual Closed-Loop" system, which leads to realize pre-course assessment, formative assessment, summative assessment, value-added assessment, and diagnostic assessment and further form two closed loop that promotes students' learning motivation and teachers' teaching strategy. Additionally, empirical research was conducted for the Artificial Intelligence course in the Intelligent Logistics Technology specialty of higher vocational education to analyze the feasibility of the model and it reformed the course learning evaluation in reconstructing the course learning evaluation system, upgrading evaluation tools to ensure precise and objective assessment and mining evaluation data to drive teaching reflection and improvement.

Keywords: Higher Vocational Education; Learning Evaluation; Evaluation Model; Formative Evaluation; Intelligent Logistics Technology Specialty

1. Introduction

To reverse unscientific educational evaluation orientations and overcome the entrenched problems of solely emphasizing scores and academic advancement, China has issued the "Overall Plan for Deepening the Reform of Education Evaluation in the New Era" (hereinafter referred to as "the Plan"), which clarifies the learning evaluation reform principles of "improving outcome-based

evaluation, strengthening process evaluation, exploring value-added evaluation, perfecting comprehensive evaluation, and leveraging information technology to enhance the scientificity, professionalism, and objectivity of education evaluation." In terms of curriculum learning evaluation, it requires "improving the academic evaluation system that organically combines process assessment with outcome assessment, strengthening the examination of classroom participation and discipline, and guiding students to establish a good study ethos." The reform of vocational education evaluation is regarded as a crucial measure to optimize type orientation and enhance adaptability, and it is essential to implement the reform of learning evaluation at the curriculum level.

The study focuses on the learning evaluation of higher vocational professional courses. Firstly, it analyzes the current theoretical research status and policy orientation of learning evaluation of curriculum, and formulates the construction strategies of theoretical models. Subsequently, it constructs a theoretical model of "Five-Assessment Dual Closed-Loop" for curriculum learning evaluation. Finally, the theoretical model is applied to conduct empirical research on the learning evaluation of professional courses, spacing, and related information for producing your proceedings manuscripts.

2. Status of Learning Evaluation in Higher Vocational Courses

2.1 Theoretical Research Status

The reform of learning evaluation in higher vocational courses is a necessity for deepening curriculum reform and improving teaching quality. Numerous experts and scholars have conducted extensive research on "the reform of learning evaluation in higher vocational courses." Firstly, there are some prevalent

issues in learning evaluation in higher vocational courses. One is the evaluation method is monotonous as quantitative evaluation often focuses on direct measurement of teaching effects, but ignores the potential but important teaching-and-learning elements such as teaching processes and student growth, leading to a unilateral evaluating effectiveness that is detrimental to the growth of vocational abilities of higher vocational students [1-3]. Another is the incomplete evaluation indicators as some higher vocational colleges use a unified teaching quality evaluation form for all majors and courses, neglecting the differences between different majors and courses [4]. Lastly, the evaluation effect is not significant as the evaluation results are often only used for recording student assessment scores, lacking effective feedback on teaching quality, which is detrimental to the in-depth promotion of teaching reform [5].

Secondly, scholars have conducted abundant explorations on the reform of learning evaluation for different types of courses in higher vocational education, which can be summarized into the following strategies and paths. One is diversified evaluation subjects, expanding from single instructor evaluation to part-time instructors from enterprises, peer expert evaluations, and truly implementing student evaluations in the generation of evaluation results [6,7]. Another is transforming value orientation, shifting from focusing on screening to promoting development, centering on students, and better serving their comprehensive development [5-8]. Additionally, there is the expansion of evaluation content, from a single evaluation of professional knowledge and skills to a multifaceted evaluation including vocational qualities (such as professional ethics and attitudes) [7-10]. Lastly, it arises some innovative evaluation methods, enriching the forms and content of formative and summative evaluations, and reasonably applying intelligent evaluation tools to improve evaluation efficiency [4].

