

## Original Paper

# Exploration and Practice of Teaching Reform in Automobile Modeling and Simulation Evaluation Course

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### **Abstract**

*This paper discusses the practical application of labor education in the automotive major in colleges and universities. The introduction emphasizes the importance of labor education in the context of the new era and points out its key role in cultivating all-round socialist builders and successors. The problems existing in the current teaching of professional platform courses in colleges and universities are analyzed, including the labor literacy and practical ability foundation of students, learning attitudes and habits, and the problems and challenges faced in labor practice. The teaching design section introduces in detail the implementation process and innovative practices of the “Scientific Research Labor-Automobile Modeling and Simulation Evaluation” project, covering teaching content, methods, student participation, assessment and evaluation methods, etc., highlighting the concept of cultivating morality through labor, increasing intelligence, strengthening the body, and educating people. The implementation of the professional platform course segmented modular teaching design course case is proposed, including two teaching cases of “Innovative Practice of Automobile Simulation Software Teaching under AI Empowerment” and the innovative application of the “Five-Step Progressive” teaching method in the information retrieval course, aiming to improve students’ information literacy, autonomous learning ability, practical ability and innovative spirit through innovative teaching methods.*

### **Keywords**

*labor education, project-based practice, personalized learning path, five-step progressive teaching method*

## **1. Introduction**

With social development and the deepening of educational reform, the importance of labor education in the cultivation of university students has become increasingly prominent. In the context of the new era, labor education has been endowed with new connotations and requirements, becoming an important

component in cultivating socialist builders and successors who are well-rounded in moral, intellectual, physical, aesthetic, and labor education. In September 2018, the National Education Conference emphasized the need to build an education system that comprehensively cultivates moral, intellectual, physical, aesthetic, and labor education, forming a higher-level talent cultivation system. In March 2020, the Central Committee of the Communist Party of China and the State Council issued the “Opinions on Comprehensively Strengthening Labor Education in Primary and Secondary Schools in the New Era,” further elevating labor education to the level of a national talent strategy. In July of the same year, the Ministry of Education issued the “Notice on the Guiding Outline for Labor Education in Primary and Secondary Schools (Trial Implementation),” providing top-level design and systematic deployment for labor education. In April 2021, “cultivating socialist builders and successors who are well-rounded in moral, intellectual, physical, aesthetic, and labor education” was written into the newly revised “Education Law of the People’s Republic of China,” and “labor” was incorporated into the national education policy, achieving the same important status as moral, intellectual, physical, and aesthetic education.

This project, “Scientific Research and Labor - Automotive Modeling and Simulation Evaluation,” is a practical labor education course for the New Energy Vehicle Engineering major. It aims to cultivate students’ labor literacy, practical skills, and innovative spirit through the integration of labor education and professional education. By involving students in actual scientific research activities, such as automotive modeling and simulation evaluation, the project enables them to master labor science knowledge and skills in practice, cultivate their practical labor abilities to be competent in professional work, develop strong innovation and entrepreneurship capabilities, and enhance their ability to identify new problems and creatively solve them in practical work. This educational model transcends the traditional scope of labor education, closely integrating labor and education, allowing university students to realize their value and achieve self-growth through labor. Simultaneously, the organic combination of scientific research practice courses and labor education enhances the practicality and applicability of labor education, helping students form correct views on labor, values, life, and the world, laying a solid foundation for their future career development and life path.

## **2. Problems Existing in Professional Platform Course Teaching in Universities**

### *2.1 Students’ Basic Labor Literacy and Practical Ability*

Students demonstrated a certain level of labor literacy and practical ability in their relevant courses. In the Automotive Modeling and Simulation Evaluation course, students have mastered basic engineering drawing and 3D modeling theory, possess computer operation skills and software application basics, and can utilize the basic functions of automotive simulation software. In the Information Retrieval course, students possess basic computer operation and internet skills, and can conduct preliminary information searches, providing possibilities for subsequent in-depth scientific research and information processing.

## *2.2 Students' Labor Learning Attitudes and Habits*

Students showed high interest in both courses and expected to improve their professional skills and information literacy through course learning. Most students demonstrated good learning habits and actively participated in class discussions and practical activities. However, some students still need to strengthen their continuous learning and self-motivation, requiring more incentives and guidance to maintain their learning motivation.

