

The Educational Value and Realization Pathway of Student Academic Competitions: From the Perspective of “Competition–Instruction Integration”

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Abstract: Academic competitions serve as a crucial mechanism for higher education to fulfil its fundamental mission of fostering virtue through education and enhancing the quality of talent development. However, current practices often reveal significant issues, such as competitions being disconnected from the instructional system and the educational potential of these competitions remaining underutilized. This paper systematically analyses the educational value of academic competitions for university students across three dimensions: transforming students' learning approaches, restructuring teachers' instructional models, and enhancing students' comprehensive competencies. It further identifies two prominent challenges in practice: the “separation of competitions and instruction” and the “utilitarian tendency.” To address these challenges, this paper proposes a teaching reform pathway centred on the integration of competitions and instruction, focusing on upgrading talent cultivation programs and strengthening faculty teams. It also constructs a trinity collaborative education system comprising “course foundation, research empowerment, and competition drive,” supported by a multi-collaborative teaching community, and establishes a long-term mechanism for competition-based education. The goal is to transform academic competitions from “an arena for a few elites” into “a growth platform for all students,” thereby contributing to the sustained improvement of talent cultivation quality in higher education.

Keywords: Academic competitions, Competition–instruction integration, Talent cultivation

1. Introduction

With the ongoing evolution of higher education reform, academic competitions have transcended their traditional role as mere extracurricular activities and have increasingly become a vital platform for cultivating innovative talent. Today, academic competitions encompass virtually all disciplinary fields, including science, engineering, agriculture, medicine, humanities, and management. Characterized by their broad impact and high level of engagement, these competitions have garnered widespread attention from universities and attracted a growing number of students to participate actively. Academic competitions serve both as a practical bridge between academic theory and application and as an effective means of stimulating students' innovative potential. They play a crucial role in advancing science, technology, and innovation-oriented education in universities, guiding students in their transformation from “those who know how to read” into “those who know how to create” [1].

However, alongside the rapid expansion in the scale of competitions, various problems have gradually emerged. First, the phenomenon of competitions and daily instruction operating as “two separate domains” remains prevalent. The educational function of competitions has not been fully realized. Second, some universities have fallen into the utilitarian trap of “competing for competition's sake,” deviating from the

original goal of talent cultivation ^[2-3]. Against this backdrop, it is of significant theoretical value and practical importance to clarify the educational value of academic competitions for university students. Bottlenecks have been identified in current practice, and effective pathways toward “competition-instruction integration” have been explored. We have transformed competition resources into instructional resources and competition outcomes into educational effectiveness, which can promote innovation in talent cultivation models in higher education and enhance the quality of talent development.

2. The Educational Value of Academic Competitions for University Students

2.1. Student Dimension: Transforming Learning Approaches and Constructing Tree-Shaped Knowledge Structures

Traditional classroom instruction, with its emphasis on theory over practice, often fails to stimulate students’ intrinsic motivation for learning. In contrast, academic competitions focus on real-world problems, testing both students’ knowledge base and practical skills. For example, the Materials Heat Treatment Innovation and Entrepreneurship Competition is guided by the principles of “solid foundations, strong integration, and breakthroughs” and the philosophy of “applying learning and reaching the pinnacle” ^[4]. It requires participating students to consolidate their theoretical knowledge while integrating multidisciplinary concepts to independently solve various challenges encountered during preparation. This approach effectively stimulates students’ enthusiasm for learning, transforming their approach from “static, passive reception” to “dynamic, active exploration.”

From the perspective of knowledge construction, knowledge acquired in traditional classrooms is often isolated, leaving students unable to perceive the intrinsic connections among concepts. In contrast, competition tasks are typically comprehensive and open-ended, requiring students to draw upon knowledge from multiple domains. Through participation in competitions, students gradually connect scattered knowledge points into complex network structures, which can advance knowledge from mere “memorization and storage” to “internalization and application.”

2.2. Teacher Dimension: Reorganizing Teaching Content

Academic competitions also play a significant role in driving and facilitating instructional reform among teachers. Competition problems, often derived from engineering practice or cutting-edge disciplinary developments, are highly comprehensive and interdisciplinary, imposing new demands on teachers to reorganize teaching content and enhance teaching methods. There are three pathways to achieving teaching reform: extracting teaching cases from competition problems, integrating competition standards into instructional design, and promoting reform of the teaching process ^[5]. Regarding teaching methods, the traditional one-way, static model of “teacher lecturing, students listening” is being replaced by approaches that engage students’ minds, hands, and voices, guiding them toward autonomous learning and innovation.