2.2 Policy Studies

According to the content of the Plan, three important directions for the reform of learning evaluation in higher vocational courses can be summarized. Firstly, the learning evaluation of courses should be designed and steadily promoted for different subjects and types of

education characteristics, enhancing the systematicness of evaluation. Secondly, digital technology should be fully utilized and evaluation tools should be upgraded to provide a support platform for evaluation reform, enhancing the scientificity of evaluation. Thirdly, the application of evaluation results should be improved, comprehensively exerting their guiding, diagnostic, regulating, and improving roles, promoting "classroom revolution" through reform, and enhancing the incentivizing effect of evaluation.

In summary, theoretical research on learning evaluation in higher vocational courses primarily focuses on the analysis of existing problems and reform strategies. Research on the theoretical models of learning evaluation that adapt to the needs of learning evaluation reform in the new era is still in its infancy that calls for more appeals. Research on the field of learning evaluation in higher vocational courses should further attempt to construct some scientific and reasonable theoretical models under the guidance of the Plan, to promote the improvement of teaching quality effectively, especially by strengthening empirical research on evaluation models, to better serve the high-quality development of higher vocational education and the comprehensive growth of students.

3. Construction of the "Five-Assessment Dual Closed-Loop" Learning Evaluation Model for Higher Vocational Professional Courses

3.1 Design Ideology of the Evaluation Model

There are three mainstream approaches to constructing a learning evaluation model. The first is based on Outcome-Based Education (OBE) theory, with learning outcomes as the core, constructing a gradual outcome chain of "major → course → teaching unit" and evaluating teaching quality by monitoring the achievement of outcomes. This model addresses the issue of traditional evaluation focusing on knowledge over abilities, but attention must be paid to matching task difficulty with students' actual abilities to avoid causing frustration due to overly high evaluation standards. The second is based on Gardner's theory of multiple intelligences, constructing an evaluation framework that covers multiple dimensions such as logical thinking, practical operation,

and professional ethics. This model emphasizes students' individualized development but needs to address the issue of insufficient standardization of evaluation tools. The third is based on the CIPP model and whole-process evaluation, constructing a dynamic evaluation system based on the four dimensions of context, input, process, and product. This model emphasizes the systematicness and feedback mechanism of evaluation but requires high completeness and real-time performance of data collection.

Higher vocational professional courses are the core of talent cultivation in higher vocational colleges, and professional course teaching is the main front for cultivating high-quality technical and skilled talents. According to previous

theoretical research results and the actual needs of learning evaluation in higher vocational professional courses, the design strategies of the evaluation theoretical model should follow: firstly, enriching evaluation subjects and fully exerting the evaluation functions of teaching subjects; secondly, perfecting the organic combination of process assessment and outcome assessment while exploring value-added evaluation, focusing on students' skill growth and sustainable development; and thirdly, improving the feedback mechanism of evaluation results to promote the effective improvement of course teaching quality. Based on the above, the theoretical evaluation model should be constructed as shown in Figure 1.

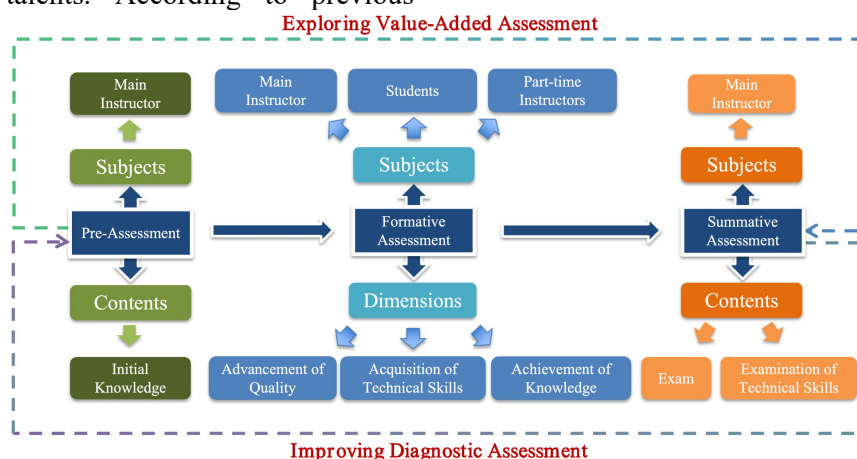


Figure 1. "Five-Assessment Dual Closed-Loop" Learning Evaluation Model for Higher Vocational Professional Courses