## *2.3 Problems and Challenges in Students' Labor Practice*

Although students possess a certain foundation and a positive learning attitude, they still face many problems and challenges in labor practice. In the automotive modeling and simulation evaluation course, some students struggle with software proficiency and spatial reasoning, which hinders their performance in complex designs. In the information retrieval course, some students have difficulty filtering, evaluating, and organizing information; their digital literacy is generally low, and their retrieval and AI application skills need improvement. These issues limit students' efficiency and effectiveness in practical work, necessitating further optimization of teaching methods and resources, as well as strengthened personalized guidance and motivation.

# **3. Instructional Design**

## *3.1 Project Implementation Process*

This project, centered on vehicle simulation technology, covers cutting-edge developments, software operation, data analysis, and research paper writing. It employs a combination of lectures and practical exercises, and is designed for 60 undergraduate students. The teaching process incorporates patriotic education to inspire students' national pride; teamwork fosters a sense of responsibility and collective honor. Simultaneously, it strengthens simulation software operation and data analysis skills to enhance professional competence; and sets high-intensity practical tasks to hone students' willpower and develop time management and self-discipline abilities. Furthermore, it emphasizes the comprehensive application of interdisciplinary knowledge to broaden students' knowledge base; and organizes participation in transportation conferences to expand academic horizons. The assessment method combines process-oriented and comprehensive evaluation to fully assess student learning outcomes. Through the implementation of the project, students have significantly improved in knowledge, skills, and competence, laying a solid foundation for their future development.

## *3.2 Innovative Practices in the Project*

### **(1) Cultivating Morality Through Labor and Optimizing the Education System**

The project introduces my country's achievements in automotive simulation technology in the first lesson, inspiring students' national pride; the teaching tells the stories of the older generation of engineers, guiding students to establish correct values. In the practical phase, students work in groups to complete vehicle design or simulation evaluation tasks, cooperating and cultivating a sense of team responsibility;

during the reporting and discussion, they ask each other questions and help each other, enhancing collective consciousness.

#### (2) Enhancing Intelligence Through Labor and Improving Professional Skills

The project includes a course on operating the Catia simulation software, allowing students to master the software's functions and application skills through a combination of theory and practice. Simultaneously, students learn data analysis tools such as Excel and Origin, mastering data processing skills through case studies. In the scientific paper writing phase, students explore innovative points, improving their research and writing abilities.

#### (3) Strengthening the Body Through Labor and Tempering Willpower

During the project implementation, students face high-intensity practical tasks, such as vehicle model construction and simulation analysis, requiring them to complete complex work within a limited time, thus tempering their willpower. Teachers encourage students to actively face difficulties and solve problems by consulting materials and asking others for help. The project requires students to complete tasks within a specified time, thus developing their time management and self-discipline skills.

#### (4) Cultivating Character through Labor and Enhancing Comprehensive Quality

This project involves knowledge from multiple disciplines, allowing students to apply their knowledge comprehensively and broaden their horizons. In the scientific paper writing stage, students utilize various abilities to improve their overall quality. The project arranges for students to attend transportation conferences, learn about cutting-edge industry trends, broaden their academic perspectives, and lay a foundation for future career development.

### **4. Implementation of Course Case Studies Based on OBE Concept Professional Platform Course Segmented Modular Teaching Design**

#### *4.1 Teaching Case: "Innovative Practices in Teaching Automotive Simulation Software Empowered by AI"*

This course emphasizes a student-centered approach, fostering moral character and cultivating well-rounded individuals, while also incorporating disciplinary characteristics and curriculum requirements. Based on solving real-world problems in classroom teaching, it proposes student-development-centered solutions, strengthens the cognitive foundation of digital learning, and focuses on the learning of basic concepts and principles.

In teaching automotive simulation software, students are encouraged to actively participate in interactive and realistic problem-solving processes supported by artificial intelligence technology. This approach not only stimulates students' openness, collaboration, negotiation, and evidence-based action awareness but also, by creating necessary conditions and contexts, allows students to actively engage in practical exploration, achieving contextualized learning.

