

# Thoughts on the preparation of mechanical innovation design competition in higher vocational colleges

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**Abstract:** *The mechanical innovation design competition is a national and comprehensive competition in which undergraduate and junior college students majoring in mechanical engineering widely participate. This paper discusses the relationship between mechanical innovation design competition and students' innovation education in detail, and expounds how to prepare for the competition in higher vocational colleges in combination with the characteristics of students in higher vocational colleges.*

**Keywords:** *Higher vocational colleges, mechanical innovation design competition, innovation education*

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## I. Introduction

The mechanical innovation design competition is a national and comprehensive competition for students majoring in mechanical engineering. Students' participation in the mechanical innovative design competition can improve their innovative design ability, comprehensive design ability and teamwork ability, improve their hands-on ability and engineering practice ability, and train their ability of innovative thinking, mechanical design and physical production according to actual needs. After years of development, more and more students from our college participated in this competition. Studying the relationship between mechanical innovation design competition and course teaching reform, and deeply guiding students to participate in mechanical innovation design competition can better cultivate compound technical and skilled talents to meet the requirements of the new era<sup>[1-2]</sup>.

## II. Relationship between mechanical innovation design competition and students' comprehensive ability

Mechanical major students mainly study mechanical design, mechanical drawing, mechanical processing and manufacturing, electromechanical control, equipment operation and maintenance, etc. After graduation, students mainly enter manufacturing enterprises to engage in research and development and operation and maintenance, so mechanical major is a highly applied major. Theoretically speaking, graduates from related majors should have very strong practical ability and comprehensive quality. However, at present, the mechanical education in application-oriented universities is seriously out of touch with the actual engineering education, and the theoretical knowledge that students learn in the classroom is quite different from the actual work. Students lack the ability to apply theoretical knowledge to solve practical problems, and students are seriously deficient in practical ability and independent innovation consciousness. There are many reasons for students' poor innovation consciousness and practical ability, both subjective and objective. With the rapid development of China's manufacturing industry, the demand for innovative and compound technical and technical talents is getting higher and higher. We urgently need to solve the problems existing in professional education and break the barrier between theoretical teaching and engineering practice<sup>[3-4]</sup>.

The mechanical innovation design competition closely follows the theme of the times, closely revolves around the forefront of manufacturing development, and insists on the characteristics of "physical participation, mechanical and electrical integration, systematic training, innovative application, and scientific and technological entrepreneurship", aiming at promoting the construction of innovative laboratories in colleges and universities, expanding the depth and breadth of practical teaching content, improving teachers' teaching and engineering practice ability, cultivating students' innovative spirit and practical ability, and improving school teaching level through competition. The mechanical innovation design competition requires students to design and produce physical works according to the theme notice issued by the main committee of the competition, and finally participate in the competition in the form of physical objects, and requires that the characteristics of the times such as intelligent control technology, digital technology or 5G+ communication technology should be integrated into the process of physical production. If students want to produce works that meet the requirements of the theme, they must not only have basic professional theoretical knowledge, but also have the ability of design, processing and manufacturing, and the knowledge of designing and producing works needs to be applied to many courses. The production of works needs to apply the theoretical knowledge of many courses, so that students can integrate

the theoretical knowledge of different courses and enhance their ability of knowledge transfer. Competition requires students to make physical objects, so it is not enough for students to know only theoretical knowledge. Students must also be required to link theory with practice, which can enhance their ability to integrate theory with practice. Students will encounter all kinds of complicated problems in the preparation process, and it takes countless discussions and attempts by the team to solve the problems, which can enhance students' ability of thinking, solving problems and teamwork. By participating in the competition, students' professional courses can be effectively promoted and their comprehensive ability can be improved. Higher vocational colleges should actively mobilize more students to participate in the mechanical innovation design competition.

### **III Analysis of existing problems**

#### **3.1 The enthusiasm for participating in the competition is not high**

Higher vocational colleges pay more attention to the cultivation of students' practical ability in course teaching, so there is a phenomenon that students only like practical work and don't like theoretical research. The mechanical innovation design competition is a comprehensive professional skill competition, which requires not only theoretical calculation and design, but also processing and manufacturing. Therefore, students in higher vocational colleges are embarrassed in the face of this kind of competition and have no confidence in themselves. Therefore, students' initiative to sign up for the competition is not high, and the number of students who take the initiative to sign up is large. It is often necessary to instruct teachers to mobilize many times to make up the number of students preparing for the competition. It takes about one year from the release of the competition theme to the actual participation in the mechanical innovation design competition, and the preparation period is long. At first, each group will be more passionate. However, as the preparation time becomes longer, many students begin to shrink back and choose to give up the competition, which requires the instructor to do the work repeatedly to persist.