3.2 Construction of the Evaluation Model

As shown in Figure 1, the model realizes pre-course assessment, formative assessment, summative assessment, value-added assessment, and diagnostic assessment. Pre-course assessment, formative assessment, and summative assessment are conducted at the beginning of the course, during the course, and after the course, respectively. The pre-course assessment is conducted by the course instructor, often through questionnaire surveys to perceive students' initial cognition regarding the course content before the course learning. Formative assessment is carried out by dual subjects of teachers and students, with teachers including the main instructor and part-time instructors from outside the school or the cooperative enterprises. The content of formative assessment is about the persistent achievements of students' course learning,

mainly examining from three dimensions as professional knowledge acquisition, professional skill enhancement, and occupational quality improvement, i.e., examining the mastery of professional course knowledge and skills and the cultivation of vocational qualities in daily learning of higher vocational students. Formative assessment is accomplished with the continuous progress of course teaching, with diverse assessment forms, such as class attendance, participation in the class, homework completion, in-class quiz. The summative assessment is mainly conducted by the main instructor, with the assessment content primarily consisting of an exam to test knowledge mastery of the entire course and a skill assessment to examine skill improvement after course learning. By comparing the pre-course and summative assessments, two assessment closed loops can be formed. Firstly, comparing the results from pre-course to

summative assessment can reveal students' progress before and after course learning, further exploring value-added assessment. For example, a student who has little cognition about the course or lies in the latter queue of the class achieves a decent score in the final exam or his rank improves significantly, which implies he has made a mass of effort, so that it is necessary to award the student for his efforts in the course, motivating him to continue hardworking and achieve continuous progress in his expertise growth. Secondly, comparing the results from summative to pre-course assessment is more significant for teachers conducting diagnostic assessment to improve teaching methods and enhance teaching quality. For example, comparing the results of summative and pre-course assessment can be analyzed which teaching content could be struggled with by students generally, and requiring further optimization of teaching methods to help students learn it easilier.

4. Empirical Research on the "Five-Assessment Dual Closed-Loop" Learning Evaluation Model

To better verify the applicability of the learning evaluation model, the "Artificial Intelligence" course of the Intelligent Logistics Technology major was taken as the research object to conduct research on the reform of learning evaluation. The course is a professional foundation course that introduces the basic knowledge, typical technologies, product services, and industry applications of artificial intelligence, with application needs as the orientation, helping students understand and master cutting-edge technologies and application cases of artificial intelligence, broaden their knowledge horizons, enhance their digital literacy, and lay the foundation for applying artificial intelligence theories and tools to solve practical problems in the future. The course teaching objectives are shown in Table 1.

Table 1. Teaching Objectives of the "Artificial Intelligence" Course

Objective Category	Objective Details
Objectives of Occupational Quality	1. Cultivate students' sense of responsibility in promoting social development through artificial intelligence.
	2. Foster students' compliance with ethical norms in the field of artificial intelligence and develop their awareness of respecting and protecting personal privacy.
	3. Understand artificial intelligence security and establish safety awareness in artificial intelligence applications.
Objectives of Knowledge	1. Understand the development status and research content of artificial intelligence.
	2. Master the basic concepts, methodologies, and important algorithms of artificial intelligence.
	3. Grasp the applications of artificial intelligence in image processing, language processing, and intelligent robotics.
	4. Understand the technical principles of machine learning, expert systems, and data mining.
	5. Be familiar with application cases of artificial intelligence in industries such as intelligent logistics, smart cities, and intelligent manufacturing.
Objectives of Technical Skills	1. Analyze the application paths and effects of artificial intelligence in application cases.
	2. Apply AI tools to solve problems.
	3. Enhance vocational abilities such as language expression, data collection, and electronic document editing.

