CSCanada
Higher Education of Social Science
Volume 28, Number 1, 2025, pp. 7-11
DOI:10.3968/13664

ISSN 1927-0232 [Print]
ISSN 1927-0240 [Online]
www.cscanada.net
www.cscanada.org

Construction of a Course Effectiveness Evaluation System: A Case Study of the "Silicate Petrography" Course

SU Xiaoli[a],*; SUN Yi[a]; YANG Linfei[a]

[a] School of Materials Science and Engineering, Jingdezhen Ceramic University, Jingdezhen, China.
*Corresponding author.

Supported by the project "'Standardized, Process-Oriented, and Value-Added' Course Effectiveness Evaluation System Construction and Implementation: A Case Study of the 'Silicate Petrography' Course" (Grant No. JXJG-23-11-7).

Received 15 December 2024; accepted 21 February 2025
Published online 26 March 2025

Abstract

Silicate Petrography is a core course in the Inorganic Non-Metallic Materials Engineering major, and its teaching quality significantly impacts students' knowledge accumulation and professional ability development. This paper, based on the OBE (Outcomes-Based Education) philosophy, uses Silicate Petrography as an example to construct a "standardized, process-oriented, value-added" course effectiveness evaluation system. This system focuses on student growth, learning processes, and capability enhancement, utilizing a data-driven feedback mechanism for teaching quality to enhance the scientific rigor and objectivity of course evaluations. Research results indicate that this course effectiveness evaluation system not only improves student learning outcomes but also provides strong support for continuous course improvement, demonstrating high application and promotion value.

Key words: Silicate petrography; Course Effectiveness Evaluation; Standardization; Process Orientation; Value Addition

Su, X. L., Sun, Y., & Yang, L. F. (2025). Construction of a Course Effectiveness Evaluation System: A Case Study of the "Silicate Petrography" Course. *Higher Education of Social Science*, *28*(1), 7-11. Available from: URL: http://www.cscanada.net/index.php/hess/article/view/13664
DOI: http://dx.doi.org/10.3968/13664

Educational evaluation is a key component of teaching reform and educational development, serving as an effective means for assessing the value of educational activities or phenomena. It is also an important factor influencing and guiding the direction of educational development. In October 2020, the Central Committee of the Communist Party of China and the State Council issued the "General Plan for Deepening Educational Evaluation Reform in the New Era," which clearly pointed out the need to reverse unscientific educational evaluation orientations (Yang, 2023). The plan proposed to "improve outcome evaluation, strengthen process evaluation, explore value-added evaluation, and establish comprehensive evaluation" to enhance the scientific rigor, professionalism, and objectivity of educational evaluations. As a result, traditional outcome-oriented horizontal evaluation methods can no longer meet the requirements of modern educational evaluation. The focus has shifted to evaluation approaches that emphasize student growth and development, becoming a focal point and research hotspot. With the rapid development of higher education, course evaluation standards have gradually transitioned from being "outcome-oriented" to being "process and value-added oriented." This shift requires improving traditional outcome evaluations, strengthening process evaluations, and exploring new models of value-added evaluation to comprehensively and authentically reflect students' learning progress (Li, 2023).

"Silicate Petrography" is the first core required course offered to second-year undergraduate students majoring in Inorganic Non-Metallic Materials Engineering (Sun, 2021). This course plays a pivotal role as a bridge between foundational courses and specialized courses. In recent years, the course has embraced OBE (Outcomes-Based Education) principles, integrating innovative elements such as blended learning, ideological and political education, virtual simulation, and information technology advancements. Supported by provincial and

university-level teaching reform projects, significant reforms and innovations have been implemented in teaching philosophy, methods, and content. Student performance and examination results are used to evaluate the effectiveness of course instruction. However, traditional single-dimensional course assessments fail to accommodate various teaching reform elements, cannot mitigate differences in learning abilities among students from different backgrounds, and lack the ability to provide timely feedback on teaching effectiveness. Consequently, they fall short in diagnosing and continuously improving teaching quality. Course assessment is a macro-level comprehensive evaluation critical for closing the loop in course construction and teaching operations but represents a weak area in practical teaching reform efforts (Dou, 2022).

