

# The Application of PBL Teaching Mode in the Teaching of Automotive Service Engineering under the Condition of Informatization

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**Abstract:** The automotive service engineering major is aimed at the automotive aftermarket, and its professional knowledge focuses on providing support for automotive professional practice. This article addresses the problems of the disconnect between theory and practice in traditional teaching, low participation of students in the entire process, untimely feedback on teaching evaluation, and difficulty in achieving student subjectivity. Based on daily teaching practice, this article discusses the importance, process, and strategy of information technology in the context of information technology, The feasibility of applying PBL teaching mode in the teaching of automotive service engineering major has supported the approval of automotive service engineering major as a first-class undergraduate major in Shandong Province, and the team teachers have won awards in the Shandong Province Teaching Innovation Competition.

**Keywords:** Information technology teaching; PBL teaching mode; Automotive Service Engineering major

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## 1. Significance of applying PBL teaching mode in automotive service engineering specialty

### 1.1 It helps to transform the teaching material system into the teaching system

At present, the teaching of automotive service engineering major adopts the traditional teaching method of "selecting teaching materials according to courses and relying on teaching materials to impart knowledge". The teaching mainly based on classroom teaching by teachers has resulted in the phenomenon of students "memorizing theories and imitating experiments" to a certain extent. Some students do not seek understanding of professional knowledge and do not explore the causes and consequences of relevant knowledge. Can not be "free" practice (test) under safe conditions, the learning process lacks the opportunity of "trial and error", divergent thinking and practical ability can not be trained, resulting in learning only book theory, learning and application disjointed, deviating from the essential requirements of teaching. PBL teaching mode requires teachers to change their identity, eliminate students' "theory fatigue", and seek the return of the essence of education<sup>[2]</sup>. In teaching, teachers guide students to find the origin of problems through phenomena "grasping results and causes", and devise solutions through "goal guidance", so that students can actively learn knowledge and form good habits in the process of solving problems. In order to achieve the "three-dimensional" teaching goal, to realize the transformation of teaching material system into teaching system.

### 1.2 It is helpful to solve the problem that is difficult to measure in process evaluation

Traditional teaching can not record students' learning track in the whole process, some students usually pay attention to attendance, homework and stage tests, and pay attention to the scope of examination at the end of class, class "head up rate" and "nod rate" are not high, and student participation is difficult to measure. Students who listen carefully tend to passively "listen and remember" rather than actively build the course knowledge structure, the ability to use knowledge to solve problems can not be exercised, and the overall development of students becomes "empty talk". With the support of information technology, PBL teaching model divides the three stages of "preview, study and review" into 7 categories and 12 evaluation contents. Through various activities, students' participation and knowledge mastery in all aspects of learning are comprehensively measured, providing data support for the implementation of

targeted teaching feedback.

### **1.3 It is conducive to the true realization of students' main body status**

In the PBL teaching model, teachers' "teaching" and students' "learning" are centered around problem-solving, and learning is placed in real problem situations. The model of "project guidance, students' speech and students' evaluation" is adopted to inspire students to think about the knowledge hidden behind problems in the process of analyzing, exploring and solving problems. Develop the ability to solve problems and learn independently. In the whole process of PBL teaching, students raise questions based on their own cognition and confusion, deepen their understanding in independent thinking, form a consensus in group discussion, and consolidate and improve the teacher's confusion, so as to complete the deconstruction and reconstruction of the knowledge system, effectively solve the problems of students passively accepting knowledge and being unable to build their own knowledge system, and truly reflect the subject status of students' learning.

## **2. Application process of PBL teaching model for automotive service engineering**

### **2.1 Online learning + discussion**

This stage focuses on solving the problem of "what is", making full use of learning platforms such as "Learning Pass" to broaden online learning content, professional knowledge to be learned and basic subject theories involved, and uploading them to the learning resource database for students to check with one click to improve learning efficiency. For example, before learning magnetolectric and Hall sensors, transfer the knowledge of Lenz's law, Hall's Law and other relevant basic disciplines to the learning task package; At the same time, basic questions are designed for each video, and online tests are carried out, focusing on solving the problem of students' basic differences and realizing the internalization of professional knowledge. Open online "brainstorming" on the video page, guide students to conduct in-depth exchanges on learning doubts and whimsical ideas, and solve doubts and doubts in the collision of ideas.

### **2.2 Classroom Q&A + Flipped classroom**

This stage focuses on solving the problems of "difficulties and perplexity" in learning. PBL teaching mode, through a series of progressive problems, uses the "five-step method" of classroom teaching to enable students to break through the knowledge difficulties one by one, clarify the knowledge context and form a knowledge system.