4.1 Implementation Plan for the Reform of Learning Evaluation

To implement the reform of learning evaluation for the course, a top-down design approach was first adopted to construct an evaluation index system, determine specific evaluation content and criteria. Then, digital evaluation tools were applied in the evaluation process to flexibly

conduct learning evaluations, supporting the diversified practice of process evaluation and outcome evaluation. Finally, evaluation data was collected and analyzed to complete the reflection and improvement of learning evaluation and instructional design, verifying the practicality of the "Five-Evaluation Dual-Closed-Loop" evaluation model.

4.1.1 Reconstructing the evaluation system and

enhancing the top-down design of evaluation
As shown in Table 2, based on the course's teaching objectives and the theoretical model of evaluation, learning evaluation elements were disassembled and reorganized from the three dimensions of occupational quality, knowledge, and technical skills to design diversified evaluation content. Quantifiable evaluation indicators were analyzed to construct the learning evaluation index system for the course,

guiding the process evaluation of course learning. Based on the evaluation index system, evaluation content was decomposed and detailed, and evaluation criteria conducive to quantification were formulated to guide students in enhancing their vocational quality, riching their professional knowledge, and growing their technical skills, which achieves unified and multi-dimensional.

Table 2. The Course Formative Assessment Content and Indicators

Teaching Unit	Assessment Content		Assessment Indicators
Unit 1: Introduction to Artificial Intelligence	Class Attendance + Classroom Activity Participation + Homework+ quiz	Group Project: Short Film Production on "Future AI Life"	Rationality of AI Future Scene Design + Work Completion + Video Production + Team Contribution+Quiz Accuracy
Unit 2: Operating Platform and Support	Class Attendance + Classroom Activity Participation + Homework+ quiz	Practical Project: Commodity Demand Analysis Based on Practical Sequences	Completion of Data Mining Experiments + Rationality of Demand Analysis + Completion Quality of Demand Report+Quiz Accuracy
Unit 3: Key Technologies of Artificial Intelligence	Class Attendance + Classroom Activity Participation + Homework+ quiz	Practical Project: Application of Deep Learning in Image Recognition and Classification	Completion of Image Recognition and Classification Experiments + Completion of Practical Reports+Quiz Accuracy
Unit 4: AI Products and Services	Class Attendance + Classroom Activity Participation + Homework+ quiz	Fun Competition: Chatbot PK	Participation in the Competition + Completion of Post-Competition Analysis Reports+Quiz Accuracy
Unit 5: Applications of Artificial Intelligence	Class Attendance + Classroom Activity Participation + Homework+ quiz	Group Project: Research on the Application of AI in Various Industry Fields	Completion of Research Results + Rationality of Case Analysis + Classroom Presentation + Team Contribution+Quiz Accuracy
Unit 6: Safety and Ethics of Artificial Intelligence	Class Attendance + Classroom Activity Participation + Homework+ quiz	Fun Debate: Does AI Bring More Challenges or Opportunities to Humans?	Completion of After-Class Summaries + Debate Performance (Additional Points for Debaters)+Quiz Accuracy

Taking the teaching unit of "Applications of Artificial Intelligence" as an example, the traditional evaluation method had involved students summarizing and designing mind maps based on classroom content after class, and teachers had assessed students' mastery of artificial intelligence application knowledge based on the completion of these homework, but we should notice that the type of evaluation was single-dimensional and unable to achieve high consistency between teaching and evaluation. After the evaluation reform, the classroom teaching design was adjusted to organize students into groups to independently complete the sorting and analysis of application cases in a specific field of artificial intelligence. The evaluation content was adjusted to the group presentations and shared learning

outcomes, with evaluation scores calculated by weighted averaging of inter-group peer evaluation + intra-group peer evaluation + self-evaluation + teacher evaluation. It not only examined students' knowledge mastery but also evaluated their vocational skills (such as expression ability, electronic document editing ability, problem-solving ability, etc.) and professional literacy (information literacy, team collaboration literacy, etc.), enhancing the instructional guidance of the evaluation through improved instructional design indeed.

