Educational and Humanities
ISSN Print: 3104-4352
ISSN Online: 3104-4360
CD ISSN: 3104-4379
https://doi.org/10.63313/EH.9046

Research on Cultivation Strategies for Improving College Students' Higher-Order Thinking Abilities Based on Bloom's Taxonomy of Educational Objectives

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How to cite this paper: Guo, L. C. (2026). Research on Cultivation Strategies for Improving College Students' Higher-Order Thinking Abilities Based on Bloom's Taxonomy of Educational Objectives. *Educational and Humanities*, 2(3), 1-9. ISSN Print: 3104-4352; ISSN Online: 3104-4360.
https://doi.org/10.63313/EH.9046
Published: 2026-03-06

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Abstract

Against the backdrop of the transformation of higher education from knowledge transmission to competence-based education, the cultivation of higher-order thinking abilities has become a core demand for the development of innovative talents. Based on Bloom's Taxonomy of Educational Objectives (the 2001 Revised Version), this paper systematically explores the cultivation strategies for college students' higher-order thinking abilities. By analyzing the current situation of cultivating college students' higher-order thinking abilities, it is found that there exist such problems as the weak cultivation of creative ability, insufficient problem-solving ability and the lack of metacognitive ability. In response to these problems, the study puts forward optimization strategies from three aspects, providing a certain theoretical basis and practical reference for the teaching reform in colleges and universities.

Keywords

Bloom's Taxonomy of Educational Objectives; College students; Higher-order thinking abilities

1. Introduction

In the era of knowledge economy and innovation-driven development, the talent cultivation goal of higher education has shifted from knowledge transmission to ability cultivation, and the cultivation of higher-order thinking abilities in particular has become a core issue of global education reform. At present, governments of many countries have clearly pointed out that cultivating students' higher-order thinking abilities is the main educational objective of higher education. The evaluation of students' higher-order thinking abilities has become an important part in numerous higher education evaluation and certification systems, and the

importance of cultivating students' higher-order thinking abilities is even more prominent in the current era of artificial intelligence transformation.

The Taxonomy of Educational Objectives proposed by American educational psychologist Benjamin S. Bloom has been revised and improved, dividing the cognitive domain objectives into six levels: Remember, Understand, Apply, Analyze, Evaluate and Create, among which the last three are recognized as the core categories of higher-order thinking. However, the phenomenon of "emphasizing low-level cognition and neglecting higher-order thinking" is still prevalent in the current classroom teaching of Chinese universities. The curriculum design and teaching implementation lack systematic planning for the cultivation of abilities such as analysis, evaluation and creation, resulting in students' deficiencies in innovation and problem-solving. Bloom's Taxonomy has evolved from the initial 1956 version to the 2001 Revised Version, with its core changes being the adjustment of cognitive objectives from the nominal forms "Knowledge" and "Comprehension" to the verbal forms "Remember" and "Understand", and the elevation of "Create" to the highest level. This paper aims to construct cultivation strategies for improving college students' higher-order thinking abilities with the theoretical framework of Bloom's Taxonomy of Educational Objectives (the 2001 Revised Version), so as to effectively promote the development of college students' higher-order thinking abilities.

2. Analysis of the Current Situation of Cultivating College Students' Higher-Order Thinking Abilities

2.1. Weak Cultivation of Creative Ability

Cultivating innovative talents is a national strategy, and higher-order thinking abilities are the key foundation of students' creativity, making it particularly important to improve students' higher-order thinking abilities. Wang pointed out that new-quality education advocates breaking the barriers of traditional school education to cultivate high-level thinking talents with innovative abilities. Traditional education focuses on the accumulation and inheritance of knowledge, attaches importance to the learning and mastery of classic knowledge, advocates systematic learning step by step with a discipline-oriented approach, and establishes a pyramid-shaped knowledge structure. With the explosion of knowledge and information in the digital and intelligent era, the traditional education curriculum system is no longer suitable for the cultivation of high-level thinking talents in the current era. In terms of curriculum setting, most college courses are structured based on the traditional disciplinary knowledge system, emphasizing the systematicness and integrity of knowledge while ignoring the stimulation of students' creative thinking. These courses follow the established syllabuses with fixed and inflexible teaching content, leaving extremely limited space for students' independent development and innovation.