Therefore, it is crucial to reconstruct new course standards to evaluate the multiple new teaching elements introduced and to build a multi-faceted, multi-angle, and full-process evaluation system that assesses students' learning outcomes. This approach aims to increase learning challenges, focus on longitudinal value-added development of students' capabilities, and assist teachers in providing timely feedback for continuous improvement of course effectiveness. Given this context, this study aims to construct a scientific and systematic course effectiveness evaluation system. Starting from a process perspective and data-driven approach, it emphasizes learning experiences and conducts research on process-driven online and offline hybrid course quality effectiveness evaluation systems to comprehensively assess the teaching effectiveness of the Silicate Petrography course.

1. CONSTRUCTION OF A COURSE EFFECTIVENESS EVALUATION SYSTEM

1.1 Design and Implementation of Multi-Level Standardized Evaluation

The construction of standardized evaluation is fundamental to ensuring the scientific rigor and comparability of evaluation results. The specific design includes:

1.1.1 Defining the Evaluation Indicator System

Firstly, we collect and organize relevant research on process-based evaluation, online and offline learning evaluation, and open online course evaluation indicators from both domestic and international sources. The process-based evaluation is divided into three dimensions: Knowledge, Ability, and Competence (Sun, 2023).

Knowledge Dimension: This dimension focuses on students' mastery of foundational theories. Students should be proficient in memorizing and understanding basic theories of crystallography, mineralogy, and crystal optics.

Ability Dimension: This dimension emphasizes students' ability to apply knowledge in real-world scenarios. Through their studies, students should be able to identify and judge key aspects of raw material selection involved in ceramic formulations or preparation. They should be capable of using mineralogical theory to correctly address issues related to raw materials in ceramic formulations and analyze and evaluate the impact of raw material selection on ceramic formulations and synthesis processes.

Competence Dimension: This dimension focuses on students' attitudes during the learning process and their scientific literacy. By integrating ideological and political education elements such as the spirit of Jingdezhen's ceramic artisans ("craftsmen come from all directions, and products go out to the world"), this dimension aims to cultivate a "craftsman spirit" and rigorous scientific attitude among students, instilling correct values and fostering a practical and innovative mindset (Sun, 2022).

Based on this, a preliminary three-level indicator system has been designed:

Level 1 Indicators: Academic Achievement Level, Learning Behavior Performance, Learning Emotional Attitude; Level 2 Indicators: Course Learning Effectiveness, Resource Utilization, Learning Enthusiasm and Concentration, Learning Emotional Tendency; Level 3 Indicators: Leveraging data from the Chaoxing Learning Platform, the Level 2 indicators are quantified into Level 3 indicators, which primarily include: Scores from unit tests, Scores from unit assignments, Final exam scores, Online learning duration, Number of posts made through the Chaoxing Learning software. Scores from in-class tests. Sentiment polarity of course evaluations. This multi-level standardized evaluation system ensures comprehensive and objective assessment of students' learning outcomes, providing a solid foundation for continuous improvement in teaching quality and student development.

1.1.2 Designing a "Standardized" Evaluation Process

Based on the existing OBE (Outcomes-Based Education) syllabus, we have developed standardized procedures for evaluating course objective achievement to enhance the effectiveness of these evaluations. This includes standardizing the final exam question-setting process and establishing criteria for both quantitative and qualitative assessments.

Pre-exam Review Process: Before printing the exam papers, the course coordinator and relevant instructors review the course objectives, assessment methods, content, and the final exam paper to ensure their rationality. A "Preliminary Examination Paper Review Form" is completed for this purpose. The final approval comes from the department head. If deemed "unreasonable," the course coordinator and relevant instructors are required to revise the assessment materials until they meet the

standards. Only after obtaining signatures following the review can the exam papers be printed.

