

# Exploration of Engineering Culture Education in Automobile Practice Courses under the Background of New Engineering

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**ABSTRACT.** The new era has endowed new engineering talents with new mission, and the national strategic development has put forward new requirements for new engineering talents. The education of new engineering talents and outstanding engineers should cultivate engineers with both engineering technical knowledge and humanistic quality. However, the survey results of students' cognition of professional practice courses indicate that teachers do not pay enough attention to and penetrate students' engineering culture education. The curriculum is reshaped from the perspective of engineering education culture, and the curriculum reform approach is constructed from four aspects of teaching method, teaching content, learning environment and assessment method. It pays attention to the coexistence and integration of diverse cultures, improves the comprehensive quality of students, and subtly enables students to be influenced by culture.

**KEYWORDS:** Engineering culture education, Automobile practice courses, New engineering talents, Humanities quality

## 1. Introduction

The “new” of new engineering is mainly manifested in the exploration of new concepts of engineering education, the construction of a new structure of disciplines and specialties, the renewal of a new mode of personnel training, the formulation of a new quality assurance mechanism for education and teaching and a new system of innovative classified development. Domestic scholars have made detailed and detailed descriptions of the construction of new engineering courses from various angles, enriching and improving the contents and ideas of new engineering construction. However, the discussion on the construction of new engineering courses often interprets “new” from the perspective of technology development and interdisciplinary integration, and practices “new” from the reform forms such as new teaching ideas and means, and the construction of new engineering courses should be supplemented and discussed from the perspective of culture [1]. Li Peigen, in his article “ Reconstruction of Engineering Education Culture “[2], expounds the far-reaching influence of Engineering Education Culture on engineering education, which is related to students' cognition of specialty and their interest in specialty and deeper understanding; teachers and students should look down on engineering education from the perspective of educational culture; This paper discusses engineering education from the cultural perspectives of freedom, transcendence and critical thinking, and encourages teachers to reshape the engineering education culture. The cultural elements of engineering and technology and the cultural perspective of engineering education are reflected in the curriculum system, classroom, teaching materials, practice links and even students' informal learning.

Engineering culture education and humanistic quality education in many science and engineering colleges and universities, on the whole, are relatively deficient, and there is a certain distance from the demands of innovative, compound and applied talents training. Therefore, in the process of training new engineering talents and excellent engineers, we should strengthen and integrate the engineering culture education in Colleges and universities, cultivate diversified “three types” talents with both engineering technology and humanistic quality. Through the edification of engineering culture and engineering ethics education, we should establish correct values and moral values, abandon the weak sense of good, weak sense of social responsibility and profit-making. In the end, the advanced culture is internalized and externalized in practice [3].

## 2. Current Situation of Students' Cognition on Practical Courses of Automobile Major

This paper makes a simple survey on 248 students of vehicle engineering major in a university who are about to enter the course of “ Automobile Dismounting Practice “ (multiple choices). What do you expect to get from the course? The results are shown in Figure 1. From the analysis of the survey results, basically 90% of the students agree with the engineering and technical significance of this practical course: consolidate and deepen the theoretical knowledge, understand the structure of the car, understand the working principle of the various systems of the car, recognize the parts of the car, and improve the practical ability; About 50% of the students expect to improve their communication ability, team cooperation ability, and cultivate their own hard-working spirit.