In terms of teaching methods, the traditional single teaching mode of cramming teaching and lecture-based instruction still dominates. Zhang argued that for a long time, schools have taken "imparting the accumulated knowledge of humanity to students" as the main teaching task, emphasizing the orderliness and systematicness of knowledge learning and discipline-centeredness, and attaching importance to the dominant role of teachers in teaching. This traditional teaching method mainly refines theoretical knowledge highly according to the chapter arrangement of textbooks, distributes the goals of knowledge, ability and quality to various teaching tasks, and then examines the degree of students' mastery through tests or evaluations. The teaching process is dominated by teachers' theoretical lectures and skill training, and students are in a relatively passive learning state, leading students to get used to relying on teachers and textbooks, lacking opportunities for independent thinking, and thus being difficult to adapt to the needs of the development of innovative ability and higher-order thinking.

2.2. Insufficient Cultivation of Problem-Solving Ability

Affected by exam-oriented education, teachers usually design teaching activities with the teaching goal of knowledge mastery, and these activity elements tend to focus on memory training and mechanical practice, so that the traditional learning environment is difficult to support learners to carry out practical inquiry activities for solving ill-structured problems and develop higher-order thinking.

The practical teaching environment is an important way to cultivate students' problem-solving ability, but the current practical teaching system in colleges and universities has obvious deficiencies in cultivating students' problem-solving ability. From the perspective of teaching content, there is an obvious disconnect between curriculum setting and the needs of practical application, which is difficult to meet the cultivation requirements of society for applied talents. At the implementation level, the scarcity of practical opportunities leads to students' insufficient hands-on training, thereby affecting the accumulation of their problem-solving experience. The specific manifestations are as follows: the off-campus internship link mostly stays on the superficial form, and students have limited opportunities to participate in core businesses; the problems in the laboratory scene are mostly "closed problems" with pre-set conditions and answers, which are essentially different from the "open problems" in reality. Gao mentioned that traditional closed test questions can only detect whether students have mastered the knowledge required for answering or a certain definite and specific answering mode, but cannot measure students' literacy such as higher-order thinking, problem-solving ability and attitudes and values.

In addition, the existing curriculum evaluation system is deficient in the assessment of problem-solving ability. The current assessment methods generally focus on the mechanical reproduction of problem-solving steps, while neglecting the evaluation of students' core abilities such as problem analysis, strategy construction and

innovative thinking. At the specific implementation level, teachers often "avoid the difficult and take the easy", tend to focus on directly observable results, and mostly adopt standardized closed-book examinations that are easy for quantitative evaluation. This evaluation paradigm, which mainly focuses on knowledge memory and skill operation, can effectively detect the mastery of basic knowledge, but it is difficult to truly reflect learners' high-level cognitive level and problem-solving ability. Such a cultivation situation leads students to form a thinking habit of "relying on standard answers", and they are easily at a loss when facing atypical problems, being difficult to effectively transfer the learned knowledge and solve problems.

2.3. Lack of Cultivation of Metacognitive Ability

Metacognitive ability refers to an individual's ability to monitor, regulate and reflect on their own cognitive processes and results. The high-level cognitive activities in higher-order thinking are inseparable from the continuous regulation of metacognition. It not only affects students' academic performance, but also plays a monitoring and regulating role in teachers' teaching activities. However, the cultivation of metacognitive ability is generally lacking in current higher education. On the one hand, teachers rarely consciously guide students to conduct self-reflection and self-monitoring in the teaching process, and classroom teaching is often targeted at completing teaching tasks. It showed that they are satisfied with the established class hour tasks but do not pay much attention to teaching effects and student feedback. This lack of reflective awareness makes it impossible for them to timely discover and improve the problems in their own teaching, and also makes it difficult for them to adapt to the changes brought by the new curriculum standards and textbooks. Even if there is reflective behavior, it often stays on the description of surface phenomena and fails to delve into the essence and root causes of problems.

On the other hand, from the perspective of individual learners, they also generally have insufficient metacognitive ability and do not know how to plan, monitor and evaluate their own learning. Based on the research of metacognitive teaching centered on self-assessment, people took students participating in the academic English writing class as the research object and found that the learning engagement of some students in performing metacognitive self-assessment tasks needs to be improved, and they do not attach importance to the role of self-assessment tasks. When performing self-assessment tasks, some students cannot conduct effective evaluation, resulting in the inconsistency between self-assessment results and actual writing performance or the inability to make evaluations, and they cannot effectively regulate the cognitive process of genre learning.