Post-assessment Review Process: After the exams, the course coordinator and relevant instructors review the assessment materials for the course (mid-term tests, final exams, regular assignments, project reports, class participation, discussion or defense performance, etc.) to ensure their appropriateness. Combining insights from previous years' course objective achievements, an expected value for course objective achievement is determined, resulting in a "Course Assessment Rationality Confirmation Form." Only after passing this rationality check can the achievement values be evaluated. If found "unreasonable," adjustments and continuous improvements are made for the following year's course.

Reconstructing Standardized Course Assessment Methods and Grading Criteria. We aim to reconstruct standardized course assessment methods and grading criteria, establishing comprehensive, humanistic, and multi-level evaluation standards for teaching objectives. This approach eliminates the one-time exam determining everything model, aiming to engage students more actively and make classes more dynamic. We introduce and implement both "quantitative assessments" and "qualitative assessments," setting clear, standardized grading criteria for each course objective.

Quantitative Assessments: Focus on evaluating student learning outcomes, including formative assessments and examination scores.

Qualitative Assessments: Focus on students' emotional and attitudinal expressions during the learning process. These include course survey questionnaires and meeting minutes from focus group discussions, aimed at providing a comprehensive, objective, and accurate evaluation of students' learning outcomes and quality development. Emphasis is placed on the entire process of ability and quality cultivation, paying attention to the progress of students' abilities and improvement of their qualities.

Ultimately, this leads to the establishment of a scientific, objective, and fair "standardized" teaching evaluation and assessment system that comprehensively evaluates students' learning results and promotes their overall development.

1.1.3 Tiered Evaluation Methods

To ensure that evaluations more accurately reflect students' growth needs, a tiered evaluation method is employed. This approach targets assessments based on students' varying learning foundations, ability development stages, and innovative learning goals. The tiered evaluation method helps instructors identify different learning levels among students during the teaching process and tailor appropriate teaching strategies according to the specific needs of each level. Through this method, greater attention can be paid to individual learning progress, thereby promoting the comprehensive development of students. Basic Level: At this level, students are required to meet fundamental requirements for mastering key points of knowledge. The focus is on ensuring that students have a solid understanding of core concepts and theories. Innovative Level: For students at this higher level, the emphasis shifts towards applying learned knowledge in innovative ways. Students are encouraged to think critically, solve complex problems, and demonstrate creativity in their application of knowledge. By implementing tiered evaluations, educators can better cater to the personalized learning processes of students, fostering an environment where all students, regardless of their starting point, can achieve meaningful growth and development. This method ensures that each student receives support tailored to their current abilities while being challenged to reach higher levels of understanding and innovation.

1.2 Design and Implementation of a "Process-Oriented" Evaluation System for Course Instruction

The process-oriented evaluation system focuses on students' performance during the learning process, utilizing information technology to track their learning behaviors in real-time, thus forming a dynamic assessment of their learning outcomes. Unlike traditional evaluation methods that only focus on end-of-term results, process-oriented evaluation emphasizes students' learning attitudes, effort, participation, and problem-solving abilities throughout the entire learning process. Its core value lies in monitoring student performance during the learning process, providing real-time feedback and adjustments, and promoting self-monitoring and reflection among students. Through this approach, teachers can not only grasp students' learning status more accurately but also adjust teaching strategies promptly based on timely feedback, thereby enhancing teaching effectiveness.

1.2.1 Classroom as the Main Battlefield for Educational Reform

The classroom is the primary arena for implementing educational reforms and plays a crucial role in leveraging the "process-oriented" and "value-added" aspects of course effectiveness evaluations. Ensuring high-quality classroom instruction is the main strategy for improving students' academic performance. The design of process-oriented evaluation primarily includes:

Collection of Student Learning Behavior Data: This involves observing classroom behavior, tracking homework completion, and collecting online learning data. Dynamic Tracking of the Learning Process: Monitoring students' participation in class activities, such as whether they actively speak up, participate in group discussions, and ask questions. Comprehensive Design of Evaluation Indicators: Developing a set of

comprehensive indicators that cover various aspects of student performance. Integration of Data Analysis and Evaluation Methods: Utilizing advanced modern information technology to analyze collected data and evaluate student performance.

