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Path Optimization and Efficacy Evaluation of College Innovation and Entrepreneurship Education under In-depth Participatory Tutorial System ——From the Perspective of Dual-capability Transmission

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Abstract

Under the background of "mass entrepreneurship and innovation", colleges and universities, as the core position for cultivating innovative and entrepreneurial talents, have attracted much social attention to the effectiveness of their innovation and entrepreneurship education. The traditional innovation and entrepreneurship education model generally has prominent problems: tutors only provide superficial guidance with insufficient participation; the capability transmission is limited to a single dimension, which is difficult to cover both academic and market needs; there is a serious disconnection between theoretical teaching and practical operation, making it hard for students to transform knowledge into practical entrepreneurial ability, which is far from meeting the requirements for cultivating compound innovative and entrepreneurial talents in the new era. The "in-depth participatory tutorial system" breaks through the shackles of the traditional model, emphasizing tutors' in-depth involvement in the entire process of students' innovative ideas from germination, project incubation to entrepreneurial practice, and building a close community of teachers and students for collaborative growth. The "dual-capability transmission"—the collaborative transformation and dynamic transmission of academic research capability and market entrepreneurial capability—provides a core theoretical perspective and practical path for the optimization of this model. Based on this perspective, this study systematically explores the path optimization strategies and efficacy evaluation system of college innovation and entrepreneurship education under the in-depth participatory tutorial system, aiming to provide a solid theoretical support and feasible practical paradigm for colleges and universities to deepen the reform of innovation and entrepreneurship education and improve the quality of talent training.

Keywords

In-depth Participatory Tutorial System
Innovation and Entrepreneurship Education
Path Optimization
Dual-capability Transmission

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1. Theoretical Basis of In-depth Participatory Tutorial System and Dual-capability Transmission

1.1. Connotation of In-depth Participatory Tutorial System

The in-depth participatory tutorial system breaks through the limitation of traditional tutorial system where tutors only impart knowledge or provide superficial guidance. It emphasizes tutors' in-depth involvement in the entire process of students' innovative projects from conception, investigation, implementation to incubation. Tutors are not only knowledge transmitters, but also guides of students' innovative thinking, trainers of practical ability and integrators of resources. In this model, teachers and students form a close cooperative relationship, promoting the comprehensive improvement of students' innovative and entrepreneurial abilities through continuous interaction and feedback[1].

1.2. Theoretical Logic of Dual-capability Transmission

Dual capabilities refer to academic research capability and market entrepreneurial capability. Academic research capability is the foundation for students' innovative exploration, including solid professional knowledge, scientific research methods and innovative thinking, etc.; market entrepreneurial capability is the key to transforming innovative achievements into practical value, covering market insight, resource integration ability, team management ability, etc. Dual-capability transmission is not a simple superposition of the two types of capabilities, but emphasizes their collaborative transformation and mutual promotion [2]. Tutors, through their own academic accumulation and entrepreneurial experience, organically integrate academic research capability and market entrepreneurial capability and transmit them to students, helping students realize the leap from knowledge to practice and from innovation to entrepreneurship [3].

2. Path Optimization of College Innovation and Entrepreneurship Education under In-depth Participatory Tutorial System

2.1. Optimizing the Operation Mechanism

Establishing and improving the operation mechanism of the in-depth participatory tutorial system is the foundation to ensure its effective implementation. The rights and obligations of tutors and students should be clarified, and scientific guidance norms and assessment standards should be formulated[4]. For example, stipulate the weekly face-to-face communication time between tutors and students, and regularly carry out project progress reporting and discussion activities. At the same time, establish a flexible incentive mechanism to commend and reward tutors who have performed outstandingly in guiding students' innovation and entrepreneurship projects, so as to stimulate tutors' enthusiasm for participation[5-7].

2.2. Improving the Teacher-Student Matching Method

The rationality of teacher-student matching directly affects the effect of dual-capability transmission. Precise matching should be carried out according to students' professional background, innovative project direction, ability shortcomings, as well as tutors' research fields, entrepreneurial experience and guidance styles. A two-way selection platform for teachers and students can be established, where students choose tutors according to their own needs, and tutors can also select students according to project characteristics[8]. In addition, for interdisciplinary innovative projects, a guidance team composed of tutors with different professional backgrounds can be set up to realize multi-dimensional capability transmission.

2.3. Optimizing the Project Incubation Process

Project incubation is a key link in realizing the transformation of dual capabilities. To optimize the project incubation process, a full-chain cultivation system of "conception - investigation - prototype - testing - incubation" should be built. In the conception stage, tutors guide students to combine academic frontiers and market demands to put forward innovative and feasible project conceptions; in the investigation stage, guide

students to conduct market research and technical analysis using scientific research methods; in the prototype stage, encourage students to transform academic achievements into preliminary product or service prototypes; in the testing stage, organize students to conduct market testing and feedback, and optimize according to the results; in the incubation stage, integrate various resources to promote the commercialization of the project[9-11].

2.4. Integrating Resource Integration Strategies

Colleges and universities should integrate internal and external resources to provide support for innovation and entrepreneurship education under the in-depth participatory tutorial system[12]. In terms of internal resources, coordinate the school's laboratories, research bases, libraries and other resources to open to students' innovation and entrepreneurship projects; in terms of external resources, strengthen cooperation with enterprises, governments, investment institutions, etc., establish industry-university-research cooperation bases, and provide students with market information, capital support and practice platforms. Tutors play a key role in resource integration, using their own network resources and industry influence to connect students' projects with various resources.

