ISSN 2522-6398 Vol. 5, Issue 21: 22-26, DOI: 10.25236/FER.2022.052105

Exploration on Teaching Reform of Engineering Mechanics for Application-oriented Undergraduate Based on Information Teaching

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Abstract: *The information technology environment provides us with virtual teaching in virtual classrooms and virtual experiments in virtual experimental laboratories. Making use of information technology to innovate teaching mode and method is an important way to accelerate the deep integration of information technology and education and teaching. According to the teaching characteristics of applied undergraduate colleges, this paper analyzes the necessity of teaching reform of theoretical mechanics course, and probes into the necessity of teaching reform of theoretical mechanics course and its application in teaching practice from three aspects: teaching content, teaching method and examination system. Through the course teaching reform, students' learning enthusiasm has been greatly improved, and their practical ability and innovative ability have been strengthened.*

Keywords: *Informational teaching, Applied undergraduate, Engineering Mechanics, Teaching reform*

1. Introduction

Engineering Mechanics is an important basic course of vehicle engineering major, which plays a bridge role in the following professional courses. In the teaching reform of contemporary universities, the traditional teaching characterized by imparting knowledge is changing to the applied teaching characterized by cultivating students' engineering practice and application ability. In application-oriented undergraduate colleges, mechanics, the basic course of civil engineering, is difficult for students to master and understand in the teaching process because of its complex theory, many formulas and abstract concepts [1-2]. In order to improve this situation, improve the teaching quality and cultivate students' learning enthusiasm and technical application ability, it is the focus of the teaching reform of Engineering Mechanics.

2. The significance of the teaching reform of Engineering Mechanics for applied undergraduate students

Mechanics is a professional basic course for engineering majors in universities, and it is the bridge and link for students to change from basic theoretical study to professional study. Its purpose is to make students familiar with and master mechanical analysis methods of mechanical motion in design through the study of this course, and theoretical mechanics knowledge is the foundation of follow-up courses [3]. Considering the continuity of the course and the needs of students for postgraduate entrance examination, the teaching content is basically the same as before the reduction. Therefore, how to achieve good teaching effect while simplifying class hours has become the primary task of the course reform of Engineering Mechanics in application-oriented undergraduate colleges.

How to adjust the talent training plan and teaching plan in applied undergraduate colleges, increase the practical teaching hours of mechanics courses, and make students understand and master the corresponding theoretical knowledge points is the key to improve applied undergraduate education, and cultivate high-quality professional talents with rich knowledge, strong hands-on ability and excellent skills for the society.

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3. Teaching status of Engineering Mechanics

3.1 The teaching content is unreasonable

Engineering Mechanics is a highly theoretical course with a large number of formulas, concepts and derivations. Its content is abstract and complex, and it needs a good foundation in mathematics and mechanics, so it is difficult for students to learn. There is a lack of training of excellent examples in the classroom, and students are not deeply impressed with the application of knowledge points after the course ends [4]. Too much emphasis on discipline in teaching content and outdated teaching methods, coupled with students' lack of initiative and enthusiasm, increase students' difficulties in accepting and digesting mechanics knowledge, and can't leave enough thinking space for students.

The arrangement of experimental class hours and theoretical class hours in some college courses is unreasonable, and the theoretical knowledge is out of touch with experimental practice, which is not conducive to students' direct digestion of theoretical knowledge. Because the course is theoretical and has many knowledge points, and the final exam requires the examination paper to basically cover all the knowledge points of the course, in order to ensure the learning effect of theoretical knowledge in the limited learning time, it is necessary to compress the practical teaching hours, which cannot meet the requirements of talent training in application-oriented undergraduate colleges.

3.2 Backward teaching methods

As far as applied undergraduate education is concerned, its talent training standard is defined as: training high-tech applied professionals who meet the needs of the front line of production, construction, management and service, and have all-round development in morality, intelligence, physique and aesthetics. It is far from enough to train talents of this specification only by theoretical courses. Using multimedia courseware can expand the amount of classroom information, improve students' learning interest and learning effect, while writing on the blackboard can help students sort out the context of knowledge points and deeply understand and memorize classroom knowledge [5-6]. Engineering Mechanics is closely related to engineering practice. It is the direct purpose of this course to train students to apply the theoretical knowledge of Engineering Mechanics to engineering practice. Therefore, new teaching methods should be actively sought to train students' knowledge application ability and innovation ability.

4. Exploration on information teaching reform of Engineering Mechanics

Informatization teaching is based on information network, with information resources as the core, the design of teaching process and the utilization of learning resources as the characteristics, the aim of training informatization talents, and the guarantee of information technology industry and informatization policies, regulations and standards, so as to meet the basic requirements of education in the information age.

