Curriculum Design of Mechanical Design Foundation Course for Mechanical Engineering Major in Military Academy

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Abstract. Mechanical design foundation is a main, compulsory and closed-book-examination course for mechanical engineering major in some military academies in China. In this paper, a curriculum design of mechanical design foundation course for mechanical engineering major in military academy is proposed. The teaching contents and teaching objects as well as teaching modes of the mechanical design foundation course for mechanical engineering major in military academy are analyzed in order to improve the teaching quality. The new curriculum design would help to promote military students' learning enthusiasm and initiative effectively and improves the teaching effect of mechanical design foundation course.

Keywords: Engineering mechanics course; curriculum design; military academy.

1. Introduction

The mission of the military academy is "to educate and train the corps of military students so that each graduate shall have the attributes essential to professional growth throughout a career as an officer of the regular army and to inspire each to a lifetime of service to the nation."[1] In order to accomplish this mission, a series of systematic courses for different majors are established to ensure that military students receive professional education in the military academy. The course of mechanical design foundation is an important technical basic course for military students majoring in mechanical engineering in military academy.

Mechanical design foundation is a main, compulsory and closed-book-examination course for mechanical engineering major and equipment management and support major in some military academies in China which is an important turning point from science and culture courses and major background courses to job training courses.

By learning this course, the military students could master the working principle, motion and dynamic characteristics of common mechanisms as well as basic knowledge of selection and design of general parts, having abilities to analyze the structure and working principle of general machines and to identify and solve complex engineering problems in mechanical design, so as to lay a solid theoretical foundation for the learning of the subsequent job training courses [2-6].

2. Teaching Content

The total class hours of mechanical design foundation increase continually by the revision and improvement of curriculum outline since 2014. The total class hours of the course are 72 hours at present. The class hours of theoretical part of the course are 64 hours, and the class hours of practice are 8 hours. The change of the total class hours of mechanical design foundation is shown in Fig. 1.

As shown in Fig. 2, mechanical design foundation course contains two knowledge modules. One module is the mechanical principle module which mainly explains the composition of machinery, the degree of freedom of plane mechanism, plane linkage mechanism, cam mechanism, gear mechanism and gear train. Another module is mechanical design module which mainly explains

gear transmission, worm transmission, belt transmission, thread connection and shaft system. In addition, mechanical design foundation course also includes cognitive and exploratory practice based upon the theoretical knowledge.

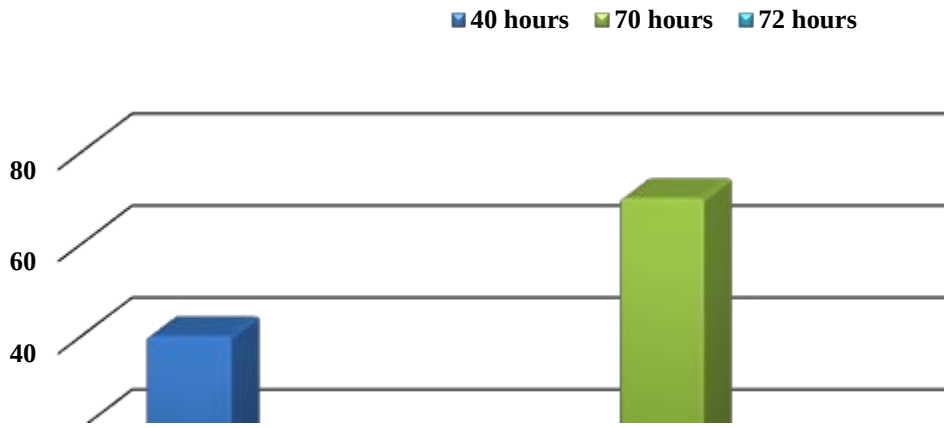

Fig. 1 The change of the total class hours of mechanical design foundation course

In the specific learning process, there is significant difference between the military students' mastery of relevant basic knowledge and their perceptual understanding of machinery. There are many textbook chapters, scattered knowledge points and complicated calculation formulas involved in this course. Therefore, the military students are unable to summarize the key points of the course independently. They also lack the ability to logically integrate and understand the key knowledge points, which leads to a vicious cycle of missing and confusion in the learning process step by step. The frustration makes the military students lose their enthusiasm and interest in learning this course.

