Research on Teaching Reform of Material Mechanics

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Abstract

Material mechanics is a basic discipline developed gradually on the basis of social practice. Its development and perfection promote the progress of science, technology and society. Material mechanics is an important basic course for engineering specialty, and it is also a subject to study the strength, stiffness and stability of Engineering components. The course is characterized by rigorous theory, complete system and strong logic. It requires students to master basic concepts and methods, and have the ability to analyze, research and solve practical engineering problems with mechanical knowledge. But in the course of material mechanics teaching in peacetime, it is found that some students are tired of learning and idling away. The phenomenon of plagiarizing homework and reviewing suddenly at the end of exam is serious. Therefore, students do not have a thorough understanding of the basic knowledge points of the course. The main reason is that the teaching methods are inappropriate and the students are right to the material. Lack of interest in material mechanics. This paper mainly focuses on how to improve students'interest in learning material mechanics and studies the teaching reform methods of material mechanics.

Keywords

Material mechanics, Teaching Reform, assessment model.

1. Introduction

With the rapid development of modern science and technology, material mechanics has many applications in mechanical, civil, hydraulic engineering, aerospace and other important projects. Mechanics is a basic discipline developed gradually on the basis of social practice. Its development and perfection promote the progress of science, technology and society. Material mechanics is an important basic course for engineering specialty, and it is also a subject to study the strength, stiffness and stability of Engineering components. The course is characterized by rigorous theory, complete system and strong logic. It requires students to master basic concepts and methods, and have the ability to analyze, research and solve practical engineering problems with mechanical knowledge. But in the course of material mechanics teaching in peacetime, it is found that some students are tired of learning and idling away. The phenomenon of plagiarizing homework and reviewing suddenly at the end of exam is serious. Therefore, students do not have a thorough understanding of the basic knowledge points of the course. The main reason is that the teaching methods are inappropriate and the students are right to the material. Lack of interest in material mechanics. This paper mainly focuses on how to improve students'interest in learning material mechanics and studies the teaching reform methods of material mechanics. This helps to improve students'mechanical knowledge reserve.

2. Reform of Teaching Content

In order to reform teaching and innovate teaching, efforts should be made first in teaching content. First of all, the teaching content of the course should be attractive, so as to stimulate

students'interest in learning. Full abstract concepts and tedious derivation of formulas, not many students even do not like, how to learn interest? Both conceptual and formula derivation are of course required. The key is how to derive concepts from general practical problems and engineering problems. How to attract students to participate in the process of mathematical analysis and formula derivation? We have made some efforts in the reform of teaching content: mainly from the "problem" to guide students to enter the teaching state as soon as possible.

For example, the explanations of deflection and deformation in mechanics of materials can only be derived from the mathematical point of view from the following three aspects:

Physical condition: Using the relation between curvature and bending moment:

$$\frac{1}{\rho(x)} = \frac{M(x)}{EI} \tag{1}$$

Geometric condition: According to the analytic geometry knowledge of higher mathematics, the curvature of plane curve is as follows:

$$\frac{1}{\rho(x)} = \pm \frac{\frac{d^2y}{dx^2}}{\sqrt{\left[1+\left(\frac{dy}{dx}\right)^2\right]^3}} \tag{2}$$

The approximate differential equation of the deflection curve of the beam is deduced as follows:

$$y'' = -\frac{M(x)}{EI_z} \tag{3}$$

The students are not interested in teaching these mathematical definitions and operations dully. Of course, the effect is not good. At the same time, it involves the relevant knowledge of mathematical plane curvature, which may be difficult to understand. In the actual teaching process, the slope is the first derivative of the curve, the concave and convex direction of the conic is the second derivative of the curve, that is, starting from its basic concepts, we can better understand the derivation process of the approximate differential equation of the deflection curve of the horizontal beam.

In order to guide students to gradually change from stereotyped thinking to open thinking, the teaching content should not only be attractive, but also be critical and challenging. The so-called critical and challenging is not satisfied with book knowledge, not satisfied with the existing conclusions, and even some conclusions should be questioned. Criticism and challenge are also reflected in the transformation of some so-called traditional methods.

3. Reforming the Teaching Model

The old teaching mode is "lecturing, doing exercises and taking the final exam" which means "the teacher talks, the students listen". Our reform of the above-mentioned teaching mode includes two aspects: one is to implement heuristic teaching in large classes to guide students to participate; the other is to open seminars. The heuristic teaching of large courses includes several links, such as "asking questions", "guiding" and "participating". It changes the passive teaching into active teaching and gives the students the initiative of learning.

For example, when talking about the part of "how to improve the stiffness of beams", the traditional method is divided into three sections: reducing load, changing span and changing the form of support. This traditional boring learning method can not provide students'interest in learning. The correct way is to let students actively participate in it and provide their subjective initiative. Starting with engineering examples, let students start from the basic concepts of mechanics and sum up all kinds of possibilities that can improve the stiffness of beams by themselves. Finally, guide the students to analyze and discuss the results. With this teaching method, students have a high interest in learning and a good classroom atmosphere. No one plays mobile phones in class. The key to this kind of teaching mode is to "ask questions",

which is a well-designed problem. Asking questions can not only guide students'interest, but also arouse students' positive thinking and actively participate in the teaching process.

4. Reform the Assessment Model

To reform teaching and innovate teaching, we must reform the traditional and rigid examination and assessment methods. The reform of examination and assessment methods is in line with the reform of teaching contents and outdated teaching modes. The principles of "attaching importance to foundation, tapping depth and stimulating wisdom" should be followed in the examination and assessment methods and contents. The new assessment method must combine the proficiency test with the in-class test.

5. Providing Teacher Level

In education and teaching activities, students are the main body and teachers are the leading. The initiative to reform and innovate teaching lies in the hands of teachers. Firstly, we must attach importance to teaching and love teaching; secondly, we should be familiar with the teaching content and study the teaching content. Finally, teaching methods should be studied.

6. Conclusions

Faced with the new era of national demand for training innovative talents, facing the rapid development of artificial intelligence technology, how should we teach our courses? How should students learn? How should the textbook be written? Where do the relevant educational and teaching resources come from? ... and so on. This series of problems must be considered and solved by every course and every teacher engaged in education and teaching. There is a long way to go. We need to start with the reform of teaching content, teaching mode, evaluation mode and teaching method.We still have to work hard, think and practice. I believe there will be a clear sky.

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