

Cultivation of students' innovative ability under the guidance of the spirit of socialist construction in the new era Teaching reform and practice

Xiaogao Yang¹, Deqiong Ding^{2*}

1. School of Mechanical Engineering, Hunan University of Arts and Sciences, Changde 415000, China;

2. Hunan University of Finance and Economics, Changsha 410000, China

Abstract: To educate people for the Party and the country, we should comprehensively improve the quality of independent training of talents, and strive to create top-notch innovative talents. How to train professional and technical talents with innovation ability for the country in the process of comprehensively building socialist modernization and the second centennial goal is an urgent problem to be solved. This paper analyzes the present situation of the course design of mechanical design, and reforms the task setting and the training of innovative thinking. Through case analysis, frustration training, current affairs and cutting-edge technology learning to explore. According to the characteristics of professional courses, the theme, practice stage and evaluation mechanism are set, in order to improve students' theoretical knowledge, cultivate innovative thinking and team spirit. The students' independent innovation ability, engineering consciousness and active practice ability have been significantly improved.

Key words: innovation ability; Process training; Teaching reform

Talent is the main body of scientific and technological innovation, and education is the mother of talent. Only by cultivating a steady stream of innovative talents can we support the building of a great modern socialist country. The essence of talents is to provide high-quality human resources for modernization, and this is especially true of scientific and technological talents. To support China's scientific and technological innovation, we must have a large and well-structured team of scientific and technological talents, ranging from scientific masters to applied talents. The course design of mechanical design is an important position for "Made in China 2025" to train innovative technical talents. The traditional training mode of curriculum design talents can not meet the needs of the modernization construction talents for the cultivation of students' innovative ability and application ability. For this reason, the domestic experts and professors of mechanical major carry out teaching reform and exploration around the course design of mechanical design.

In this paper, the teaching method of multi-concept integration is used to reform the course design of mechanical design, so as to cultivate students' independent innovation ability, enhance their engineering consciousness and active practice ability. It is helpful to improve the teaching quality of mechanical design course design, and train more mechanical engineers with innovative ability for the society.

I. The current situation and existing problems in the learning process of mechanical design course

In the traditional mechanical design course, students often just passively accept the knowledge explained by the teacher, lack of initiative and creativity. In the course design process, the emphasis is placed on the teaching of theoretical knowledge, while the cultivation of students' practical ability is ignored. In addition, the curriculum lacks flexibility and practicability to meet the problems that may be faced in practical engineering. In addition, the course design is often stuck in the operation of "spelling", that is, the design of parts must be completed first, and then the final assembly design. This practice makes students lack of understanding of the overall design process, leading to their inability to connect the parts with the overall structure, thus affecting the cultivation of innovation ability. In addition, in the traditional design of the course, students' requirements for innovation are often ignored, resulting in a lack of innovation awareness and practical ability, which limits their future work development.

Therefore, in order to train a group of excellent mechanical design talents with innovative consciousness, practical ability and problem solving ability, it is imperative to reform the design teaching of mechanical design course.

1. The teaching problems of mechanical design course

The course design of mechanical design is an important link to cultivate the practical innovation ability of students majoring in mechanical design. However, there are some problems in the course design of mechanical design at present. For example, classroom teaching methods, assessment methods, practice links and so on need to be improved. In addition, the training of students' independent thinking and innovation ability is insufficient in the course of Mechanical Design, which makes most students only good at "talking on paper", but poor in solving practical problems and innovation ability. Under the current background of "Made in China 2025", the state vigorously promotes the innovation activities of core technologies, and pays attention to the cultivation of college students' innovative ideas and innovative abilities. Therefore, it is necessary to take students' innovation ability as the guidance and put forward targeted teaching reforms to improve the teaching quality of mechanical design course design and strengthen the cultivation of students' innovation ability, so as to provide guarantee for training qualified engineers.

2. Problems existing in traditional mechanical design courses

With the rapid development of society, the traditional mechanical design course has gradually fallen behind. First of all, the traditional mechanical design course attaches importance to theory but neglects practice, and neglects students' practical operation ability. Secondly,

the teaching design is not close to the practical application, lack of novelty and innovation. Thirdly, the traditional teaching method is monotonous and inflexible, and the teaching content lacks flexibility and interaction. Finally, the traditional mechanical design teaching is difficult to stimulate students' interest in learning, resulting in students losing interest in mechanical design courses.