4.1 Promote the innovation of teaching methods

With the rapid development of information technology, great changes have taken place in teaching methods. The information technology environment provides us with virtual teaching in virtual classrooms and virtual experiments in virtual experimental laboratories.

Virtual classroom refers to the learning environment constructed by multimedia communication technology on the computer network, which allows teachers and students in different places to hear and see each other. Not only can real-time communication function be used to realize most of the teaching activities in traditional physics classrooms, but also asynchronous communication function can be used to realize unprecedented teaching activities, such as asynchronous tutoring and asynchronous discussion.

Virtual experiment generally refers to using some information technology means to imitate some virtual experimental scene. We use it as a bridge to overcome the limitations of natural conditions such as resources, time, manpower, etc., and connect the practical experience occurring in the real world with the imaginary space, so as to increase our cognitive experience and expand our understanding of the world. In addition to teaching, teachers and students can also use the network to instantly obtain relevant reference materials while learning online, which enhances their learning interest and effect.

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In the teaching process, classroom teaching is a major organizational form, so it is particularly important to create an equal, democratic and tolerant classroom atmosphere. In the teaching process, it is necessary to strengthen students' engineering concepts, and integrate basic theoretical knowledge, quality education and ability cultivation by widely connecting with practice, so that students can realize the important role of Engineering Mechanics in practical engineering through study [7].

The author thinks that the experiment before the theoretical explanation should take the form of demonstration, with teachers demonstrating and students observing as the main methods. After learning the theoretical knowledge, students have a certain understanding of the knowledge, and they are required to design or verify experiments by themselves. In the experiments, they review and consolidate the knowledge they have already learned, find new problems, and achieve the purpose of teaching without teaching. So as to lose interest in this knowledge point, the next experiment is just to cope with it. First, do experiments, give students an intuitive concept, arouse students' interest in what they have learned, arouse their enthusiasm for self-study, and then talk about theories that students can easily accept. Then, experiments can play a role.

4.2 Optimize teaching content

For application-oriented undergraduate colleges, the teaching goal of theoretical mechanics is not only to enable students to master basic theoretical knowledge, but more importantly, to combine the theoretical knowledge they have learned with engineering practice to solve practical problems in real life. For example, combining the content of the follow-up courses, selecting appropriate practical engineering problems, simplifying engineering cases into examples with moderate difficulty, and completing the introduction and application of basic theories through the reverse thinking and analysis of examples. Teachers need to spend more time and energy on curriculum planning and lesson plan writing. Of course, in this process, teachers' comprehensive ability has also been well trained. The process of optimizing teaching content is shown in Figure 1:

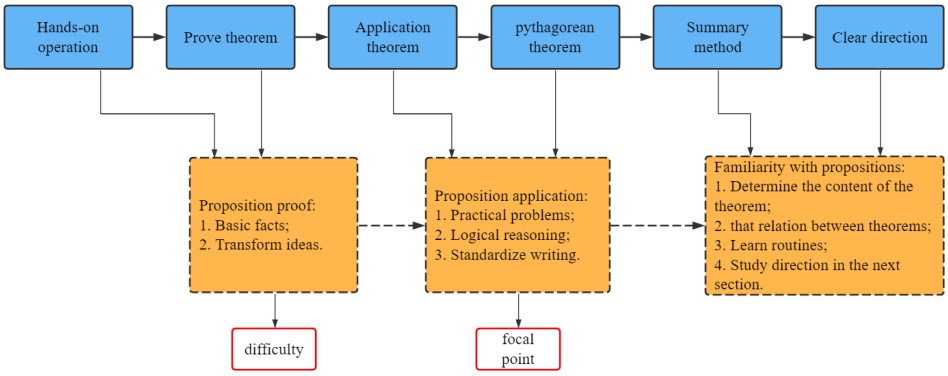

Figure 1: Optimize the process of teaching content

Application-oriented, promoting the balance and popularization of educational informatization. Explore the application of micro-courses in blended learning. Pay attention to the organic mixing of the elements (learning situation, learning strategies, learning methods, etc.) of micro-course and blended learning, improve the pertinence of micro-course content, and realize the optimization of teaching and learning effect. Innovate classroom teaching forms, reverse classroom teaching links, and realize that knowledge is taught outside class and knowledge is internalized in class.