3. Construction of Efficacy Evaluation System for College Innovation and Entrepreneurship Education under In-depth Participatory Tutorial System

3.1. Process Indicators

3.1.1. Frequency of Teacher-Student Interaction

Covering offline face-to-face communication and online communication (such as video conferences, instant messaging, etc.), it is necessary to count the number of interactions per week/month and the duration of each communication. By recording the communication content (such as the depth of academic discussion, details of entrepreneurial practice guidance), it accurately reflects the depth of tutors' participation in students' innovation and entrepreneurship process, which is the key to measuring the continuity of guidance and the quality of interaction[12].

3.1.2. Project Progress

Focus on the completion of project plan nodes (such as creative research, prototype development, market testing stages), compare with preset goals, and analyze the reasons for delay or advancement. At the same time, pay attention to the achievement quality of phased results (such as patent applications, user feedback reports, demo demonstrations) to reflect the management level and promotion efficiency of the project incubation process.

3.1.3. Performance of Students' Ability Improvement

Comprehensively evaluate the dynamic progress of students' academic research (such as experimental design, data analysis) and market entrepreneurship (such as user demand insight, resource integration) capabilities from the dimensions of innovative thinking output in class discussions, logical rigor and data support of practice reports, as well as role adaptation and communication and coordination in team cooperation, so as to build a visual track of ability growth[13].

3.2. Result Indicators

3.2.1. Students' Dual-Capability Level

Use professional skill assessments (such as practical operation of scientific research methods, industry trend judgment) to quantify academic foundation, and assess entrepreneurial thinking through business plan defense (including business model verification, market competition analysis). Compare the data differences before and after training to accurately measure the improvement of dual capabilities, providing empirical basis for educational effects.

3.2.2. Project Incubation Success Rate

Taking "completion of commercial operation closed loop (such as product launch, continuous revenue)" as the standard, count the conversion ratio of students' innovative projects from idea to implementation. Distinguish project types such as technology-driven and service innovation types, analyze the influencing factors of success rate differences, and optimize the allocation of incubation resources[14].

3.2.3. Social Value Creation

Economic benefits include statistics on sales revenue, tax

contributions and increments in employment positions; social benefits focus on the social pain points solved by the project (such as environmental protection problems, people's livelihood needs) and the promotion effect on industry standards/technological iteration. Through a combination of quantitative and qualitative methods, it comprehensively presents the social radiation power of innovation and entrepreneurship education.

4. Case Analysis: Practice of In-depth Participatory Tutorial System in College Innovation and Entrepreneurship Education

Taking a certain university as an example, since it implemented the in-depth participatory tutorial system in 2020, it has achieved remarkable results in the field of innovation and entrepreneurship education. In terms of the operation mechanism, the university issued the Regulations on In-depth Guidance Work of Tutors, which clearly requires tutors to conduct at least 4 face-to-face special seminars with students every month, each lasting no less than 90 minutes. At the same time, it established a three-dimensional assessment system of "digital filing of guidance logs + anonymous student evaluation + project result traceability". Tutors who excel in the annual assessment are given incentives such as doubling teaching points and tilting research funds, so that the active participation rate of tutors has increased from 62% to 91%.

In terms of teacher-student matching, a three-dimensional online matching platform of "disciplinary direction - project demand - tutor expertise" was built, integrating 28 items of label data such as research fields and entrepreneurial experience of 568 tutors. After students submit their project plans, they can receive 3-5 tutors recommended by the system intelligently. The guidance relationship is determined after two-way communication, and the satisfaction rate of teacher-student matching has remained above 92% in the past three years.

In the project incubation link, the university jointly built a 12,000-square-meter innovation and entrepreneurship incubation base with the local government, equipped with modular laboratories, roadshow halls, and legal and financial consulting windows, forming a four-stage cultivation chain of "creative evaluation - prototype development - market verification - commercial landing". The base incubates more than 80 student projects annually.

Efficacy evaluation shows that after the implementation of this model, students' scientific research indicators such as academic paper publication and patent application have increased by 47% year-on-year, and the number of awards in business plan competitions has increased by 53%; the success rate of project incubation has jumped from 18% to 48%. Among them, 12 projects have obtained venture capital with a total financing of 23 million yuan, driving more than 300 employment positions, and 5 innovative achievements with social value have been formed in the fields of smart agriculture and environmental protection technology[15].

5. Conclusion and Outlook

Based on the perspective of dual-capability transmission, this study explores the path optimization and efficacy evaluation of college innovation and entrepreneurship education under the in-depth participatory tutorial system. The research shows that by optimizing the operation mechanism, improving the teacher-student matching method, optimizing the project incubation process and integrating resource integration strategies, the implementation effect of the in-depth participatory tutorial system can be effectively improved, and the collaborative transmission of dual capabilities can be promoted. The constructed multi-dimensional efficacy evaluation system can scientifically measure the actual effect of this model.

Future research can further expand the sample scope, conduct comparative analysis on the implementation of in-depth participatory tutorial system in different types of universities, and explore more targeted path optimization schemes. At the same time, with the development of information technology, research can be conducted on how to use big data, artificial intelligence and other technologies to improve the accuracy of teacher-student matching and the scientificity of efficacy evaluation, so as to promote the development of college innovation and entrepreneurship education to a higher quality level.

Disclosure statement

The author declares no conflict of interest.

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