By enabling students to solve problems proactively, exploratory, and creatively, the course organically combines disciplinary knowledge, academic knowledge, and experiential knowledge both inside and

outside the classroom. It guides them to reflect on the opportunities and challenges that artificial intelligence technology brings to society, fulfill their personal responsibilities and obligations in the digital society, and develop problem-solving awareness and strategies. Ultimately, this teaching process aims to help students develop essential character traits and key abilities, enabling them to become effective technology users, innovative technology designers, and rational technology reflectors.

The case studies, through the deep integration of AI technology, achieve comprehensive innovation in the teaching process. This course utilizes intelligent summarization to automatically generate classroom summaries, improving the efficiency of teaching reflection; interactive bullet comments enhance classroom interest and promote students' in-depth understanding and memorization; intelligent learning companions provide 24-hour Q&A services to support students' self-exploration and practice; personalized learning paths dynamically push suitable resources through knowledge graphs to meet students' individual needs; and the intelligent evaluation system combines process and results to achieve automated scoring and feedback.

#### *4.2 Teaching Case: "Innovative Application of the Five-Step Progressive Teaching Method in Information Retrieval Courses"*

This course is a comprehensive literacy course dedicated to cultivating and improving students' abilities in scientific and technological literature and information resource retrieval and analysis. It primarily uses classroom lectures and retrieval practice projects, requiring students to master specific methods of Chinese literature retrieval systems and to edit appropriate topic search formulas. The course consciously integrates ideological and political elements, promoting the spirit of scientists, inspiring students to be innovative and respectful of science, and cultivating excellent academic ethics and moral character.

The information retrieval course aims to cultivate students' information literacy and self-learning abilities to meet the needs of the information explosion era. The course emphasizes the combination of theory and practice, using case studies and hands-on operations to enable students to master basic information retrieval methods and techniques. Simultaneously, it focuses on cultivating students' innovative thinking and ethical awareness, guiding them to use information resources rationally and systematically. The course is student-centered, encouraging active participation in discussions and practice to improve students' information acquisition, analysis, and application abilities, laying a foundation for lifelong learning and career development.

This course, aligned with Xihang University's strategy for cultivating top-tier innovative talents, adopts a student-centered, problem-based approach, employing Project-Based Learning (PBL). Through group discussions, students independently collect information and identify and solve problems. Case studies are used to enhance the integration of ideological and political education elements into the scientific literature retrieval course. The course aims to cultivate students' self-learning abilities, literature retrieval skills, and scientific innovation capabilities. Simultaneously, it integrates information ethics, information laws and regulations, and scientific spirit into the curriculum, comprehensively improving students' information literacy and cultivating innovative talents with cognitive skills, critical thinking, and a

problem-solving mindset. This teaching case optimizes the teaching process of the information retrieval course through the innovative application of a “five-step progressive” teaching method. As shown in the diagram, the course guides students’ practical growth through objectives, systematically guiding them from the beginning to the end of the course using a five-step teaching process—initial contact, trial contact, connection, optimization, and continuation. Each step is accompanied by corresponding teaching and student activities, ensuring full student participation and practice in all stages: clarifying tasks, developing plans, executing tasks, evaluating and improving, and summarizing and reflecting. Furthermore, the emotional trajectory tracking documented the students’ emotional changes from confusion and anxiety to curiosity and positivity, then to challenging themselves and striving, ultimately achieving a sense of accomplishment and confidence, reflecting the students’ growth path throughout the course. This teaching case not only enhanced students’ information retrieval skills but also fostered their teamwork and self-learning abilities, laying a solid foundation for cultivating high-quality information retrieval professionals.

## 5. Conclusion

This paper delves into the practice and innovation of labor education in automotive engineering programs at universities. By analyzing existing problems in current teaching, it proposes targeted teaching design schemes, including project implementation processes and innovative practices, emphasizing the comprehensive educational goal of cultivating morality, intelligence, physical fitness, and character through labor. The implementation of a segmented, modular teaching design course case study demonstrates the successful application of two specific teaching examples, verifying the effectiveness of innovative teaching methods in enhancing students’ comprehensive qualities. These practical results not only provide valuable references for teaching reform in automotive engineering programs but also offer insights for other majors to conduct labor education and teaching innovation, contributing to the in-depth development of labor education in universities and cultivating more high-quality talents who meet the demands of the new era.

## Projects

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