4.1.2 Upgrading evaluation tools to ensure precise and objective assessment

Digital and intelligent evaluation tools are widely used in teaching to record and analyze the process behaviors of teaching and learning accurately, fully tapping into online teaching

activity data as an important basis for formative assessment. The tools could enable real-time monitoring and early warning of the learning process.

In the case of the empirical research, digital evaluation tools facilitated the diversification of evaluation subjects, embodying students' subjectivity in the evaluation process, such as allowing students to complete self-evaluations and peer evaluations of group projects online. They also promoted the diversification of evaluation methods, making quantitative evaluation more precise and qualitative evaluation more objective. For example, in group projects with complex scoring formulas, individual scores could be automatically generated after multiple evaluations. Teachers and students could express their agreement with viewpoints in class discussion posts through likes or flowers.

4.1.3 Mining evaluation data to drive teaching reflection and improvement

Evaluation data could be collected, analyzed, diagnosed, and applied through the SPOC platform for course teaching, driving classroom teaching reform.

For example, in the "Products and Services" unit, an online questionnaire was issued on the topic "Should a driverless car prioritize protecting passengers or pedestrians in an accident?" to collect students' viewpoints. Backend evaluation data analysis revealed high student participation, proactive thinking, active discussion, and high-quality viewpoint output, reflecting that students had certain reflections and interests in the topic of the relationship between artificial intelligence and humans. Based on the evaluation data analysis of the activity, a "Fun Debate" activity was designed in the "Security and Ethics of Artificial Intelligence" teaching unit, with the topic "Does artificial intelligence bring more challenges or opportunities to humans?" Through the confrontation of viewpoints between the pros and cons, students were encouraged to deeply consider how humans should respond to the changes brought about by artificial intelligence, guiding them to seize opportunities and face challenges in the era of artificial intelligence. The class summaries after the debate were part of the evaluation content for the unit, with debaters from both sides earning bonus points to encourage active participation.

4.2 Analysis of Evaluation Effects

After the implementation of the learning evaluation reform, the following three effects have been achieved:

4.2.1 Shifting evaluation mindset and enhancing course teaching quality

Teachers have updated their learning evaluation reform philosophy, shifting their focus to students' process learning and subsequently to their learning status and effects. It promotes teachers to prioritize the design and implementation of classroom teaching activities. Students, on the other hand, have transformed from being passive evaluators to new subjects of evaluation, gaining more participation in the learning evaluation, thereby enhancing their enthusiasm for participating in classroom teaching activities.

4.2.2 Optimizing teaching methods and enhancing teachers' professional abilities

Teachers continuously explore and improve their teaching designs, organizing more diverse teaching activities to enrich course evaluation methods. In the ongoing reform and exploration, teachers' teaching and research abilities are continuously enhanced, promoting their personal professional growth.

4.2.3 Innovating learning methods and enriching students' comprehensive qualities

The course evaluation index system and evaluation criteria help students clarify their learning goals and directions from the aspects of literacy, knowledge, and abilities. By participating in diversified evaluation activities, students break away from traditional learning methods, enhance their sense of learning achievement, and promote the improvement and overall development of their comprehensive qualities.

5. Conclusion

This study has constructed a "five-evaluation double-closed-loop" theory model for learning evaluation of higher vocational professional courses, integrating pre-evaluation, formative evaluation, summative evaluation, value-added evaluation, and diagnostic evaluation. An empirical study of evaluation reform was conducted on the "Artificial Intelligence" course in the field of Intelligent Logistics Technology. This has achieved certain results in improving the quality of course teaching, enhancing teachers' teaching abilities, and comprehensively enhancing students' abilities

and qualities. In subsequent research, it is necessary to further conduct empirical studies on evaluation reform for different types of professional courses to verify its universality and improve the model structure.

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