Integrate basic curriculum resources, provide high-quality digital education resources and software tools, build online education platform, set up curriculum teaching resource database and curriculum website, and cooperate and exchange with other universities and enterprises to realize the sharing of high-quality teaching resources [8]. Combining modern multimedia teaching methods and adopting various teaching methods can make theoretical teaching lively and interesting, make students feel more involved in the classroom, become the main body of the classroom, and improve students' learning initiative.

4.3 Reform and improve the assessment system

Information-based teaching evaluation is based on students' performance and process, with the aim of focusing on the cultivation of information literacy, knowledge ability and innovation ability. The

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evaluation standard is based on the joint compilation of students and teachers according to practical problems and previous experience, and the standard is not fixed. Students can learn about their learning situation through evaluation and adjust their learning methods in time. Teachers and students participate in teaching evaluation together, and the teaching level and learning ability are improved [9]. This paper makes a process assessment of the course of Engineering Mechanics to highlight the characteristics of paying equal attention to theory and practice. The assessment should ensure that students' mastery of all the important and difficult knowledge of the course can be checked, and this goal can be achieved with the help of information-based teaching methods. The evaluation and analysis model is shown in Figure 2:

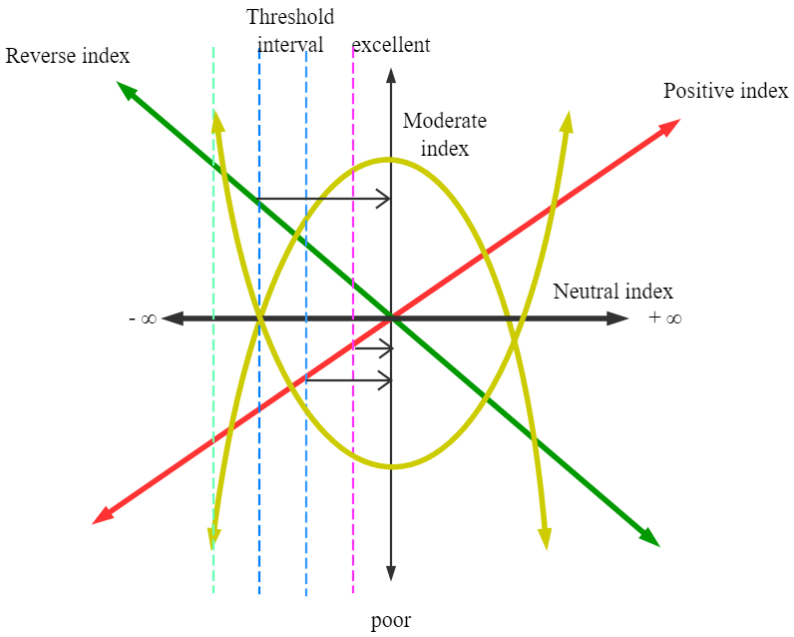

Figure 2: Index analysis model

Diagnose, intervene and predict the learning situation by relying on big data learning analysis; The implementation of online micro-certification of academic qualifications such as digital badges and the development of flexible learning evaluation at different levels make massive open online course more in line with the informal learning needs of lifelong learners in the online learning environment. Accurately predict students' learning difficulties and recommend targeted learning paths [10]. From the perspective of information-based teaching, learning analysis has the characteristics of rich learning data, diverse analysis dimensions and real-time dynamic intervention, which strongly promotes the accurate learning supported by big data.

In order to enable students to better combine theoretical mechanics knowledge with daily life and practical engineering problems, they should hand it in in in the form of homework. All the examination questions handed in by students must include the title, standard answers and the reasons for the questions. Finally, some of these questions can be selected as final questions to encourage students' enthusiasm. Through a semester's trial, this multi-form examination method has greatly mobilized students' enthusiasm and initiative in learning, avoided all kinds of drawbacks of traditional examinations, and made students realize the importance of theoretical mechanics courses.

5. Conclusions

Informatization teaching is based on information network, with information resources as the core, the design of teaching process and the utilization of learning resources as the characteristics, the aim of training informatization talents, and the guarantee of information technology industry and informatization policies, regulations and standards, so as to meet the basic requirements of education in the information age. In the teaching reform of contemporary universities, the traditional teaching characterized by imparting knowledge is changing to the applied teaching characterized by cultivating students' engineering practice and application ability. Using information technology to innovate teaching mode and method is the eternal theme of educational reform and development, and the continuous development of information technology will promote the innovation of teaching mode and method. Reform is necessary and necessary. In the future teaching process, we will continue to explore, learn and

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learn from the advanced experience of theoretical mechanics curriculum reform at home and abroad, and finally achieve the goal of engineering quality education by combining the training objectives of applied talents in our school.

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