The first step is to build a learning framework. On the basis of elaborating the learning objectives, contents and methods of this class, students are divided into reasonable groups according to their self-test scores, and the overall balance of the group is formed. The second step is to inspire thinking through questions. Through video, simulation and other forms, the original picture of the problem is presented to inspire students to think about the cause of the problem, analyze the method of solving the problem, explain the focus of the course, and bring the students into the problem solving situation through class activities. For example, when studying the causes of vehicle side-slip and steering loss in groups, the cause of vehicle state change is analyzed, and the slip rate, a key parameter of control, is introduced. The third step is comprehensive use to improve ability. After completing the first two steps of knowledge construction, create task scenarios, design your own solutions through group discussion, and deeply internalize knowledge. During the discussion, by paying attention to the progress of each group, we can find out the starting point of students' thinking, think about doubts and ideological highlights in time, so that students can truly become the protagonists of learning. Meanwhile, we can combine the works submitted by each group, carry out flipped classroom, and use the "random selection" method of learning platform to invite students to report and share their achievements. It can also avoid the potential "negative work" phenomenon. The fourth step combines practical learning with practical application. By presenting the learned knowledge to the students, the theoretical teaching will be more grounded, and the students will have a new understanding of the professional knowledge. Step 5 Summarize and improve innovation and expansion. On the basis of summarizing the learning content of this class, according to the latest development of technology, students are guided to think about the shortcomings of existing technology and explore ways to improve it. For example, after learning the safe driving system, students are inspired to think about whether the vehicle can achieve autonomous braking when the driver is not concentrated. It leads students into the unbalanced state of "seeking knowledge without obtaining it", stimulates students' desire to explore, encourages them to actively participate in learning, and cultivates students' problem awareness and innovative thinking<sup>[1]</sup>.

### **2.3 Experimental operation + design innovation**

This stage focuses on solving the problem of "transforming theory into practice". The final point of PBL teaching model is "learning to apply, to promote learning, learning to use". In the teaching process, the first is to optimize the functional positioning of

the laboratory, change the traditional thinking of "opening with the course" in the use of time, form the basic positioning of "opening according to demand", and arrange full-time laboratory staff to assist students to verify and answer the puzzles in learning; The second is to increase the frequency of teaching in the practical teaching base, lead students to enter the enterprise and take the post, adopt the "task-driven" teaching mode, so that students can face the actual task, find the problem together with the enterprise engineers, discuss the countermeasures on the same stage, and verify the solution, such as using the basic theory of automobile marketing to investigate the marketing status quo of XXX models sold in XXX region. Identify weaknesses in the sales process, develop marketing strategies and implement them; Using fault diagnosis theory, I analyzed the reasons why the car could not start, drew fault trees and detected and eliminated the faults one by one, formed a process training of "ideation-design-application", and applied what I learned to various college students' innovation competitions. The participation rate of students in this major was 67%, and the prize rate increased by 8%. Students' innovative consciousness and problem-solving ability have been greatly exercised and improved.

### **3. Strategic thinking on applying PBL teaching mode in automotive service engineering specialty**

PBL teaching model sets teaching questions around the realization of the "student-centered" teaching goal, controls the teaching direction from the problem situation, and uses network resources to broaden the learning dimension, so that students can grasp the starting point of knowledge, the difficulty of understanding and the focus of application, and gives full play to the maximum advantages of PBL teaching model.

#### **3.1 Create real problem situation and control teaching direction**

PBL teaching mode focuses on the construction of problem scenarios, and the clever setting of problems can improve students' autonomous learning ability, cultivate students' "problem awareness" and enhance students' critical thinking ability<sup>[1]</sup>. In the teaching process, real problem scenarios are created according to real problems existing in the automotive aftermarket, and curriculum knowledge is combined with real problems. It can effectively stimulate students' desire for inquiry and cultivate their ability to understand and use knowledge. For example, in the course of automobile fault diagnosis and detection, a project on automobile exhaust treatment is designed from the perspective of environmental protection. Students are guided to analyze the process of exhaust gas generation, the composition of exhaust gas, the emission standards of exhaust gas, the use of tools to collect and detect exhaust gas, the division of groups to discuss solutions, and the improvement of automobile exhaust purification devices. Finally, we introduce the exhaust gas purification device in the market, compare and analyze the structural principle, so that students can achieve the purpose of applying what they have learned in solving practical problems.

#### **3.2 Focus on student-centered, whole-process feedback and guidance**

The construction of questions is the prerequisite for the effective implementation of PBL, and the quality of questions is directly related to the quality of classroom teaching and thus affects the learning effect of students. As the subject of teaching activities, students should not only conform to the provisions of the teaching syllabus and the requirements of the teaching law, but also pay attention to the improvement of students' learning effect. Therefore, in the setting of problems, it is necessary to start from the confusion of students' learning, identify the weak links of their knowledge system, and treat the symptoms. At the same time, it is necessary to use the functions of "rush answer" and "topic discussion" of the information-based teaching platform to grasp the degree of students' participation in offline classes and the achievement of knowledge goals, master the learning status of students throughout the process, and analyze the results of students' participation in activities. Timely evaluation (individual evaluation, group evaluation, teacher evaluation), feedback and answer questions, push students forward, and achieve the purpose of not letting a student fall behind.

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