

# The Reform of Automotive Machinery Foundation for Applied Undergraduate Course

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**Abstract.** The rapid development of the automotive industry has put forward higher and higher requirements for the new technology. The traditional teaching method has been unable to meet the requirements. The development of applied undergraduate education also puts forward the requirements of professional transformation for the construction of automobile service engineering in our university. This paper, taking the reform of the basic course "automobile machinery foundation" as an example, introduces the teaching methods such as physical integration and overturning the classroom, and explores a way of teaching reform to meet the requirements of the training of talents in this field.

## 1. Introduction

Undergraduate education is mainly divided into general undergraduate education and applied undergraduate education according to the different types of talents. Among them, the training of ordinary undergraduate education is better than the basic theory, specialized knowledge and basic skills of the subject in the field, and the senior talents who are engaged in scientific research work or undertake the preliminary ability of special technical work. The applied undergraduate mainly trains senior application talents of high tech sector, technology intensive industry and other administrative departments, and takes on the tasks of training the managers, organizers and teachers of vocational schools for the first line of production. From the different training objectives of the two, it can be seen that the depth and breadth of the applied undergraduate education to theoretical knowledge should be weak in general undergraduate education, and the requirement of practical ability is higher than that of the ordinary undergraduate. But the applied undergraduate is different from the vocational education. It also requires students to have reasonable knowledge structure, master the general method of scientific work, correctly judge and solve practical problems, have the ability and habit of lifelong learning, and can adapt and be competent and changeable profession field.

## 2. The Necessity of the Reform of the Course

This course is a professional basic course of automobile service engineering. It is the cornerstone of specialty. It is not only a prerequisite for learning the specialized courses of engine and chassis, but also the prerequisite and guarantee for the automobile maintenance technician. At the same time, it prepares the necessary theoretical knowledge for continuing study and forms certain professional ability and theoretical analysis ability.

First of all, through the investigation of the 4S, automobile service, automobile manufacturing enterprises and auto parts sales enterprises in Shanghai and the Yangtze River Delta region, we find that the students' professional theoretical knowledge and communication ability are not strong, and lack of innovation and self-study ability. The former teaching model of pure theory makes students lack the intuitionistic feeling to the object when they study and not combine the typical mechanical structure with the actual application of the car. The students' whole learning process is passive and negative, which eventually leads to the serious loss of independent exploration spirit, the sharp decline of learning effect and the embarrassing situation of employment difficulties after graduation.

### **3. Course Orientation**

This course is designed to train students to have a strong understanding of the knowledge of mechanical basic knowledge applied to the typical mechanical structure of a car and the ability to analyze and analyze the automobile mechanical structure design and accident analysis, and to use the corresponding engineering mechanics knowledge to carry out simple calculation and analysis. This course is not only different from the basic course of automobile machinery in the ordinary undergraduate course, but also different from the course of the automobile machinery foundation of the vocational education. It is a kind of professional basic course which is a combination of the theory and practice.

### **4. The Reform of the Course**

#### **3.1 The Main Content of the Course**

The main contents of the basic course of automobile machinery are divided into two parts. The first part mainly includes the application of mechanical transmission, hydraulic and pneumatic transmission and common engineering materials. The second part mainly includes the most basic mechanics analysis and calculation of the mechanics of statics and material mechanics mainly by engineering mechanics.

#### **3.2 Reform of Teaching Methods**

##### **(1) The teaching of integration of science and reality**

The so-called integration of theory and practice is the integration of theory and practice. Breaking through the disconnection between theory and practice, teaching links are relatively concentrated. [1] It emphasizes the leading role of teachers. By setting teaching tasks and teaching goals, the teachers and students can teach, learn, and do the whole course, build the training framework of quality and skills, enrich the classroom teaching and practice teaching, and improve the quality of teaching. This method is not entirely applicable to the whole course of the course. It is applied only in the first part of mechanical transmission content teaching. For example, in the first part of the study of typical mechanism and transmission mode, first use the commonly used mechanism in the car as the introduction to arouse the students' interest in thinking of this kind of mechanism, and then study the related theoretical model and the related movement track analysis, stand on the height of the theory, and then further put forward the possibility of institutional improvement. To achieve real integration of theory and practice, we must meet the following requirements.