Moreover, course content often lags behind industry developments and advances at the disciplinary frontiers, making it challenging to meet the demands of cultivating innovative talent. Competitions enable teachers to promptly access new technologies, methods, and equipment within their fields. Furthermore, aligned with the integrated application of knowledge required by competitions, teaching content can be restructured from a “chapter-based” approach to a “knowledge-module” framework, promoting the integration and dynamic expansion of instructional material. In terms of instructional organization, comprehensive problems serve as entry points, and student teams are formed to simulate authentic competition processes. Through team collaboration, idea exchange, teacher guidance, and the students’ “summary–reflection–innovation” cycle, the student-centered teaching philosophy is effectively implemented.

2.3. Educational Dimension: Enhancing Comprehensive Competence

From an educational perspective, academic competitions provide an effective platform for enhancing the comprehensive competencies of university students. Unlike traditional classrooms, academic competitions emphasize a holistic evaluation of students’ overall abilities. During participation, students must simultaneously develop multiple skills. The team-based model requires a clear division of labor and close cooperation, effectively cultivating communication and teamwork skills. Competition deadlines and judging criteria compel students to plan tasks and make timely decisions under pressure, fostering

time management, rule interpretation, and stress resilience. When facing open-ended problems, students must go beyond conventional approaches and continuously refine their solutions, thereby training critical thinking, knowledge transfer, and problem-solving abilities^[6-7]. The cultivation of these comprehensive competencies and innovative traits is thus effectively strengthened.

3. Prominent Problems in the Current Practice of Competition-Based Education

Although the scale of student participation in academic competitions at our university has increased year by year (see Table 1), the awards remain highly concentrated in a few competitions. Consequently, the reach and benefits for the average student remain limited. Competitive teaching faces two significant challenges.

Table 1: Statistics on Student Participation and Awards in Academic Competitions.

Year	Number of Participating Teams	National Awards	Provincial and Ministerial-Level Awards	Number of Participants (Person-Times)
2023	17	5	12	51
2024	16	3	13	57
2025	23	7	16	101
Sum	56	15	41	209

3.1. Separation of Competitions and Instruction

Currently, many universities assemble teams only temporarily for short-term intensive training before competitions, reducing these events to a “second classroom” for a small group of “elite students” rather than benefiting the broader student body. This disconnect occurs at three levels: first, there is a lack of organic alignment between teaching and competition content. Classroom instruction fails to provide systematic knowledge support for competitions. Second, the development of competition-related skills has not been integrated into regular coursework and still depends on last-minute cramming before competitions. Third, the experience and skills students acquire through competitions rarely feed back into classroom learning. This fragmented approach separates competitions from teaching, limiting the educational impact of competitions to a small number of participants. Consequently, valuable competition resources are wasted, and the full educational potential of competitions remains unrealized.

3.2. Utilitarian Tendency

As the importance of competition achievements in university rankings and disciplinary evaluations continues to grow, some universities have adopted a distinctly utilitarian approach. Their efforts focus on selecting a few “seed players” to compete for rankings. Academic competitions have become an “arena” where a small elite vie for honors. More seriously, in some cases, violations such as submitting purchased, ready-made projects have occurred. Some students merely go through the motions, gaining no genuine growth from the preparation process. This utilitarian value orientation not only undermines the educational purpose of competitions but also negatively impacts the development of students’ values, compromising the fairness and integrity of education.

4. Prominent Problems in the Current Practice of Competition-Based Education

To address the aforementioned problems, efforts should focus on two aspects: upgrading the talent cultivation program and strengthening faculty team development. These initiatives should be implemented at the course level. With teachers as leaders and students as participants, a systematic mechanism integrating “competition and instruction” can be established (see Fig. 1).

