

Research on the Teaching Reform of Automobile Structure Course for Vehicle Engineering Major

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Abstract: Automobile structure is the core course of vehicle engineering major in universities. In order to improve the quality of students majored in vehicle engineering in universities comprehensively, this article starts from analyzing the current teaching status of automobile structure course, and then analyzes the existing problems in the teaching of automobile structure course, and puts forward teaching reform approaches of the course based on undergraduate cultivation objective.

1. Introduction

"Automobile structure" course is a very important professional basic course for vehicle engineering specialty, and also a core course. The start time for the course varies in different schools as per their different teaching plans, and may be opened in the first semester of the second academic year, or the second semester of the second academic year in different schools. This course can directly influence the study of professional course for the vehicle engineering specialty. The subject contains traditional automobile structure, modernized automobile structure and the current new energy automobile structure, so it involves lots of contents; The school is now carrying out teaching reform, without changing its time for basic courses, but more time for professional basic courses and professional courses is compressed, with fewer class hours; It is requested to reinforce the cultivation of theoretical knowledge, operational ability and the capacity to solve actual problems and focus on cultivating capacities according to the undergraduate teaching evaluation requirements of vehicle engineering specialty. The current course involves massive contents, less time, but higher requirements, so in order to meet the cultivation requirement of the course, it's imperative to carry out the teaching reform of automobile structure course. Therefore, this paper discusses the teaching problems of automobile structure course from multiple perspectives, such as multi-media application in teaching, evaluation mode and teaching mode, and also puts forward teaching reform approaches for the automobile structure course.

2. Current Status and Analysis of Automobile Structure Course

Automobile structure course plays an important role in vehicle engineering specialty, and it's necessary to analyze its current status, find out its problems and deficiencies, and make improvements accordingly.

Fewer total class hours, updated and increased teaching contents [1]. On one hand, according to the request of the State Education Commission of the PRC for higher education, it advocates to carry out quality education, improve teaching efficiency, and shorten class hours, so the class hours for general professional basic courses and professional courses are decreased to some extent. As a professional basic course for vehicle engineering specialty, it's inevitable to decrease the class hour of "automobile structure", which has caused the shortage of class hours in the teaching of "automobile structure", with serious shortage as per the traditional class hours for teaching; On the other hand, people's living standard and requirements for automobiles are getting higher and higher along with the social progress and the development of industrial technologies (for instance, decreasing urban pollution, improving energy utilization rate, making use of clean energy and new energy, and improving automobile comfort). A batch of new automobile technologies, hydrogen

fuel automobiles, pure electric automobiles, hybrid electric automobiles, methanol automobiles and other new energy automobiles emerge accordingly, which increase the teaching contents of the automobile structure course in both quantity and difficulty due to new technologies. However, teachers generally adopt "cramming" teaching mode to complete the teaching task, but due to fewer class hours, more contents, and bigger difficulties, students are lack of the time to digest and absorb, and also encounter with understanding difficulties, which have caused serious influence on the teaching effect. Meanwhile, due to the compressed class hours, knowledge about engineering drawing cannot be well mastered, and since the automobile structure course is quite demanding in students' capacity to read charts, students encounter with more difficulties in understanding structure charts, which has also brought difficulties to the teaching of the course, and caused serious influence on the teaching progress. How to solve a series of problems such as fewer class hours, more contents and bigger difficulties, complete teaching tasks successfully within the planned class hours while making students master the learned contents, and improving teaching efficiency can be one of the problems that should be discussed by teachers.

The teaching method is simple. With respect to the traditional teaching mode currently adopted by most universities, teachers play a main role in the teaching process, supplemented by students. In classes, teachers will be responsible for teaching knowledge, while students are responsible for accepting knowledge, during which students are learning knowledge passively, and will accept whatever taught by the teacher. Due to intensive class hours, teachers will teach lots of contents in one class, and students will completely follow the thoughts of teachers to learn knowledge, and are uncertain whether they can master the knowledge taught by teachers, without any imitative in the process. Their personality to think problems actively has been obliterated. On the other hand, since the teacher is teaching the whole time in class, students don't have the time to absorb and digest knowledge. The class is boring and may cause understanding difficulties. The final teaching effect is bad.