First of all, the selection of the site for the actual integration of the teaching must be in the laboratory, and the organization can be seen and even touched first, and the movement process of the organization can be vividly displayed in front of the students, helping the students without any practical experience to better imagine and understand the composition and process of the movement, and then to the abstract and difficult work of the textbook. Combining theory with learning effectively overcome students' fear of theoretical learning.

Secondly, the rational set of practice links. Appropriate selection of the mechanism in the car corresponds to the typical mechanism in the mechanical foundation. For example, when you talk about the 4 connecting rod mechanism, you can ask the students to study the windshield wiper and the door opening and closing device of the car. According to the kinematic pair composition of the mechanism diagram, the degree of freedom is calculated, and then the material is thoroughly analyzed from the theoretical height, which not only deepens the students' understanding of the theoretical knowledge, but also has a clearer recognition of the practical application of the organization and has laid a good theoretical foundation for the future teaching of other automobile professional courses.

Finally, in order to realize this process of interactive learning, the teachers have high requirements, not only have a solid theoretical teaching experience of "automobile machinery foundation", but also can accurately analyze the movement principle and track of the organization, and have certain engineering practice ability, which can guide the students to put forward problems, analyze and solve

problems from the angle of engineering, and also to the automobile. The structure principle is quite familiar, and the typical mechanism applied in the automobile is selected as the object of analysis and research.

## (2) The teaching method of overturning the classroom

Under the traditional education mode, the teacher completes the presupposition in preparing lessons, and controls in the course of teaching, completes the teaching task [2]. But with the development of the times, this teaching mode is often difficult to deal with the two dimensions of knowledge and information. The flipped class can also be translated as "upside down the classroom", which refers to the readjustment of the time inside and outside the classroom and the transfer of the right of decision from the teacher to the students. [3] This teaching method is mainly applied in the second part of engineering mechanics knowledge learning.

This part of the content is mostly theoretical calculation, before the teacher lecturing mainly, but the teacher has always spoken very well, students can understand, but do each homework do not feel like the next, the main is that the students have not set up the idea of solving engineering problems, this kind of following type of learning can only be negative understanding, lack of active thinking, not to talk about innovative thinking. After the use of the flipped class, a few examples are explained by the teachers. The main points are mainly guided by ideas, the key points are given at the key point, and then other examples are given. The students are asked to be discussed by the students in groups. Then the students are represented by the students, and the students can express their thinking in the form of language in the form of language, but the pressure is larger in the beginning. Teachers can give positive guidance and prompting by the side, slowly make students establish their own accurate thinking of language expression, and turn thinking into a habit, creating conditions for solving difficult problems in their future work. Secondly, to give students the space to discuss each other, not only to analyze the wrong, but also to find other people may have problems or some good methods of disintegration, learn to make up for their strengths, and to lay a good foundation for the training of team spirit.

But in this process, the teacher should be able to find out the problems in time, make a summary or key explanation, and have a good ability to control the course, not to call the classroom into a big store, to make some of the students become bystanders, and finally a serious tore or not to complete the original teaching plan.

## 5. Summary

"Automobile machinery foundation" course is a traditional course of mechanical and near machine classes. It has a good theoretical basis, but it is difficult to learn. In the face of the new era of innovation and creative spirit, a new teaching method and method should be applied to explore a suitable teaching mode. This model does not have a set of rules, and there is no mature method to learn from. There is no mature method that can be used for reference. It is necessary to integrate higher education and vocational education, and get out a way to cultivate advanced applied talents in high-tech sector, technology intensive industry and other administrative departments

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