1.2.2 Specific Measures for Process-Oriented Evaluation

Classroom Participation: Recording students' participation in class activities, including active speaking, group discussions, and question-asking. Homework Completion: Tracking the submission and quality of assignments and project reports, noting whether they are submitted on time. Online Learning Data: Collecting data from the Chaoxing Learning Platform regarding online learning duration, chapter-by-chapter study progress, and online interaction.

1.2.3 Quantitative Assessment Methodology

By leveraging the big data prediction and intelligent evaluation functions of the Chaoxing platform, the course assessment is quantified into two major components: summative assessment (50%) and formative assessment (50%). The formative assessment includes:

Online Learning (10%): Focusing on blended learning elements, such as online MOOC study duration and chapter quizzes.

Class Participation (8%): Assessing sufficient engagement in classroom activities, responses to teacher questions, and ideological and political education elements like learning attitude, appearance, and behavioral norms.

Homework (12%): Evaluating students' review, understanding, and mastery of each chapter's key points, including virtual simulation experiment operations.

Special Topic Research Reports (20%): Assessing literature research, problem analysis, oral or written expression skills, and incorporating course ideological and political education elements by encouraging students to reflect on their professional thinking and planning.

Through these measures, the process-oriented evaluation system ensures a multi-faceted approach to teaching reform elements, covering both online and offline mixed-mode teaching elements, ensuring comprehensive and accurate evaluation of students' learning processes and outcomes.

1.3 Design of a "Value-Added" Evaluation System for Course Instruction

The value-added evaluation system, fundamentally a form of process-oriented evaluation, differs from both result-oriented and process-oriented evaluations by focusing on measuring the knowledge gained, skills enhanced, and competencies developed by students throughout their learning journey. This approach evaluates the effectiveness of teaching activities by emphasizing longitudinal student development. By comparing and analyzing changes in students across different stages of the course, it truly reflects their progress trajectory, aiding teachers in improving instruction and enhancing the student learning experience.

Based on course objectives and students' developmental needs, the value-added evaluation indicators are designed to cover several aspects: Knowledge Gain: Measuring students' mastery of foundational knowledge and core concepts. Learning Attitude and Emotional Development: Tracking changes in motivation, enthusiasm, and engagement. Innovation and Thinking Skills: Evaluating the development of higher-order thinking abilities such as proposing new ideas and designing innovative solutions. Comprehensive Competence: Assessing the formation of rigorous research attitudes and scientific spirit through observation of research methods and learning behaviors.

During each teaching session, individual student performance data and participation in teaching activities are reviewed to provide channels for improvement in future teaching design and activities. Through continuous implementation and iterative recording of courses, the "value-added" growth of individual students is documented, ultimately analyzing the individual "value-added" situation to inform targeted teaching measures and provide appropriate learning resources, achieving personalized education that highlights individual student characteristics.

Knowledge Gain: Analyzed through students' grasp of foundational knowledge and core concepts. Classroom activities and outcome assessments serve as evaluation objects. A "preset expected value" quantifies teaching activities and outcome assessments, with the statistical functions of the Chaoxing Learning Platform and other information technology tools used to record students' learning behavior. Pre- and post-course test scores are compared to analyze the "value-added" situation of individual teaching activities.

Learning Attitude: An important factor affecting learning outcomes. The value-added evaluation can include records of changes in students' learning motivation, enthusiasm, and participation, measuring the value added in learning attitude.

Higher-Order Thinking Skills: Observing whether students exhibit advanced cognitive abilities at the end of the course, such as proposing new viewpoints or designing innovative solutions.