4.1. Pathways for Realizing the Integration of Competition and Instruction

4.1.1. Enhancing Talent Development Programs

The talent cultivation program serves as the central guiding framework for talent development in universities. Integrating academic competitions into this system is a crucial element in the top-level design of the “competition–instruction integration” reform, which encompasses the following three

aspects: First, it is essential to establish the significant role of academic competitions within the talent cultivation system. Competitions should be integrated throughout the entire talent development process and explicitly incorporated into the program's cultivation objectives. Simultaneously, professional core competency indicators should be revised to create a closed-loop system encompassing "objectives–requirements–competencies–evaluation." It must be fully recognized that academic competitions are not merely traditional supplementary extracurricular activities; rather, they serve as a crucial pathway for cultivating innovative, interdisciplinary, and application-oriented talents, as well as a core mechanism for advancing students from "knowledge receivers" to "value identifiers, problem discoverers, and innovation practitioners."

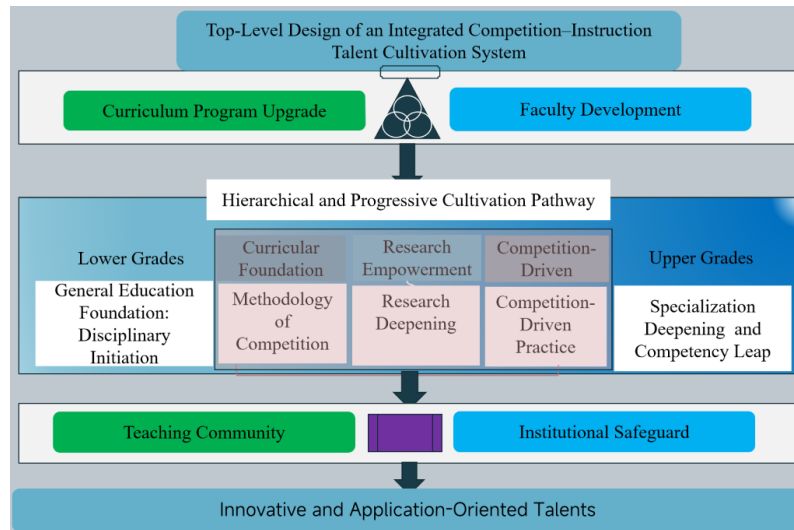


Figure 1: Overall Framework of the "Competition-Teaching Integration" and the Trinity Collaborative Education System.

4.1.2. Establishing a trinity collaborative education system comprising "course foundation, research empowerment, and competition drive"

A grade-based, progressive cultivation framework should be implemented (see Fig. 1). Junior students (Years 1–2) should focus on general education foundations, emphasizing core foundational courses supplemented by laboratory experiments and small-scale course projects to strengthen their mathematical foundations, engineering literacy, and practical skills. Senior students (Years 3–4) should shift toward professional specialization and capability enhancement, guided by core professional courses while advancing research training, innovative open experiments, and project-based learning. On this basis, a systematic "competition–course" integration mechanism should be established, offering innovation and entrepreneurship elective modules and specialized courses such as "Methodology of Academic Competitions." This approach transforms the competition preparation process into structured, progressive, and assessable course components, thereby expanding competition-based education from "elite participation" to "broad coverage," and from "experience-driven" to "standardized education."

4.1.3. Establishing a mechanism for credit recognition

The cultivation program should formally stipulate that students who participate in high-level academic competitions can have their awards converted into credits for practice-oriented courses. This provides an institutional guarantee and incentive for student participation, facilitating the deep integration of competition-based education with the regular cultivation system.

4.2. Building a Multi-Collaborative Teaching Community

An excellent team of supervisors is the primary guarantee for implementing the educational model of "competition–instruction integration," where competition promotes both teaching and learning. This model encompasses three key aspects: conceptual transformation, team collaboration, and continuous optimization.

4.2.1. Promoting teachers' conceptual transformation: from "knowledge transmitters" to "capability architects"

The implementation of competition–instruction integration represents a fundamental paradigm shift

for all teachers, not just competition supervisors. This transformation involves breaking away from the traditional classroom model that separates lecturing from practice and disconnects examination from application. Concepts such as real-world problems, cross-boundary collaboration, and innovation-driven development—central to competitions—are incorporated into daily instruction. Teaching objectives shift from focusing solely on “knowledge” to emphasizing “application ability.” Instructional design evolves from “orderly progression” to “stepped challenges,” and the evaluation system expands from relying solely on “final assessment” to a multi-dimensional profile that includes both “process assessment” and “landmark achievements.”