#### **3.2 The initiative to solve problems is weak**

The preparation process of mechanical innovation design competition is mainly divided into four stages. First, the research on the theme of the competition, which requires students to carefully analyze the theme requirements and conceive the competition plan according to the theme requirements; Second, the design of theoretical model and three-dimensional model requires students to analyze the feasibility of the scheme from the perspective of theory and three-dimensional simulation; The third is processing and manufacturing, which requires students to choose suitable materials and various parts for processing and assembly; The fourth is equipment debugging and competition. At this stage, all the entries have been basically completed, and students need to debug their works to the best state and prepare for on-site expert defense. From the initial scheme design to the construction of three-dimensional simulation model, to the physical processing and actual competition, students will encounter all kinds of complicated problems. Due to the weak academic performance and learning ability of students in higher vocational colleges, most students are unwilling to take the initiative to study and think when they encounter problems. They always hope that other students in the group can solve them or guide teachers to guide them. Some groups even feel that they can't do it and choose to give up directly. In the process of preparing for the competition, the instructor needs to constantly check and supervise the progress of the students, and few students take the initiative to catch up with the teacher. Generally speaking, students in higher vocational colleges have weak learning ability and lack the enthusiasm to analyze and solve problems.

#### **3.3 Insufficient innovation platform and innovation funds**

Compared with most undergraduate colleges, higher vocational colleges generally have the problems of insufficient innovation platform and innovation funds for students. Although higher vocational colleges pay more attention to the cultivation of students' practical ability, there is a serious shortage of platforms for students to carry out innovative practice outside the classroom. Generally, schools only have traditional machine tools and ordinary 3D printing equipment, and few higher vocational colleges provide students with simple processing centers for preparing for the competition. The accuracy of parts processed by on-campus equipment is generally poor, so many parts need to be processed off-campus, which increases the processing time period and economic cost. Due to the shortage of funds that higher vocational colleges can support the competition, and few scientific research funds for instructors can be used to support students' competitions, the quality and accuracy of the entries in higher vocational colleges are generally poor. The mechanical innovation design competition is in kind, and the quality and accuracy will directly affect the score of the work, so the funding problem will also become a factor restricting the work to achieve good results.

#### **IV. Exploration on preparation for the match**

##### **4.1 Increase publicity and guidance to attract more students to participate in the competition**

Instructors should take the initiative to publicize and guide the mechanical innovation design competition, and use various ways and channels to carry out competition publicity. Introduce the related topics of the competition by using the entrance education for freshmen and the teaching of mechanical courses, so that more students can understand the content of the competition and encourage them to actively participate in the competition. Invite students who have participated in the competition and won prizes to share their experience of preparing for the competition and winning prizes, and analyze how they completed the production of the entries step by step, so as to build students' confidence in the competition. Set up a student club for mechanical innovation, organize members of the club to carry out club activities related to the competition, and let more students know the process of making mechanical innovation works in advance.

##### **4.2 Enhance students' innovative consciousness and teamwork ability**

The focus of the mechanical innovation design competition is to examine the innovation and practicality of the entries. In the process of completing the production of the entries, students need to constantly put forward ideas and ideas to solve problems. In the process of classroom teaching and daily guidance, Chinese medicine pays attention to cultivating students' independent thinking ability and innovative consciousness. When students encounter problems that need to be solved in the process of design and manufacture, as instructors, we should not directly tell students the solutions and ideas, but indirectly guide students to think for themselves, so as to cultivate students' independent thinking ability. The mechanical innovation design competition is a team competition, which takes a long time to prepare for the competition and requires a lot of work. The instructor must guide the students to do a good job in team building and division of labor. Most of the work cannot be done by the team leader or individual students in the group, but should be done according to the specialties of the members in the group.

##### **4.3 Strengthen competition guidance and eliminate students' dilemma**

Although all kinds of competitions take students as the main body to participate in the competition, most students rarely participate in the competition, so they lack experience in preparing for the competition. In addition, students in higher vocational colleges have poor initiative in learning, so the instructor must strengthen the guidance of students participating in the competition. Organize students' meetings every week, so that students can report on their preparations and hardships, and the instructor can put forward some practical suggestions according to everyone's preparations, so as to guide students to optimize and improve their own plans. It is really difficult and challenging for students in higher vocational colleges to design, process and manufacture a complete work by themselves. There are often students who want to give up when they are doing it, which will cause embarrassment. If the teacher doesn't guide the students when they have negative emotions, they may really give up the competition. Instructors should actively eliminate students' negative emotions and inform them that such a situation will exist in every competition, as long as the students who persist to the end have achieved good results; Guide students to increase their courage to face difficulties and bravely face difficulties in competition and life.

##### **4.4 Build an innovation platform and actively strive for competition funds.**

The cultivation of students' innovative consciousness and innovative ability is a step-by-step process. It is not enough to rely only on course teaching and guidance of instructors. We must build a platform for this kind of competition. It is necessary to provide students with a fixed innovation activity room for carrying out innovation activities and making works. The activity room is equipped with necessary equipment and tools, such as computers, 3D printers, simple processing equipment and various tools. In the innovation activity room, students need to be arranged on duty in turn, and all kinds of innovation activities should be carried out regularly to attract more freshmen to enter the activity room and learn about innovation competitions. If all kinds of competitions want to achieve better results, they must also have enough competition funds. Participating schools should take the initiative to set aside special funds for innovative competitions to support students' innovative training and the production of entries; At the same time, actively strive for all kinds of social funds to support students' innovative activities through various channels.

#### **V. Conclusion**

Although there are various difficulties and problems for students in higher vocational colleges to participate in the mechanical innovation design competition, I believe that all kinds of difficulties can be overcome with the active efforts of teachers and students. We should encourage and guide more students to participate in this comprehensive competition.

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