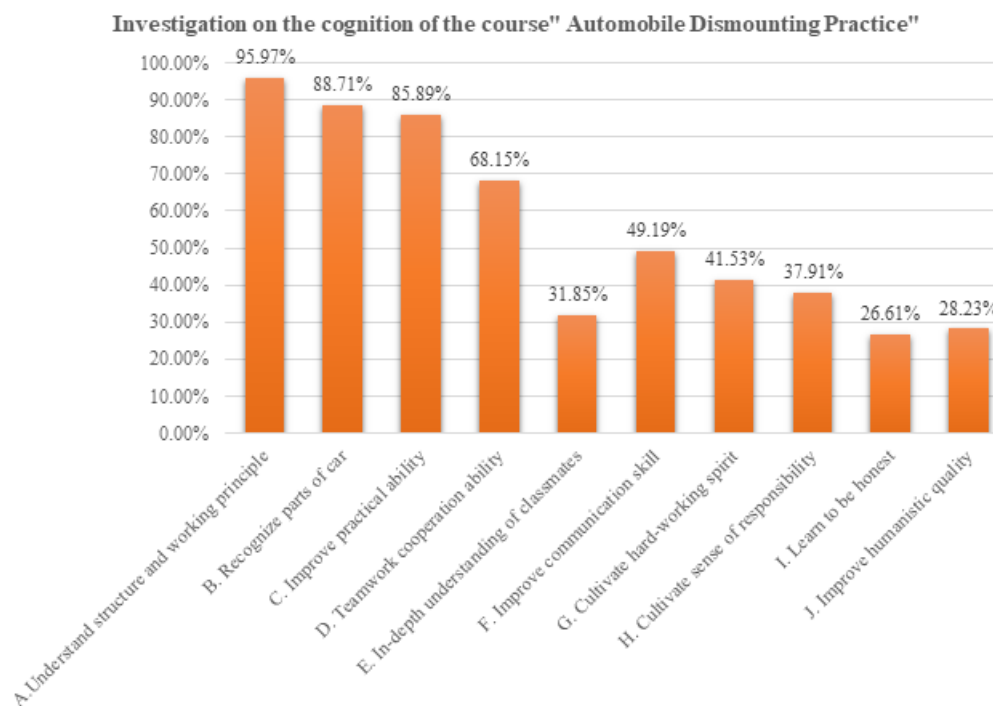


Fig.1 Investigation on Students' Cognition of Practical Courses in Automobile Major

Only a small number of students expect that through this practical course, they can improve their humanistic quality, learn to be honest, and cultivate their sense of responsibility. The survey results show that students' awareness of engineering culture education is very weak. Most students think that they cannot improve their cultural literacy in professional practice courses, and can only obtain relevant professional knowledge. There is a certain deviation between students' cognition of professional practice course and teaching objectives and the supporting point of professional graduation requirements.

From the perspective of students, in the learning process of similar practical courses, students did not feel the infiltration of engineering culture education, but simply learned scientific knowledge and engineering technology, and had little understanding of engineering concept, engineering ethics, engineering system and industry norms, and had a good understanding of craftsman spirit, hard-working spirit, critical innovation spirit and team spirit in engineering practice. The cooperation spirit is not deep. From the perspective of teachers, professional teachers with science and engineering background do not pay enough attention to engineering culture education. In the organization of teaching forms and teaching contents, they give less guidance to students' engineering spirit and culture education. Engineering spirit affects engineers' understanding, emotion, will and behavior of engineering, which is the concentrated embodiment of excellent engineers' excellent spiritual quality [4].

## 3. Ways of Constructing Automobile Practice Courses in the Perspective of Engineering Education Culture

From the perspective of engineering education culture, the course content of automobile disassembly and assembly practice is reshaped, so that the new engineering construction not only stays in the reform of conventional engineering education methods and means, but also pays more attention to the coexistence and integration of multiple cultures, improves the comprehensive quality of engineering students, and cultivates students' practical and realistic scientific

spirit, patriotic spirit of great nation confidence, and craftsman spirit and courage Innovative spirit of exploration and team spirit of coordination and cooperation.

### **3.1 Diversified Teaching Method**

Break the traditional teaching method, change the teacher-centered teaching mode, problem-based teaching method, guide students to analyze problems from the cultural perspective of critical thinking, help students establish innovative consciousness and improve their innovation ability. In the process of students' hands-on practice, we should know from practice and compare with the structure in textbooks, so as to cultivate students' scientific spirit of “not only on the top, not only on books, but only on reality”, so as to produce true knowledge through practice. This paper focuses on the analysis of some contents different from the textbook, such as why it is so, what are the advantages and disadvantages of such design or layout, if you are a designer, will you design like this? Is the design presented in front of you reasonable? Not all existing is reasonable. Students must dare to ask questions before they can analyze problems, so that solving problems, blindly accepting the knowledge instilled by teachers is not conducive to the cultivation of students' innovative thinking. The goal of higher education is to cultivate outstanding engineers with innovative thinking ability. Especially in the context of new engineering construction, students should not be completely immersed in the consciousness of teachers. Students should be encouraged to try boldly from the perspective of interdisciplinary integration.

### **3.2 Rich Case Teaching Content**

Using typical case teaching content to guide students to pay attention to some problems existing in human society is conducive to cultivating students' humanistic feelings of “truth, goodness and beauty”, and thinking about using technical services to improve a certain situation. In fact, the emergence of electric vehicles was earlier than that of internal combustion engines. However, due to the technical level at that time, electric vehicles were not suitable for long-distance driving, and electric vehicles did not develop. From the 1950s to the mid-1960s, due to environmental pollution and oil resource problems, electric vehicles began to recover. Engineers once again turned their attention to electric vehicles, so as to ease the energy supply of gas-fired vehicles and the environment.

With commemorative teaching cases, students' engineering spirit is nurtured, which is conducive to the cultivation of students' patriotism and self-confidence belief in a big country, contributing to the vigorous development of automobile industry, and shouldering the personal responsibility entrusted by the times. In 1956, the first “Jiefang” truck was successfully assembled and trial produced on the brand-new general assembly line of Changchun No.1 Automobile manufacturing plant, ending the history that China could not manufacture automobiles. In the early years, China began to develop V8 engine. At that time, the biggest difficulty in production was cylinder block casting. In 1958, China's first domestic V8 engine was assembled and ignited successfully, and Hongqi CA72 high-grade car was manufactured.