4.2.2. Constructing a trinity collaborative teaching community composed of “core faculty + industry mentors + competition advisers”

This community is not merely a simple combination of three teams but represents a deep integration (see Fig. 2). Core faculty serve as the “transformer,” responsible for converting competition cases into systematic course content while ensuring the achievement of teaching objectives and maintaining the scientific rigor of evaluation. This integration aligns with the goals of education. Industry mentors act as the “sensor,” keenly perceiving technological advancements and market changes. They provide authentic engineering scenarios, project cases, and professional standards for teaching, thereby preventing the issue of “competing for competition’s sake.” Competition advisers function as the “calibrator,” proficient in competition rules, judging criteria, and preparation strategies. They excel at extracting research topics that are both challenging and pedagogically appropriate from competition tasks and at converting high-pressure experiences into effective teaching cases.

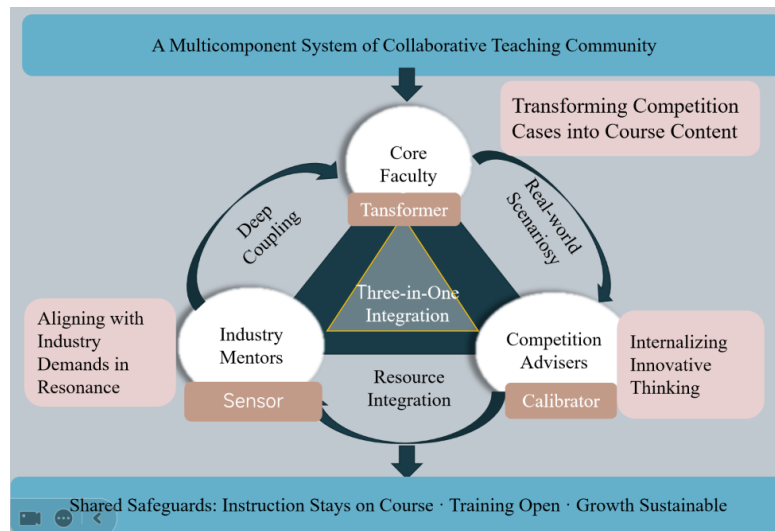


Figure 2: Operational Mechanism of the Multi-Party Collaborative Teaching Community.

4.2.3. Establishing a Mechanism for Continuous Optimization

Team optimization fundamentally involves conscious self-renewal, strategic structural adjustments, and rhythmic iterative upgrades, which can be achieved through the following approaches. “Inter-university Linkage”: Collaborating with counterpart teaching teams at other institutions to form an “optimized development community.” We regularly conduct mutual visits, joint teaching research, and collaborative competition-task analyses. “University–Enterprise Integration”: Deepening cooperation with leading industry enterprises by embedding new technologies, standards, and industrial demands into all aspects of team development. Synchronization between the team’s competency structure and industrial development is achieved through jointly built practice platforms, co-developed teaching projects, and collaboratively trained teachers. “Deep Engagement in Competition Circles”: Maintaining close ties with competition organizing committees, authoritative judges, and benchmark participating teams. We actively participate in rule discussions, criteria interpretation, and trend analysis to ensure that supervisory concepts remain cutting-edge, preparation strategies are scientific, and responses are efficient. Reason: The text was revised to improve clarity, coherence, and readability. Sentence structures were refined for better flow, and technical terms were clarified. Punctuation and capitalization were corrected to conform to standard academic writing conventions.

5. Conclusion

Academic competitions for university students should not be regarded merely as decorative elements of higher education. Instead, they should serve as a driving force for instructional reform and the enhancement of talent cultivation quality. Universities must move beyond simply pursuing competition results and return to the core purpose of education—transforming every competition into a stepping stone for student growth, every guidance session into an opportunity for teachers to reflect on their teaching methods, and every event into a catalyst for curriculum reform. Only by genuinely integrating competitions into the entire talent cultivation process can the educational value of academic competitions shift from an ideal to a reality, and from a privilege for a few to a growth platform for many. This approach is not only an essential requirement for the substantive development of higher education but also an inevitable path toward cultivating innovative talent.

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