It can be seen that in the process of metacognitive ability cultivation, a considerable proportion of students have the following problems: lacking clear learning goals and systematic planning, showing significant randomness in learning; being unable to

effectively identify their own deficiencies in the knowledge acquisition stage and difficult to optimize learning strategies in a timely manner; failing to conduct scientific evaluation and in-depth reflection on learning effects after completing learning tasks. This situation makes it impossible for them to obtain effective feedback from existing experience to improve learning methods, ultimately leading to the double decline of learning efficiency and academic performance, and the insufficient cultivation of students' metacognitive ability.

3. Cultivation Strategies for Improving College Students' Higher-Order Thinking Abilities Based on Bloom's Taxonomy of Educational Objectives

3.1. Construct an Innovation-Driven Curriculum System to Stimulate Creative Ability

In accordance with the high-level requirements of the "Create" cognitive dimension in Bloom's Taxonomy of Educational Objectives, colleges and universities should construct an innovation-driven curriculum system to stimulate college students' creative ability in an all-round way. In the design of curriculum content, break the traditional disciplinary barriers and increase the proportion of interdisciplinary courses and cutting-edge seminar courses. Specifically, science and engineering majors can add characteristic courses such as "Integration and Innovation of Science, Technology and Humanities" and "Interdisciplinary Engineering Design" to guide students to think about problems from different disciplinary perspectives and broaden their thinking boundaries; liberal arts and social sciences majors can offer courses such as "Cultural Creativity and Social Innovation" and "Cross-Field Creation in the New Media Era" to encourage students to combine theoretical knowledge with practical creativity. At the same time, update the curriculum content regularly, introduce the latest research results of the discipline and industry practice cases, let students access the most cutting-edge information and stimulate their innovative inspiration.

In the reform of teaching methods, it is necessary to implement a teaching model oriented to "inquiry and creation". Constructivism theory points out that the meaning construction of knowledge needs to be realized through active inquiry, and Project-Based Learning (PBL) is an effective carrier conforming to this principle. Project-based teaching is an important carrier for the cultivation of students' higher-order thinking abilities, and an important channel to improve students' abilities to raise, analyze and solve problems, as well as their decision-making ability and critical thinking ability. These abilities will become an important cornerstone for students' sustainable development. Low-level knowledge will gradually become obsolete with the improvement of social informatization, but the acquired higher-order thinking abilities will be ever-lasting. When students apply these higher-order thinking abilities to learning, they will surely generate new

sources of knowledge growth.

In the process of practical teaching, teachers can organize students to carry out inquiry-based learning and team cooperation based on real problem situations or scientific research topics, and improve their innovative ability and practical level through the project-driven teaching model. For example, in computer professional courses, teachers assign a project task of developing an innovative application program, let students form teams independently, and explore independently from demand analysis, scheme design to code implementation, with teachers only providing guidance at key links. At the same time, the traditional assessment method should be reformed, the proportion of innovative indicators in the evaluation system should be increased, and a diversified evaluation standard should be established, which not only focuses on students' mastery of knowledge, but also pays more attention to the evaluation of students' innovative thinking, innovative methods and innovative achievements, encouraging students to innovate boldly and dare to break the traditional thinking stereotypes.

3.2. Strengthen the Practice-Oriented Teaching Model to Improve Problem-Solving Ability

In accordance with the goal levels of "Apply", "Analyze" and "Evaluate" in Bloom's Taxonomy of Educational Objectives that point to problem-solving, colleges and universities should strengthen the practice-oriented teaching model to improve college students' problem-solving ability. First of all, optimize the curriculum content and strengthen the combination of theory and practice. In curriculum design, increase teaching links such as practical case analysis and simulated practice, so that students can use the learned knowledge to solve problems in real or simulated situations.