II. Mechanical design course design teaching reform

In order to better adapt to the requirements of talent training in modern society, achieve all-round training of students and enhance their practical innovation ability. It is necessary to actively explore the setting of design tasks, training of new thinking, case analysis, evaluation and feedback, so as to enhance students' practical ability and innovation ability. The teaching methods of the curriculum should be more flexible and diversified to fully mobilize students' learning enthusiasm; Make the mechanical design course more close to the practical application, pay attention to training students' practical ability and innovation consciousness, in order to meet the needs of practical application; At the same time, it is necessary to use modern information technology means, such as intelligent simulation software and virtual experiment platform, to provide technical support for mechanical design teaching reform.

1. Setting and requirements of design tasks

In order to better cultivate students' innovative ability, the principle of "simple and practical" is adopted in the setting of design tasks to ensure that students can get practical exercise and improvement in the course design. Specifically, from the selection of topics, defining task objectives, demand analysis and other aspects, as far as possible to ensure the practicability and feasibility of the design task. At the same time, pay attention to the guidance and supervision of the whole process of students, through the formation of student groups, course progress tracking, etc., to ensure that students have the ability to independently complete the actual mechanical design tasks.

In the design process of innovative thinking training, including but not limited to stimulate students' interest, cultivate students' initiative, encourage students to put forward new ideas and so on. In addition, it also pays attention to let students understand some innovative ideas and methods in actual mechanical design through case analysis and other ways, so as to promote students' innovative ability in the design process.

2. Innovative thinking training in the design process

In the course design of mechanical design, the training of innovative thinking is a very important link. By guiding students to use innovative ideas, the training of innovative thinking in the design process can be carried out more effectively. First of all, the setting and requirements of design tasks should take into account the space of students' independent thinking and innovation. For example, in a mechanical design task, a theme or design requirement should be given, but at the same time, students should be allowed to freely play under this theme or requirement and put forward their own innovative ideas. This kind of open design task can stimulate students' creative thinking ability. Secondly, during the design process, students should be guided to divergent thinking and try to consider problems from different angles. When students are designing mechanical principles, they are guided to break through traditional thinking and try to adopt new ways of thinking, so as to provide more reasonable and perfect schemes. Through these methods, students' innovative thinking ability can be better cultivated and a solid foundation for their future career can be laid.

3. Mechanical design course design teaching reform implementation plan

In the course design teaching reform practice, nine themes are set to help agriculture, convenient life, happy travel, smart home, green environment, healthy diet, cherish life, beautiful home, and self-selected topics. By inspiring students' innovative thinking, students' innovative ability is given full play to the design of new devices and new equipment, and students' practical operation ability is cultivated through modeling and material production. The practical case analysis of this teaching method is as follows:

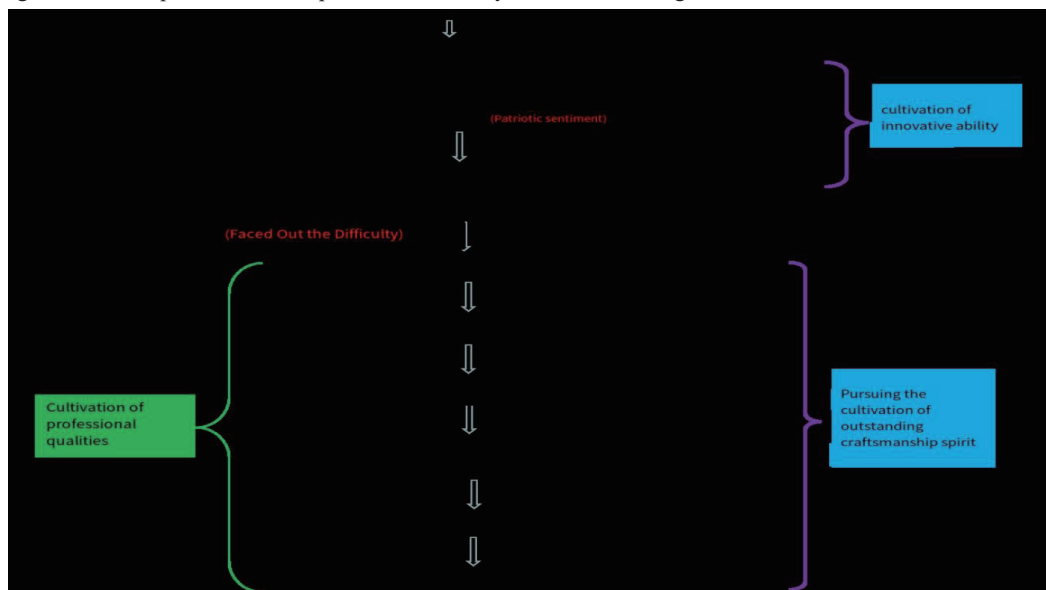


Figure 1. Program design of students' innovative ability cultivation under the guidance of "Twenty Great Spirits"