To cultivate students' humanistic quality with the teaching cases of classic characters' deeds is helpful for shaping students' personality quality, training their psychological quality, daring to try and face failure. Joe Girard, a world-famous automobile salesman, had done many things before he was 35 years old, but he did not give up. Giving up means complete failure. Only by persisting in the end can he achieve the final success. In 15 years, he sold more than 10000 cars. No one has broken his world auto sales record.

Taking industry standards as teaching cases, strengthening students' engineering consciousness is conducive to the formation of students' engineering concept and plays a guiding role in students' behavior. A car is made of 10000-30000 parts, and it needs to go through a variety of certification systems before it can be put into the market. It is composed of more than 8700 parts level, more than 1100 system level and more than 500 vehicle level tests, involving more than 10 test verification fields, reflecting the “craftsmanship spirit” of the automobile industry [5].

### **3.3 Open Learning Environment**

With the combination of virtual and real teaching methods, the promotion of time fragmentation learning method is helpful to cultivate students' autonomous learning ability [6]. With the rapid development of information technology, the network age provides many conveniences for people's life, and also provides more choices for learning environment. Part of the teaching content and the virtual disassembly and assembly of cars are arranged on the network. The students' learning place is not limited to the classroom. The study room, library, dormitory and even the playground may become “classroom”. The open learning environment is convenient for the formation of students' self-learning consciousness. It is not centered on the teacher, and turns the passive into the active, making up for the traditional indoctrination teaching mode Disadvantages, rich teaching content for students to provide a lot of room for progress, you can choose according

to their own interests, let excellence become a habit.

### **3.4 Personalized Assessment Method**

In the practice part, the teaching organization form of team grouping is adopted. The whole class is divided into several groups, and each group is divided into different execution positions. Each student implements the rotation system to complete the practical tasks of different work contents according to certain or mechanism. Students are trained to have team consciousness, overall situation consciousness and dedication consciousness, obey the arrangement of the team and strictly implement the work process. Considering the teaching content and assessment requirements of practical courses, there is no unified test paper evaluation with standard answers at the end of the course, but a personalized assessment standard is formulated, and comprehensive evaluation is carried out according to the division of responsibilities and practical performance of students in the course. The personalized assessment method can better reflect the students' understanding of the meaning of the team, whether they can handle the relationship with the team leader and team members, and carry out the work in the process of communication among team members, listening to other people's opinions and suggestions. As a team leader, I can organize, coordinate and direct the work of the team; as a member of the team, I can obey the arrangement of the team leader, and complete the work that I don't like or is not good at, and can complete the work on time with quality and quantity, without affecting the overall performance of the team due to individual.

## **4. Conclusion**

The new era has given new mission to new engineering talents, and the national strategic development has put forward new requirements for new engineering talents. They should have engineering technology practice ability and engineering cultural literacy. It is necessary to strengthen the engineering culture education in professional courses. The engineering culture education is the guidance of spiritual level, which cannot be achieved overnight, nor can it only rely on a certain course. It should be run through and integrated in the talent training program silently to let students accept the influence of culture. The construction of new engineering courses in Colleges and universities should take the cultivation of diversified and innovative engineering talents with both high level of professional quality and comprehensive quality.

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## **References**

- [1] Wang, Y.Q. New Engineering Discipline Construction-A Cultural Perspective. *Research in Higher Education of Engineering*, No.1, pp.16-23, 2018.
- [2] Li, P.G. Reconstruction of Engineering Education Culture-On Cultural Aspect of Emerging Engineering(II). *Research in Higher Education of Engineering*, No.3, pp.1-5, 2018.
- [3] Li, Q.Q., Li, H. The Analysis of Engineering Cultural Education in Building "New Engineering". *Journal of Anhui Jianzhu University*, Vol.25, No.4, pp.79-82, 2017.
- [4] Wang, Z.B. On Basic Contents of Engineering Culture Education: About Study and Implementation of the Spirit of Xi Jinping's Important Speeches on Cultural Education. *Journal of HeFei University of Technology (Social Sciences)*, Vol.34, No.2, pp.114-120, 2020.
- [5] Zhou, P., Shen, K. Exploration of Ideological and Political Education in the Teaching of Automobile Manufacturing. *The Guide of Science & Education*, No.2, pp.85-87, 2020.
- [6] Wei, X.X., Tian, Z.W. Exploration on the teaching mode of combining virtual and real in automobile engine disassembly and assembly practice. *University education*, No.7, pp.96-98, 2018.