Secondly, strengthen the construction of practical teaching bases to provide more practical opportunities for students. Colleges and universities should establish long-term and stable cooperative relations with enterprises, scientific research institutions and other parties, expand practical teaching bases, and let students participate in actual projects and production activities. The construction of practical teaching bases needs to realize the functional upgrading from "skill training" to "problem-solving". Colleges and universities should jointly build "real problem laboratories" with industry enterprises, transform the actual problems of enterprises into teaching projects, and let students experience the whole process of problem diagnosis, scheme design and implementation verification in real work scenarios. This "immersive" practice can prompt students to break through the limitation of fragmented knowledge in classroom learning and learn to solve problems with systematic thinking under the conditions of incomplete information and limited resources. The Cognitive Apprenticeship theory in pedagogy indicates that such practical participation under the guidance of experts can effectively promote students' acquisition of tacit knowledge and the development of

higher-order thinking.

Finally, establish a practical teaching quality monitoring and evaluation system, conduct a comprehensive and objective evaluation of students' practical process and practical achievements, feed back the evaluation results in a timely manner, help students find problems and improve deficiencies, and continuously enhance their problem-solving ability. Traditional standardized tests are difficult to evaluate students' higher-order thinking processes such as problem representation and strategy selection, so it is necessary to develop "performance assessment" tools, such as problem-solving portfolios and situational simulation tests.

3.3. Implement Metacognitive Training Programs to Enhance Metacognitive Ability

To improve college students' metacognitive ability, colleges and universities can implement metacognitive training programs in accordance with the requirements of monitoring and regulating cognitive processes in Bloom's Taxonomy of Educational Objectives. Teachers should focus on cultivating students' metacognitive awareness in the teaching process and guide students to reflect on and monitor their own learning process.

At the same time, offer metacognitive training courses or lectures to systematically impart metacognitive knowledge and skills. The curriculum content can include knowledge and methods in terms of learning goal setting, learning plan formulation, learning strategy selection, learning process monitoring and learning effect evaluation. Through theoretical explanation, case analysis, practical exercise and other methods, let students master metacognitive strategies and learn to effectively plan, monitor and regulate their own learning. In addition, establish a personalized learning guidance mechanism. According to students' individual differences and learning characteristics, teachers provide targeted metacognitive guidance for students, help them formulate learning plans and strategies suitable for themselves, and realize autonomous learning and self-development.

4. Conclusion and Prospect

Based on Bloom's Taxonomy of Educational Objectives (the 2001 Revised Version) as the theoretical framework, this study systematically explores the cultivation dilemmas and optimization paths of college students' higher-order thinking abilities. The study finds that current college education has obvious shortcomings in the cultivation of creative ability, problem-solving ability and metacognitive ability: the rigid curriculum system and one-way indoctrination teaching inhibit the germination of creative thinking; the disconnection between practical teaching and real problems and mechanical evaluation methods lead to students' weak problem-solving ability; the lack of metacognitive training makes students lack reflection and regulation of the learning process.

In response to the above problems, this study proposes a three-dimensional

collaborative cultivation strategy: first, construct an innovation-driven curriculum system, and stimulate students' ability of reorganization and innovation at the "Create" level through interdisciplinary curriculum integration and Project-Based Learning (PBL); second, implement a practice-oriented teaching model, and deepen the problem-solving ability at the "Apply-Analyze-Evaluate" levels relying on enterprise cooperation projects and real case scenarios; third, design metacognitive training programs to guide students to establish a self-regulation mechanism of goal setting, process monitoring and effect reflection. These strategies are closely anchored to the core dimensions of "Analyze, Evaluate and Create" in Bloom's Taxonomy, providing an operable practical plan for colleges and universities to realize the transformation from knowledge transmission to competence-based education.

Future research can be further deepened from the following directions: first, explore the integration path of Bloom's Taxonomy with emerging educational technologies such as artificial intelligence (AI) and virtual reality (VR), and develop intelligent teaching tools to support the personalized cultivation of higher-order thinking abilities; second, strengthen empirical research, and test the long-term effects of different cultivation strategies through longitudinal tracking, especially their impact on students' career development; third, pay attention to the regulatory role of cultural differences in the cultivation of higher-order thinking, and optimize the applicability of the strategies in combination with the local educational context. In addition, issues such as how to balance the relationship between knowledge transmission and ability cultivation, and how to construct a diversified and dynamic evaluation system still need to be further explored. With the transformation of higher education from "knowledge-based" to "competence-based", the theoretical value and practical significance of Bloom's Taxonomy will be further highlighted, providing continuous theoretical support and methodological guidance for the cultivation of talents with higher-order thinking abilities.

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