First, students are prepared with novel and interesting design tasks, and specific task requirements are set. By guiding and inspiring the students, students are encouraged to keep exploring and practicing, and their innovative thinking is stimulated. These design tasks require students to make use of what they have learned, give full play to their creativity and imagination, give full play to their innovation ability and practical operation ability, and experience the charm of mechanical design practice. Secondly, emphasis should be placed on cultivating students' innovative thinking ability in the design process. Through the introduction of knowledge point exploration and discussion, students are encouraged to study and think independently, dig deep into the core ideas and methods of mechanical design, and exercise students' logical thinking and analytical ability. In addition, through the operational training of practical projects, students' cognition and understanding of mechanical design are constantly improved, and their practical research ability and hands-on operation ability are also promoted. Finally, the node comments and stage supervision are combined to pay attention to the effectiveness and guidance. Through the evaluation of students' practical results, academic level, innovation ability and other aspects, the teaching reform is summarized and reflected. At the same time, according to the evaluation results, strategic adjustments were made in time, which promoted the teaching reform to achieve more excellent results. Through targeted improvement, students can also obtain more comprehensive knowledge and skills improvement in the course design teaching activities, and realize the effective achievement of teaching objectives.

Through the above reform exploration, in addition to the improvement of professional and technical level has achieved remarkable results, more importantly, it has stimulated students' innovative thinking, improved students' practical ability, and promoted the realization of students' all-round development goals. This also provides valuable experience and reference for the future teaching reform.

III. Effect evaluation and reflection

Through the teaching experiment, the improvement of students' innovative ability and practical ability has a significant promoting effect. First of all, through the cultivation of students' innovation ability, it is found that students' innovation consciousness and innovation ability have been comprehensively improved. In the design process, students can think more actively and put forward more novel and reasonable innovative schemes. In the design of this course, students tried many novel ideas involving mechanical design and engineering technology, and solved some traditional mechanical design problems. These more innovative design schemes not only bring new ideas to the course design, but also can better apply the learned knowledge to practice. Secondly, through the practice process of this course design, students' practical ability has been significantly improved. In the specific course design process, students need to combine the completed design accessories through practical operation, and test and modify them. In this process, students actively completed the relevant work, more familiar with the practical mechanical design and engineering application of the relevant knowledge. Through nearly 6 years of training, students have obtained 16 utility model patents, 7 invention patents, published papers and approved provincial innovation and entrepreneurship projects reached 12 and 8 respectively. This shows that the reform and exploration of mechanical design course design is effective, and students' independent innovation ability, engineering consciousness and active practice ability have been cultivated.

Reference

- [1] Heping Xu. Promoting the "Trinity" high-quality Coordinated development of education, science and technology and talents in the New era -- Building a new understanding of the strategy of strengthening China with talents and supporting Chinese-style modernization [J]. Journal of Technical Economics, 2023,42(1):1-13.
- [2] Xuan Li. Research and Practice on Teaching Reform of "Mechanical Design" Course Design [J]. Education and Teaching Forum,2022,3(10): 63-66.
- [3] Hongyan Li. Talent Training Strategy under the Reform of "Mechanical Design" Curriculum Design Teaching [J]. Communication and Discussion,2022,271:151-153.
- [4] Zhicheng Huang, Jinbo Pan, Xingguo Wang. Course design of "Mechanical Principles" and "Mechanical Design" under the background of engineering certification Research on Teaching reform [J]. Science and Technology and Innovation, 2019,23:46-50.
- [5] Curriculum design teaching Reform of "Mechanical Principle" and "Mechanical Design" Based on Professional Certification of Engineering Education [J]. Science and Technology and Innovation, 2019,24:97-101.

About Author: Yang Xiaogao (1977,7), male, Han nationality, PhD, Associate professor, research direction: Mechanical Engineering.

Corresponding author: Deqiong Ding

Fund Project: 1. Innovation Ideological and Political Teaching Reform and Practice of Mechanical Design Course Design under the background of New Engineering (No. : HNJG-2021-0824; JGZD2122).

2. Teaching Reform Research and practice of integrating statistics courses into Innovation and entrepreneurship training under the background of "Internet +" (No. : HNJG-2022-1235).

3. National College Students' Innovation and Entrepreneurship Training Program project: Research on dual-nozzle 3D printer (No. : 201810549004).