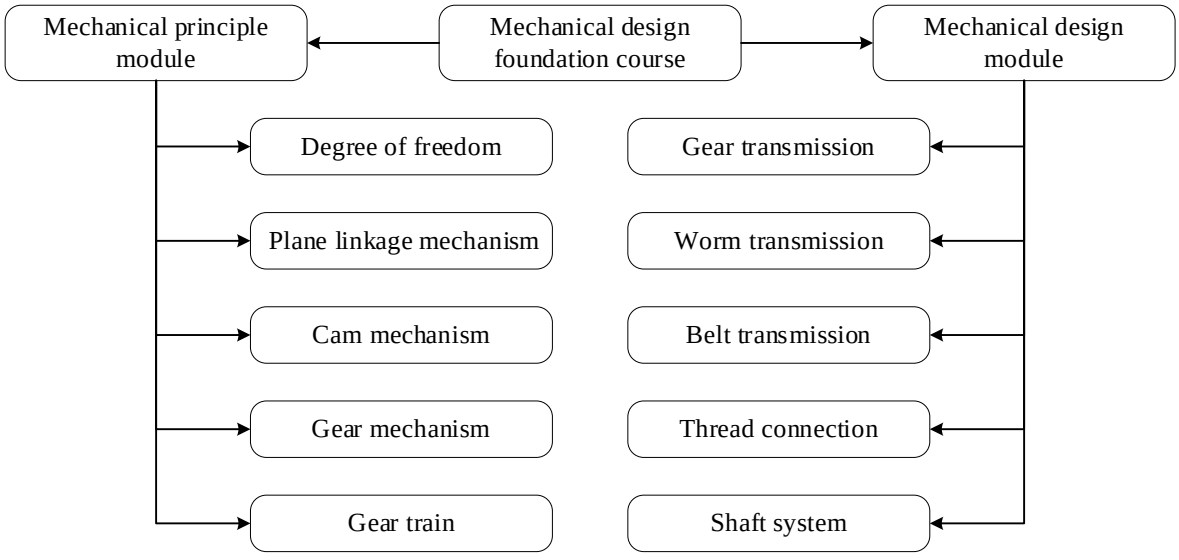

Fig. 2 The mechanical principle module and the mechanical design module

3. Teaching Objects

On the basis of characteristics of the military students, the sources of military students and their learning conditions are statistically analyzed and shown in Fig. 3. According to the statistics of the sources of military students and the analysis of their learning condition, the military students mainly consist of two parts: candidates from the college entrance examination and selected soldiers, with a relatively balanced distribution in each class. However, we can also see the learning distinction between the two parts military students which originate from their education levels and working experiences. In view of the above analysis, we must start from the characteristics of the source of

military students, and then formulate the targeted teaching plan respectively which is appropriate to different teaching objects, so as to achieve the purpose of teaching students according to their aptitude. A more detailed analysis of the military students from two different sources are as follows.

