Journal of Contemporary Educational Research, 2025, Volume 9, Issue 12
http://ojs.bbwpublisher.com/index.php/JCER
ISSN Online: 2208-8474
ISSN Print: 2208-8466

# Reform and Exploration of Formative Evaluation of Courses in Local Universities Based on the "Four New Disciplines" Initiative

**Mingyuan Liu[1], Shulin Wu[1], Yu Yang[1], Chunyan Ma[1], Zhihui Jiang[1], Guangyuan Yang[2]***

[1]School of Basic Medical Sciences, Jiamusi University, China
[2]The First Affiliated Hospital of Jiamusi University, China

***Corresponding author:** Guangyuan Yang, ygy665@126.com



**Abstract:** Against the backdrop of the national "Four New Disciplines" initiative aimed at promoting the construction of a first-class university system, strengthening interdisciplinary integration, and facilitating the optimization and upgrading of professional structures, this study takes Jiamusi University as the research object. Focusing on issues such as vague evaluation indicators, a single evaluation subject, rigid evaluation carriers, and a lack of feedback mechanisms in current course formative evaluations, this research systematically constructs practical strategies with operability. The goal is to provide references for the construction of university education evaluation systems, drive reform and innovation in education evaluation systems, and continuously optimize university education evaluation systems.

**Keywords:** "Four New Disciplines" initiative; Local universities; Course formative evaluation; Teaching reform and exploration

**Online publication:** December 31, 2025

## 1. Introduction

The "Double First-Class" initiative is a significant higher education development strategy deployed by the Central Committee of the Communist Party of China and the State Council, serving as a pivotal measure to guide Chinese universities in enhancing their overall strength and international competitiveness [1]. In 2019, Wu Yan, then the Director of the Higher Education Department of the Ministry of Education, proposed at the National Conference of Higher Education Directors that "China will vigorously develop four types of disciplines, namely, establishing exemplary undergraduate programs in emerging engineering, emerging medical sciences, emerging agricultural sciences, and emerging liberal arts, to lead universities in optimizing their disciplinary structures, improving the quality of disciplinary construction, and fostering the formation of a high-level talent cultivation system" [2]. The "Four New Disciplines" initiative provides a core guiding direction for the reform of curriculum evaluation in local universities. However, analysis reveals that current

course evaluation practices in local universities generally suffer from the problem of "three emphases and three neglects." This evaluation model is significantly misaligned with the requirements of the "Four New Disciplines" initiative, which emphasizes competency-oriented development, strengthened process-based learning experiences, and the highlighting of innovative practice, and therefore finds it difficult to effectively cultivate and enhance students' capabilities [3]. Based on this, this study takes Jiamusi University as its research object, focusing on undergraduate students' evaluations of knowledge and cognitive processes. It operationalizes abstract knowledge and cognitive processes into specific, evaluable indicators, thereby providing strong support for the further development of practical models.

## 2. The connotative relationship between the "Four New Disciplines" initiative and formative evaluation

### 2.1. The connotations and requirements of the "Four New Disciplines" initiative

The "Four New Disciplines" initiative represents key strategic measures proposed by the state to address the new round of technological revolution and industrial changes, aiming to support the connotative development of higher education. Their core lies in guiding talent cultivation with new concepts, organizing disciplinary systems with new standards, restructuring teaching processes with new approaches, and enhancing teaching quality through new methods. For local comprehensive universities like Jiamusi University, the "Four New Disciplines" initiative presents both significant opportunities and daunting challenges.

The construction of emerging engineering disciplines requires a transition in engineering education from a traditional discipline-oriented approach to an industry-demand-oriented one, emphasizing cross-disciplinary integration, innovative design, and practical skills. The construction of emerging medical disciplines focuses on the integration of medicine with engineering and liberal arts, emphasizing holistic care throughout the life cycle, and promoting the organic integration of humanistic qualities with clinical competencies. The construction of emerging agricultural disciplines targets rural revitalization and the development of modern agriculture, highlighting multidisciplinary convergence to cultivate innovative talents capable of addressing complex challenges in agriculture and rural areas. The construction of emerging liberal arts disciplines focuses on breaking through the traditional paradigm of liberal arts talent cultivation, fostering interdisciplinary convergence between the humanities and social sciences with science, engineering, medicine, and agriculture, and cultivating compound talents with cultural confidence and a global perspective [4].

