

# Construction and Practice of Innovative Ability Training Mode of "Spiral Combination of Competitions and Courses, Deep Integration of Specialty and Creation"

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**Abstract.** In view of the current curriculum education, discipline competitions and innovation and entrepreneurship education, there are the following problems: old teaching content, low participation in discipline competitions, and the teaching reform of single course that is difficult to realize the comprehensive improvement of students' innovation ability in four years. This paper first proposes to establish a curriculum system of spiral combination of course groups and discipline competitions. Then it puts forward a training mode of deep integration of specialty and innovation ability and full penetration of innovation ability of "competition, research, patent and design". Finally, it suggests to build three platforms namely innovation and entrepreneurship activity support platform, interactive discussion platform between teachers and students, interdisciplinary team building platform to provide support for deep integration of professional education and innovation ability training. It forms a systematic theoretical basis, implementation path and reform effect, which has great guiding significance for the integration of course teaching and entrepreneurship and innovation education.

## 1. Introduction

UNESCO pointed out at the International Conference on Education for the 21st century that the youth in the 21st century should not only receive academic and vocational education in the traditional sense, but also have the "third education pass" that is the innovation and entrepreneurship education. Innovation and entrepreneurship education has become an important topic and general consensus of higher education in the world [1-3]. In China, in 2010, the Ministry of Education issued *the Opinions on Vigorously Promoting Innovation and Entrepreneurship Education in Colleges and Universities and College Students' Independent Entrepreneurship Work*. In September 2014, Premier Li Keqiang proposed "mass entrepreneurship and mass innovation" at Davos world economic forum, forming a new trend of "mass innovation" and "everyone innovation". In 2015, the State Council issued *the Opinions on Deepening Innovation and Entrepreneurship Education Reform in Colleges and Universities*. The implementation opinions of the reform show that entrepreneurship and innovation education is of strategic significance to enhance the driving force of our national development. The basic unit of training talents in colleges and universities is the specialty, and the core of the specialty is the curriculum construction [4-5]. It is of great significance to combine the discipline competitions with the course teaching, and to integrate the innovation education with the specialty education for the talents training in colleges and universities.

## 2. Problems faced and ideas proposed

### 2.1 Old teaching content

At the beginning of the implementation of this project, there are still some outstanding problems to be solved, mainly including the old teaching content of the course, the practice or experiment in a single course mainly for verification, the lack of practice and innovation ability integration training, and poor teaching quality. Most courses take teaching materials as the main teaching resources, which is difficult to adapt to the rapid development of professional technology. The teaching of a single

course is also difficult to achieve the goal of comprehensive ability training, and students' innovation awareness and innovation ability lack of cultivation.

## 2.2 Low participation in discipline competitions

The participation degree of discipline competitions is low, and the relevance degree of discipline competitions and professional course teaching is low. What's worse, the feedback classroom teaching is insufficient. Excellent students are selected to participate in the discipline competitions. However, the proportion of students participating in the competitions is relatively low. The design experience of the winning works is also difficult to give back to the classroom teaching. The degree of connection with the professional course teaching is low, and the works and resources cannot be integrated into the course teaching.

## 2.3 The teaching reform of single course is difficult to realize the comprehensive improvement of students' innovation ability in four years

Curriculum is the top priority of higher education. The "gold course" proposed by the state focuses on the teaching reform of single course, which has depth, difficulty and challenge. However, the single course is difficult to achieve the cultivation of students' comprehensive ability.

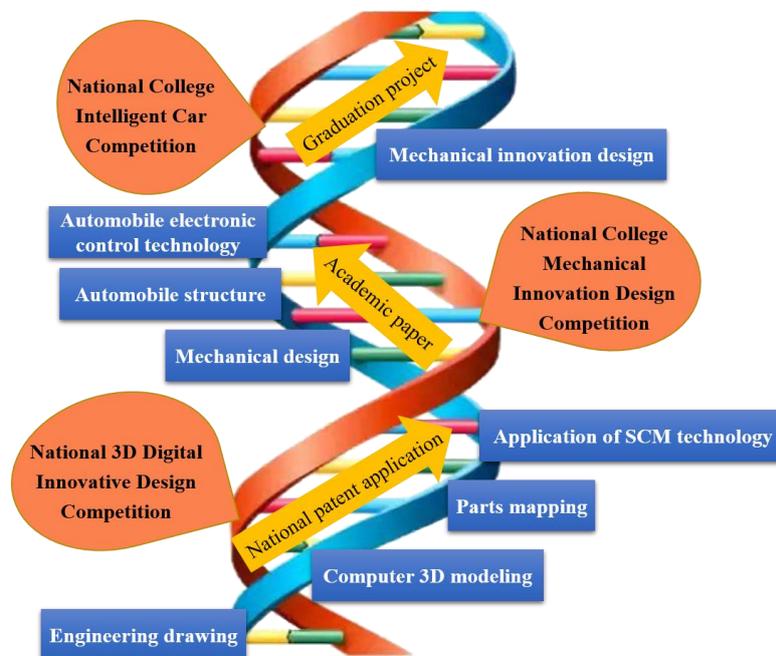


Fig. 1. Innovative ability training mode of "spiral combination of competitions and courses, deep integration of specialty and creation".