Comprehensive Competence: Evaluating the development of rigorous research attitudes and scientific spirit through data obtained from observing research methods and learning behaviors.

Based on initial data and subsequent learning performance, a growth curve for each student is plotted to visually reflect progress across different stages of the course. This analysis helps teachers quickly identify growth trends and areas needing improvement.

The final value-added evaluation of the course can refer to the "achievement status" to measure the overall "achievement" of all students' teaching activities. This comprehensive assessment provides insights into the effectiveness of the course and guides future improvements.

2. REAL-TIME DYNAMIC EVALUATION AND CONTINUOUS TRACKING FEEDBACK FOR IMPROVEMENT

The ultimate goal of evaluation is to guide teachers in enhancing their teaching quality and promote students' learning efficiency through feedback. Therefore, evaluation results must be scientific and accurate, allowing timely identification of issues and summarization of strengths after thorough analysis, thus continuously improving teaching methods. In the context of value-added evaluation, real-time dynamic evaluation and feedback are conducted by comparing "preset expected values" with actual student performance during activities. This allows for immediate adjustments to the teaching process, focusing on the individual "value-added" growth of each student to ensure the quality of each lesson. Students can view their performance at various stages anytime and gain a detailed understanding of their learning status through feedback reports, which facilitates self-regulation and improvement. This mechanism not only aids students in self-adjustment but also provides teachers with targeted teaching data.

To broaden the scope of continuous tracking feedback, information platforms can be utilized to distribute surveys or conduct qualitative assessments regarding improvements in teaching methods, diversity in evaluation approaches, and reasonableness of the evaluation process. The "process-oriented, value-added" course effectiveness evaluation is not a one-time event but an ongoing effort that integrates quantitative and qualitative evaluation results, combined with past analysis reports, to continuously improve. This creates a closed-loop system forming a dynamic virtuous cycle of "evaluation - feedback - improvement - re-evaluation," promoting a teaching evaluation paradigm that enhances both teaching and learning.

3. CONCLUSION

This paper constructs a "standardized, process-oriented, value-added" course effectiveness evaluation system, exploring solutions to enhance teaching quality using the example of silicate petrography courses. It leverages the guiding, motivating, diagnostic, and improvement roles of evaluations to achieve "evaluation-driven teaching improvement." For teachers, this enriches the connotation of course evaluation, optimizes the teaching environment, and enhances teaching competence and quality. For students, it promotes active engagement, livelier classrooms, increased satisfaction, and improved learning outcomes, leading to positive benefits. Research indicates that the application of the evaluation system significantly improves students' knowledge acquisition, skill development, and comprehensive competency cultivation, providing practical demonstrations for teaching quality enhancement and curriculum reform in local universities. Future work will focus more on supporting these efforts with information technology platforms and ensuring the flexibility of the evaluation system to adapt to evolving educational needs.

REFERENCES

Dou, J. H., & Zhu, H. (2022). Value-added assessment instructional design and practice based on OBE concept. *Foreign Language Education & Research, 10*(4), 22-28.

Li, X. T. (2023). *Research on the application of value-added assessment in classroom teaching* (Master's thesis). Shanghai Normal University, China.

Sun, Q. R., Xi, Z. L., & Ding, Y. H. (2023). Exploration of teaching process evaluation based on intelligence factors and non-intelligence factors. *Higher Education Forum, 10*, 32-34.

Sun, Y., Li, K., & Li, Z. K. (2021). Curriculum reform in silicate petrography course based on OBE system. *China Light Industry Education, 6*, 89-91.

Sun, Y., Li, K., & Liu, S. X. (2022). Cultivation and exploration of international vision capabilities in industry-focused universities under the context of engineering accreditation. *Science & Technology Vision, 2*, 44-46.

Yang, L. (2023). Practical pathways for formative assessment in the context of new era educational evaluation reform. *Newest, 10*, 242-245, 249.