Multi-media teaching effect is bad, and students are lack of initiative. An advanced teaching mode is to use multi-media in the teaching of the automobile structure course, but PPT courseware is mainly adopted, which contains texts and photos. It can improve the teaching efficiency to some extent, but it may not improve students' learning efficiency. As can be seen from the information feedback, the teaching effect isn't ideal. Since PPT contains a big amount of information, students will read PPT by themselves while teachers are teaching the course, and will follow the thought of PPT completely, lack of thinking, and study knowledge passively.

Single evaluation mode. The course has two parts of teaching contents: The theoretical teaching of automobile structure, and the practical teaching of automobile parts and complete automobile disassembly and assembly. The evaluation of the course contains two parts: The theoretical teaching and the practical teaching of disassembly and assembly; the theoretical teaching accounts for 90% of the total score, while the practical teaching of disassembly and assembly accounts for 10% of the total score, and the traditional evaluation mode of theoretical teaching is as follows: The daily performance of students accounts for 20% of the total score, while the examination paper score accounts for 70% of the total score. The daily performance mainly includes: Operation, attendance rate and daily questions. The traditional evaluation mode of practical teaching is: Internship report, and the daily performance in disassembly and assembly; internship report accounts for 6% of the total score, while the daily performance in disassembly and assembly accounts for 4% of the total score. Such evaluation mode cannot evaluate students comprehensively and objectively. It can easily generate high score and low abilities like the traditional evaluation mode, and students who study regularly, learn by rote for examinations, but are bad in manipulative ability and comprehension capacity can often get high scores, but it's difficult for students who have high comprehension capacity, strong manipulative capacity and are fond of thinking to get high scores. Such evaluation mode should be reformed by combing with characteristics of the automobile structure course.

3. Reform Measures for the Automobile Structure Course

With respect to problems found on the basis of the aforementioned analysis about the teaching of the automobile structure course, improvement measures are put forward as follows:

Formulate practical and feasible teaching outline [2]. Teaching outline is the programmatic document of the course, and is formulated as per the cultivation objective of vehicle engineering specialty, and the contents include: Teaching requirements, teaching objective, teaching contents, distribution of class hours for teaching, prerequisite courses before starting the course, follow-up course teaching, teaching methods, and evaluation mode. While formulating the teaching outline, it is requested to take teaching requirements, teaching contents, the distribution of class hours for teaching and the evaluation mode, etc. into comprehensive considerations on the basis of the course teaching objective and follow-up course teaching demands, and should reflect students-centered study in the outline, give full play to students' initiative, creativity and innovation as well as teachers' leading and guiding role. Meanwhile, the outline should contain accurate control of time distribution. The teaching contents contain not only traditional structures, modernized structures, but also new energy vehicle structures, so there will be more course contents, less time and bigger difficulty, and reasonable evaluation mode should be reflected at last.

Application of modernized education technology approaches [3]. With respect to the application of modernized education technology approaches in teaching, on one hand, it is the application of multi-media courseware (PPT), which contains a big amount of information and can express texts, photos, animations and images. An automobile is formed by tens of thousands of independent parts, and contains complicated structure. In the theoretical teaching process of automobile structures, it's difficult for teachers to express it clearly by writing on the blackboard and applying teaching aids, etc., and even if teachers can express it, it's still difficult for students to understand. With multi-media courseware, expression problems can be solved. The structural sketch of automobile assemblies combined with simple texts can express automobile assembly structures, and by adopting 3D charts, the automobile assembly appearance can also be expressed, while animations and images can express the working principle of automobile assembly, and multi-media can fully mobilize students' visual sense, auditory sense, etc., and make it easy for them to understand automobile assembly structures and working principles; During the automobile disassembly and assembly practices, animations and images can be used to show the automobile assembly and complete vehicle disassembly and assembly process, and before starting, students can watch the disassembly and assembly practices animations or images at first, to have a sensory cognition on the disassembly and assembly. Before students start disassembly and assembly practices, teachers can carry out standard operations of disassembly and assembly for automobile assembly or complete vehicle and then record a video, so students can watch it, and operate accordingly. The second part is virtual disassembly and assembly, by carrying out the disassembly and assembly of complete vehicles or assembly via virtual software platforms, it cannot only be used in the theoretical teaching of automobile structure, but also the teaching of automobile disassembly and assembly, especially in the teaching process of automobile disassembly and assembly, students can carry out virtual disassembly and assembly on the computer, and then carry out actual disassembly and assembly after getting familiar with it. Multi-media teaching can improve teaching efficiency and effect.