In view of the above problems, the team has focused on the interaction among discipline competitions, the effect improvement of course teaching and the improvement of talent training quality, and long-term research and practice in discipline competitions, course teaching reform, innovation ability training are carried out. Furthermore, the paper puts forward the education idea of the innovative ability training mode of "spiral combination of competitions and courses, deep integration of specialty and creation", as shown in Fig. 1. Taking the spiral combination of discipline competitions and course teaching as the starting point, the perfect leap of professional education and innovation ability training is formed. The curriculum system of spiral combination of course groups and discipline competitions is established. The training mode of deep integration of specialty and innovation ability and full penetration of innovation ability of "competition, research, patent and design" is put forward. Three platforms namely innovation and entrepreneurship activity support platform, interactive discussion platform between teachers and students, interdisciplinary team building platform are built to provide support for deep integration of professional education and innovation ability training.

### 3. Model construction and implementation

#### 3.1 Establishing a curriculum system of spiral combination of course groups and discipline competitions

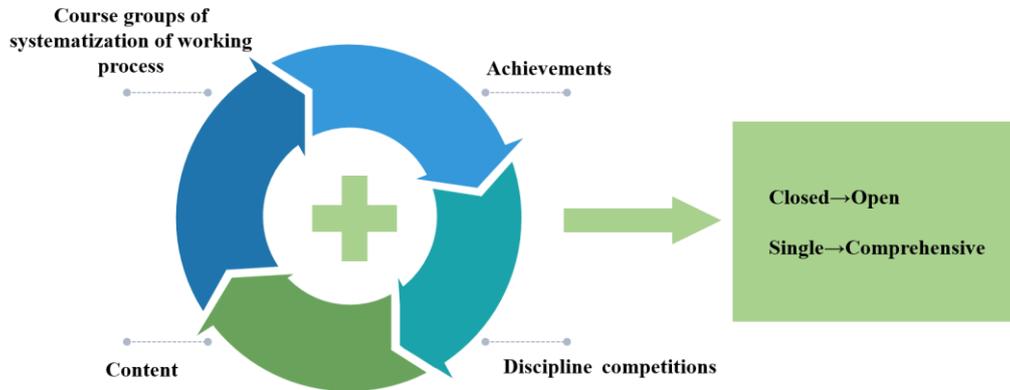


Fig. 2. Curriculum system of spiral combination of course groups and discipline competitions.

As shown in Fig. 2, the corresponding competition items in "Competition Evaluation and Management System in Colleges and Universities" are combined with course groups, and competition majors are combined with commonness, while courses are combined with competitions. Reshape the teaching content of the course oriented to the cultivation of innovation ability, and take the cultivation of the ability of "product innovation design" as the core, then carry out the course reconstruction and teaching design. Follow the principle of "system integration, comprehensive design of frontier technology, and gradual layering". By improving the innovative design ability from basic theory, engineering application, product design thinking and expression to innovative design to structural design, the innovative ability training is integrated into every link of teaching, which highlight the early, gradual and engineering nature of the innovation ability cultivation.