### 2.2. Educational advantages of formative assessment

Formative assessment differs from traditional summative assessment in that its core focus lies in process-orientation, developmental nature, and feedback. It involves continuously collecting student learning information during the teaching process, providing immediate feedback to help students identify learning gaps, adjust their learning methods, and collaborate with teachers to iteratively optimize teaching arrangements and processes. Within the context of the "Four New Disciplines" initiative constructions, formative assessment holds particularly critical educational advantages. Firstly, in terms of ability orientation, formative assessment focuses on the development of students' higher-order thinking and practical abilities, aligning perfectly with the emphasis on innovation capabilities and critical thinking norms in the "Four New Disciplines" initiative. Secondly, in terms of process focus, formative assessment centers on monitoring and guiding students' learning processes, enabling teachers to promptly adjust teaching strategies and achieve dynamic optimization and upgrading of the teaching process [5]. Thirdly, in terms of promoting individualization, relying on continuous

learning feedback, formative assessment is conducive to gaining insights into students' individual differences, providing support for personalized teaching, facilitating the progress of each student, and fully embodying the student-centered educational philosophy. Finally, in terms of mutual growth between teaching and learning, formative assessment not only promotes student growth but also creates opportunities for teachers to reflect on their teaching, driving continuous upgrades in teaching quality. At present, Jiamusi University is intensifying its efforts to integrate the Outcome-Based Education (OBE) concept into undergraduate courses, with the expectation of highly aligning the student-centered teaching philosophy with the value orientation of formative assessment.

## 3. Current status and causes of formative assessment in local university courses

### 3.1. Vague evaluation indicators

The vagueness of evaluation indicators severely restricts the effectiveness of formative assessment. Most teachers report practical difficulties in translating higher-order cognitive abilities into actionable, specific indicators, resulting in formative assessment still being confined to superficial indicators such as assignment completion and attendance rates. For example, in liberal arts courses, evaluation criteria are limited to superficial indicators such as word count and fluency of sentences, without assessing students' narrative logic, creative conception, and other cognitive processes.

### 3.2. Single evaluation subject

Currently, teacher evaluation still dominates in curriculum evaluation, while student self-evaluation, peer evaluation, and industry evaluation account for a relatively low proportion or are even absent. Self-evaluation enables students to "recognize their shortcomings," peer evaluation allows students to "see the full picture," and industry evaluation helps students "clarify their direction." The absence of student self-evaluation results in passive evaluation and lacks the process of self-reflection and improvement; the lack of peer evaluation leads to a deficiency in detailed feedback beyond the teacher's perspective, making the evaluation less comprehensive. Evaluation results without the participation of industry experts do not align with the actual needs of the industry; this single-subject model fails to fully reflect the diverse abilities and competencies required by the "Four New Disciplines" initiative, cannot comprehensively represent students' true abilities, and struggles to support students' smooth transition into the professional world, ultimately leading to a disconnect between the talents cultivated and societal needs.

### 3.3. Rigid evaluation carriers

To effectively implement formative evaluation, systematic carriers are required for support. However, research has found that many courses still rely on traditional carriers such as "paper assignments + classroom notes," lacking systematic recording and analysis of the learning process; the application of online teaching platforms mostly remains at the level of resource uploading and assignment submission, without fully utilizing data tracking functions. The rigidity of carriers leads to fragmented evaluation processes: teachers find it difficult to comprehensively grasp students' learning paths, and students similarly cannot use these carriers to review their own cognitive development processes, making it challenging to achieve self-reflection and innovation [6].

### 3.4. Lack of feedback mechanisms

The core value of formative assessment centers on "feedback for improvement," yet some courses still exhibit

a phenomenon of "emphasizing assessment over feedback": feedback content mostly consists of "grades and scores," lacking detailed analysis of knowledge gaps and cognitive misconceptions; feedback timing is delayed, with most courses providing only one centralized feedback session mid-semester, failing to promptly guide students in adjusting their learning methods; feedback adopts a one-way model, lacking two-way communication between teachers and students and personalized guidance [7]. Consequently, students are unable to enhance their cognitive levels in a targeted manner, and the diagnostic function of assessment is completely compromised.

## 4. Construction of a formative assessment system for local university courses based on the "Four New Disciplines" initiative

### 4.1. Construction of evaluation indicators for the knowledge dimension

Based on the requirements related to the "Four New Disciplines" initiative, we categorize course knowledge into four distinct levels and design corresponding evaluation indicators for each level, as shown in **Table 1**.