Integrate theories with practical teaching. The so-called integration refers to blending practical teaching in theoretical teaching, and theoretical teaching in practical teaching, i.e., these two teaching parts are one. In the traditional automobile structure course teaching, these two teaching parts are separated, and generally, theoretical teaching will be firstly implemented before the practical teaching of disassembly and assembly, and the disadvantage includes abstract theoretical classrooms, relatively boring and obscure to understand. The automobile structure course can be taught in automobile structure laboratories. Firstly, it is applicable to disassemble automobile assemblies thoroughly, and then put labels of parts name on each part. Teachers can explain the function of each part respectively. After students have sensory cognition on automobile parts, teachers can go back to theoretical classrooms, and teach theoretical courses as per the regular

teaching mode. It's better to teach theoretical courses in laboratories, and then go back to the site after finishing certain assembly theory class, let students install the assembly by themselves, and then divide them into groups and carry out another disassembly and assembly, and then summarize accordingly. This process refers to sensory cognition-theories-practices-theories. Students can fully understand the function of each part, the assembly structure and overall working principle, deepen their understanding about basic knowledge, think better, and give full play to their initiative, exercise their manipulative ability and the capacity to solve actual problems. In this process, teachers can make full use of laboratory equipment, teaching aids, teaching software, tools and other resources, to carry out teaching effectively and improve the teaching efficiency and effect.

Open automobile structure laboratories. Generally, laboratories in universities are opened at specified time when students should do experiments, and then closed after students finish experiments. On one hand, not all 11 classes have experiments in laboratories; on the other hand, laboratories are closed when students encounter with problems at ordinary times and want to carry out disassembly and assembly in laboratories, so there will be demand conflicts. In order to solve such conflicts, give full play to the function of laboratories, and make effective use of laboratories, automobile structure laboratory can be built into an open laboratory, so students can do experiments in the laboratory at any time. By doing so, students can go to the laboratory at any available time based on personal demands, which can improve their learning initiative and consciousness. Besides, laboratories can also provide students with more opportunities to study and exercise, and improve students' the capacity to solve actual problems. It can not only improve the utilization rate of laboratories, but also exercise students.

Optimize teaching contents. Given the fact of less time, more contents and faster upgrading, we can only complete teaching tasks within the effective time and let students master the learned knowledge by reasonably arranging teaching contents. Contents taught by teachers should highlight key points, characteristics and difficulties, and should also be centered on textbooks and supplemented by referential data. Students can learn some secondary contents by themselves, to give full play and exercise their independent learning capacity, combine reasonable teaching contents with the self-taught contents of students, and realize the course learning objective.

Reasonable and feasible evaluation mode^[3]. After finishing the course, students will be evaluated reasonably. Traditional evaluation mode can be divided into the evaluation of theoretical course and practical course, wherein theoretical course accounts for 90% of the total score, practical course accounts for 10% of the total score. Both the distribution and evaluation mode of traditional evaluation scores are unreasonable. After improvement, the evaluation score of theoretical course accounts for 50% of the total score, while the practical course accounts for 50%. The score of theoretical course consists of daily performance (accounts for 15%), big homework score (accounts for 10%), and examination paper score (accounts for 25%). Daily score consists of the daily homework score (accounts for 5%), daily attendance (accounts for 5%), and daily questions (accounts for 5%); By adopting such mode to evaluate theoretical courses, we can not only evaluate students' learning process, but also their final learning effect; The score of practical teaching courses consists of internship report (accounts for 30%), performance in the disassembly and assembly process (accounts for 10%), and questions (accounts for 10%). Internship report evaluates students' capacity in writing, summarizing, understanding, understanding, thinking and the capacity to solve actual problems, etc. Practical courses can not only evaluate students' manipulative capacity, but also their capacity to solve actual problems, and finally give a reasonable evaluation about the student as the course is completed.

4. Conclusion

The automobile structure course contains theoretical course and practical course, and should have corresponding plans in teaching outline, teaching methods, teaching approaches, and evaluation mode, etc., to improve teaching efficiency and teaching effect and make students acquire higher learning enthusiasm, learning initiative, and cultivate their learning manipulative capacity, innovation capacity and the capacity to solve actual problems.

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