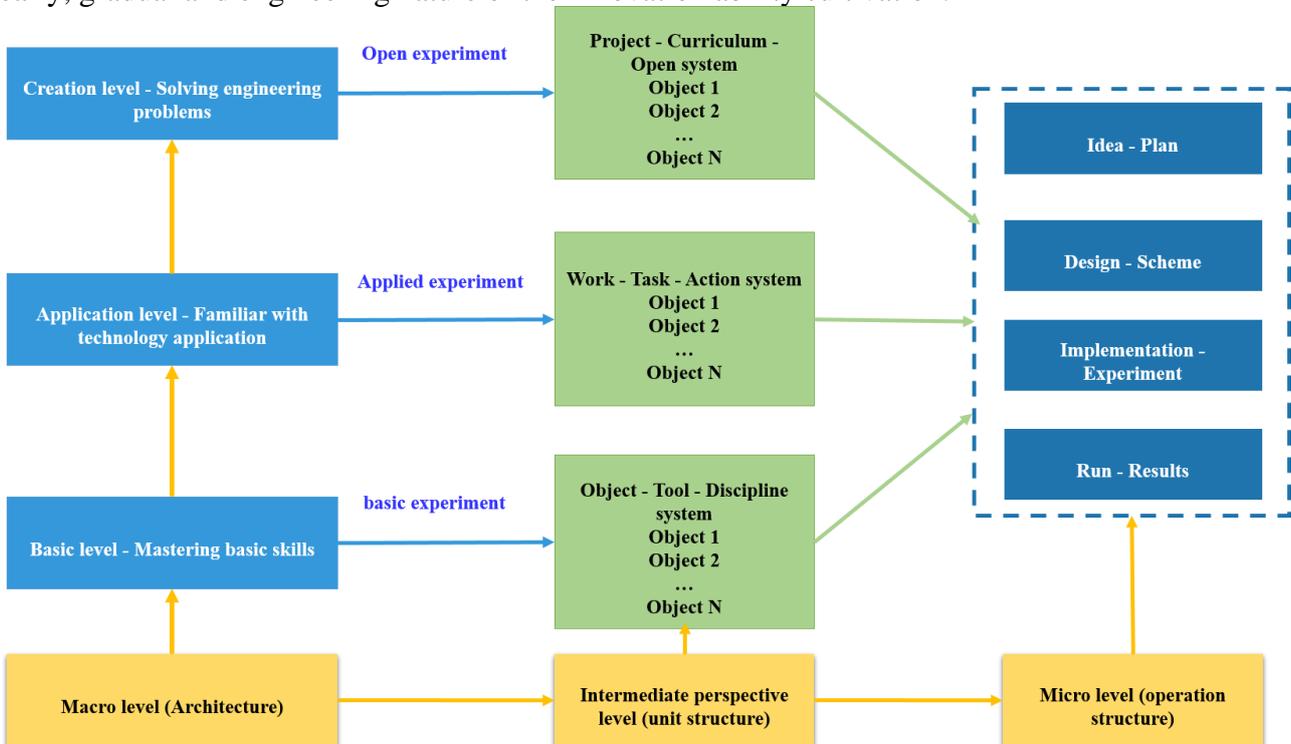


Fig. 3. Hierarchical applied experimental teaching content system.

As shown in Fig. 3, the experiment is separated from the theory course. Through integration, reorganization and innovation, the transformation from the traditional mode of experiment teaching subordinate to the theory teaching to the innovation mode of constructing relatively independent experiment course are realized. Establish a hierarchical framework of basic level of mastering basic skills, application level of familiar with technology application and creation level of solving

engineering problems [6], and combine it with discipline competitions and innovation training. Carry out experiment planning and design of basic experiment to applied experiment then to open experiment, and establish an applied experiment teaching content system from low level ability to high level ability.

### **3.2 Put forward the training mode of deep integration of specialty and innovation ability and full penetration of innovation ability of "competition, research, patent and design"**

Adhering to the concept of "education is based on educating people and students are the main body", our design is hierarchical, diversified, step-by-step and from shallow to deep, which can gradually improve the students' engineering practice ability. In the four-year study cycle of undergraduate course, the combination degree of discipline competitions and specialty, and the integration degree of discipline competitions and course teaching are improved to maximize the improvement of students' ability by the way of discipline competitions, "College Students' Innovation and Entrepreneurship" training project, national patent application, graduation project and academic paper to connect the whole process.

### **3.3 Build three platforms to support the deep integration of professional education and innovation ability training**

Innovation and entrepreneurship activities support platform: set up a support platform for innovation and entrepreneurship activities, providing policy consultation and other related services for students to carry out discipline competitions and innovation and entrepreneurship activities. Timely publicize all kinds of college students' competitions, and strive to make every student know the discipline competitions, then every student who has the intention to participate can learn the details of relevant discipline competitions.

Interactive discussion platform between teachers and students: build an interactive discussion platform between teachers and students to create an innovation environment and strengthen the interaction and communication between teachers and students, which not only points out the direction for students to participate in innovation and entrepreneurship activities, but also provides strong professional knowledge support, and increases their confidence and motivation.

Interdisciplinary team building platform: under the background of innovation driven, interdisciplinary cross fields is often the source of innovation. Build interdisciplinary team building platform, encourage students of all disciplines to cross fusion and join hands with each other, team members trust each other, fully mobilize the enthusiasm of each team member, play their strengths and tap their potential.

## **4. Summary**

This paper innovatively puts forward the education idea of "spiral combination of competitions and courses, deep integration of specialty and creation". It clarifies the specific implementation path and way of the spiral combination of discipline competitions and course teaching, and the deep integration of professional education and innovative education, and forms the integrated cluster of competition and course with the course groups formed by several courses and the corresponding events in the "Competition Evaluation and Management System in Colleges and Universities". Competition majors combine with commonness, while courses combine with competitions. It has formed the innovation ability realization path of "competition, research, patent and design" through the whole process. The combination degree of discipline competitions and specialty, and the integration degree of discipline competitions and course teaching are improved to maximize the improvement of students' ability by the way of discipline competitions, "College Students' Innovation and Entrepreneurship" training project, national patent application, graduation project and academic paper to connect the whole process. Three platforms namely innovation and entrepreneurship activity support platform, interactive discussion platform between teachers and students, interdisciplinary team building platform are built to provide support for deep integration of professional education and innovation ability training.

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