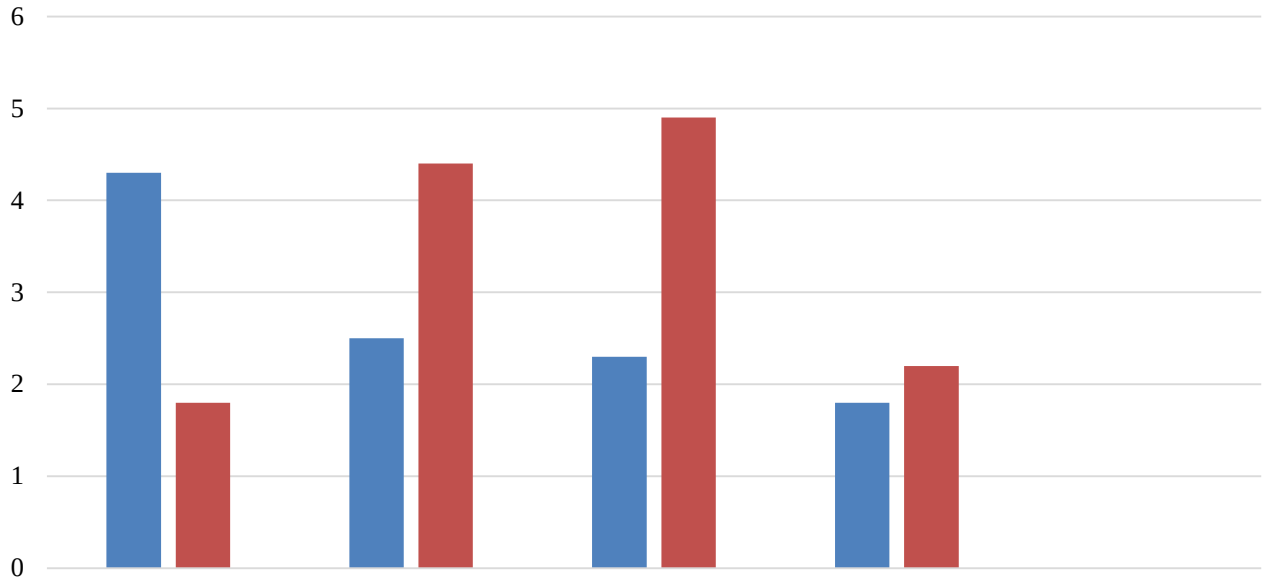

Fig. 3 Source of teaching objects and analysis of learning situation

The military students who are candidate from college entrance examination, have been admitted to military academy through the National unified examination of college enrollment. They are characterized by active thinking, solid foundation and strong self-learning ability. But they have not been engaged in practical work ever, so they lack relevant practical operation ability.

The military students who are selected soldiers have gained rich experience at the grassroots level through the experience of military life. They have some understanding of the concepts of parts and components involved in this course. In addition, they attach great importance to the learning opportunities of the military academy with a serious learning attitude and good discipline. However, their relevant knowledge base is relatively weak due to the gap period occurred in the learning process.

Based on the above analysis results, the teaching plan is formulated respectively for the major taught in mechanical design foundations course. For command majors in the military academy, such military students belong to engineering command category, so the teaching content emphasis should focus on engineering practice and application. They should focus on solving the problem of "how to do". As for the management major of the military academy, such military students belong to the management and technology job positions, so they should focus on theoretical methods and solve the problem of "why to do" in the teaching process.

4. Teaching Mode

Due to the objective constraints of the resource conditions such as faculty strength, class schedule and practice environment in the current teaching process, the teaching mode adopted by the course still mainly focuses on the teachers' subjectively lecture and the students' passive acceptance. The basic outstanding issues are as follows.

First of all, traditional teaching mode focuses on the "cramming" of book knowledge, but ignores the construction of students' knowledge system and the guidance of improving their comprehensive knowledge application ability. Secondly, the link between theoretical knowledge learning and practical application of the course is deficient. Thirdly, the cultivation of students' innovative consciousness and ability still needs to be improved. Finally, the specific teaching methods is lack of diversity, and the application of situational learning mode is insufficient. At

present, the traditional teaching methods are mainly multimedia assisted classroom teaching, the efficiency and convenience advantages of network information technology in differentiated learning, inquiry learning and group cooperative learning are not given full play. Therefore, it is still valuable to develop and apply digital information technology to improve teaching quality.

5. Summary

According to the characteristics of mechanical design foundation course in the mechanical engineering major of military academy, this paper puts forward a curriculum design for analyze the teaching contents and teaching objects as well as teaching modes in order to improve the teaching quality. In the future, we will continue to further explore and analyze the needs of troop talents, carry out dynamic updates, and cultivate practical technical personnel who meets the troop needs.

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