**Table 1.** Evaluation indicators for the knowledge dimension

| Knowledge level | Assessment focus | Specific evaluation indicators | Applicable course types |
|---|---|---|---|
| Factual knowledge | Memorization & recognition | Mastery of terminology, accuracy in recalling specific facts, adherence to symbolic standards | Foundational/introductory courses |
| Conceptual knowledge | Comprehension & association | Depth of understanding of conceptual relationships, ability to apply theoretical principles, completeness of knowledge structure | Core/specialized courses |
| Procedural knowledge | Application & operation | Proficiency in skill operation, rationality in method selection, and standardization in process execution | Laboratory/practical courses |
| Metacognitive knowledge | Reflection & regulation | Adaptability of learning strategies, self-monitoring ability, knowledge transfer & innovation | Comprehensive/design courses |

In the work of constructing the "Four New Disciplines" initiative (new disciplines, new majors, new courses, and new textbooks) curriculum, emphasis is placed on the evaluation of conceptual knowledge and metacognitive knowledge, focusing on the depth of students' understanding of core disciplinary concepts and their ability to transfer knowledge and innovate. Against the backdrop of curriculum reform that deeply integrates information technology with education and teaching, the school, guided by the systems and standards for constructing first-class curricula, incorporates the practical effects of integrating information technology into teaching reform into the professional evaluation system, thereby strengthening the guiding role in evaluating high-level knowledge.

### 4.2. Construction of evaluation indicators for cognitive processes

Based on Bloom's Taxonomy of Cognitive Objectives and combined with the requirements of the "Four New Disciplines" initiative construction for cultivating students' abilities, this study divides the evaluation indicators for cognitive processes into six stages, with corresponding evaluation indicators presented in **Table 2**.

**Table 2.** Evaluation indicators for cognitive processes

| Cognitive stage | Core competency | Assessment methods | Evidence form |
|---|---|---|---|
| Remember | Knowledge reproduction | Concept discrimination, knowledge point restatement | Accurate terminology usage, correct matching of foundational concepts |
| Understand | Meaning construction | Case explanation, phenomenon elaboration | Paraphrasing in one's own words, an accurate summarization of core viewpoints |
| Apply | Contextual transfer | Problem solving, solution design | Correct application of formulas/theorems, appropriate method selection to solve problems |
| Analyze | Element decomposition | Structure analysis, relationship sorting | Identification of argument logic, distinction of category differences, and discovery of implicit assumptions |
| Evaluate | Value judgment | Standard application, quality assessment | Provision of evidence-based critique, evaluation of solution merits and shortcomings |
| Create | Innovation generation | Artifact design, model construction | Proposal of original solutions, design of experimental procedures, integration of elements to generate new products |

In advancing curriculum evaluation reform, particular emphasis is placed on "two characteristics and one degree" (advanced nature, innovative nature, and appropriate degree of challenge). In evaluating cognitive processes, emphasis is placed on assessing higher-order cognitive abilities such as analysis, evaluation, and creation. Challenging learning tasks such as project-based learning, case studies, and comprehensive design are employed in conjunction with systematic evaluation indicators to effectively enhance students' cognitive abilities.

### 4.3. Advantages of formative assessment guided by the "Four New Disciplines" initiative

The formative assessment of courses at Jiamusi University, based on the construction of the "Four New Disciplines" initiative (new engineering, new medical sciences, new agricultural sciences, and new liberal arts), reflects the characteristics of assessment in different fields in the following ways: Firstly, new engineering focuses on assessing students' engineering thinking and system design capabilities, emphasizing their ability to analyze and solve complex engineering problems. Secondly, new medical sciences emphasize evaluating students' clinical thinking and humanistic care abilities, as well as their capacity to integrate theory with practice, collaborate in teams, and communicate with patients. Thirdly, new agricultural sciences highlight the assessment of students' ecological thinking and sustainable development capabilities, valuing their comprehensive ability to solve complex agricultural system problems. Fourthly, new liberal arts primarily evaluate students' critical thinking and cultural understanding abilities, with a particular emphasis on cross-cultural understanding and innovative expression. By integrating common requirements with distinctive focuses, the assessment indicator system achieves a comprehensive and scientific evaluation of the knowledge and cognitive development process of students in local universities under the context of the "Four New Disciplines" initiative construction.

## 5. Reform strategies for formative assessment of courses in local universities based on the "Four New Disciplines" initiative construction

Firstly, in terms of institutional safeguards, Jiamusi University has introduced documents such as the *Opinions on Implementing Formative Assessment in Courses*, stipulating that the proportion of formative assessment in course grades should not be less than 30%, and incorporating the effectiveness of assessment reform

into teacher teaching evaluations. By leveraging policy incentives, the university promotes the thorough implementation of formative assessment and establishes a sound mechanism for monitoring assessment quality. Regular inspections and evaluations of the implementation of formative assessment are conducted to ensure its fairness, objectivity, and effectiveness.

Secondly, in the realm of faculty support, local universities can implement "specialized training on the 'Four New Disciplines' initiative (new engineering, new medicine, new agriculture, and new liberal arts) and formative assessment," inviting educational assessment experts and outstanding teachers to give special lectures and share case studies. They can also organize teachers to participate in off-campus seminars on assessment reform to enhance their capabilities in assessment design and implementation. Teachers are encouraged to engage in teaching research and practical exploration, innovating assessment methods and tools based on their disciplinary characteristics and teaching realities.

Thirdly, in terms of resource support, there should be increased investment in teaching resources. On the one hand, the construction of information-based teaching resources should be strengthened, and the functions of online teaching platforms should be improved. By fully utilizing technologies such as big data and artificial intelligence, a comprehensive recording and analysis of students' learning processes can be achieved, providing robust data support for formative assessment. For example, developing intelligent learning analysis systems capable of monitoring students' learning behaviors, progress, and outcomes in real time can provide teachers with precise teaching feedback. On the other hand, it is essential to integrate on-campus and off-campus resources to establish comprehensive repositories of teaching cases, examination questions, and learning resources, catering to the diverse teaching evaluation needs of different courses and disciplines.

Fourthly, reasonable incentive policies should be formulated at the incentive and support level. Teachers who actively participate in formative evaluation reforms and achieve remarkable results should be given preferential treatment in terms of professional title assessment, performance rewards, and excellence awards. A special reward fund for teaching evaluation reform should be established to recognize and reward individuals and teams that excel in evaluation reform. Additionally, by promoting outstanding teaching evaluation cases and experiences, a favorable environment for reform can be cultivated.

## 6. Conclusion

In conclusion, local comprehensive universities should prioritize the construction of a "knowledge-cognition" two-dimensional evaluation index system based on Bloom's Taxonomy of Educational Objectives, along with practical strategies in terms of systems, faculty, resources, and incentives, to address the issues of ambiguity, singularity, and fragmentation in traditional evaluations. This will provide concrete pathways for implementing the "Four New Disciplines" initiative construction requirements in the curriculum domain.

## Funding

Key Commissioned Project for Research on Teaching Reform in Undergraduate Universities by the Education Department of Heilongjiang Province in 2022 (SJGZ20220121); General Project for Research on Teaching Reform in Higher Education in Heilongjiang Province in 2024 (SJGYY2024225)

## Disclosure statement

The authors declare no conflict of interest.

## References


[1] Yan L, Hu H, Zheng Y, et al., 2022, The Development Path of the Medical Profession in China's Engineering Universities from the Perspective of the "Four New" Disciplines. Ann Med, 54(1): 3030–3038.

[2] Cheng Z, Huang X, Qiao Y, 2025, Discussion on the Current Research Status and Trends of Formative Assessment in Domestic University Courses. Modern Education Science, (02): 149–156.

[3] Deng F, Xie M, 2024, Construction and Practice of a Formative Assessment System for Blended Courses in Local Undergraduate Universities. Theory and Practice of Innovation and Entrepreneurship, 7(20): 1–4.

[4] Li R, 2025, Exploration and Practice of the Innovative Talent Cultivation Model of "SST+CBL" for Inorganic and Analytical Chemistry under the Background of the "Four New Initiatives": Taking Gansu Normal University for Nationalities as an Example. Teaching in Forest Regions, (08): 52–56.

[5] Yang X, 2021, Effectiveness Analysis of Formative Assessment Reform in Applied English Courses at Universities: Taking the "English Interpretation" Course as an Example. Modern English, (04): 71–73.

[6] Chen H, 2020, Methods and Practices of Formative Assessment in Online Teaching of Professional Courses in Universities. Science & Technology Economy Market, (08): 138–139 + 142.

[7] Wu J, He S, 2025, How is Interdisciplinary Talent Cultivation Possible under the Background of the "Four New Initiatives" Construction: A Systematic Literature Review. Journal of Hubei Normal University (Philosophy and Social Sciences Edition), 45(04): 96–104.