

# Research on the Teaching Reform of Vehicle Engineering Job Internship Based on the Industry-Education Integration

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# Abstract

Job internship is a necessary practical link for the cultivating of high-level applied talents in the field of vehicle engineering. In view of the current problems in job internships, such as insufficient integration between universities and enterprises, single management mode, and simple evaluation method, this article explores and studies the teaching of vehicle engineering job internship from the aspects of talent cultivation mode construction, teacher team construction, internship content reconstruction, ideological and political element mining, and evaluation method formulation. The results indicate that the undertaken teaching reform can effectively enhance the teaching quality of post-practice and improve students' professional skills. These explorations and practical experiences in reforming the internship program can also serve as a reference for similar professional job practice.

# **Subject Areas**

Mechanical Engineering

#### **Keywords**

Integration of Industry and Education, Vehicle Engineering, Job Internship, Project Based Teaching Contents

# **1. Introduction**

Job internship is an important practical stage for students majoring in vehicle engineering to initially develop their engineering abilities. The fundamental goal is to cultivate and exercise their practical work abilities. The teaching quality of job internships will directly affect the quality of talent cultivation in this field [1]. The internship teaching at Shanghai University of Engineering Science is generally arranged in the sixth semester, and students have about two months of on-site internship in enterprises. At this stage, students have basically completed the study of professional basic courses and core courses, and have a certain level of professional technical foundation and operational ability [2]. The establishment of internship courses provides a necessary way for the cultivation of applied composite talents in the field of vehicle engineering. Through specific job positions in enterprises, students can cultivate their engineering awareness and thinking, promote their more flexible application of professional theoretical knowledge, and enhance their confidence in future interviews and job applications. Job internship can achieve the effect of practical exercises and have a positive promoting effect on the growth of students into qualified engineering and technical talents [3] [4].

#### 2. Current Situation of Internship in Vehicle Engineering

With the increase in the number of students majoring in vehicle engineering, the off-campus internship mode has gradually evolved from a unified arrangement in the past to a more diversified mode, with the individual wishes of students as the dominant factor, achieving a two-way choice between students and enterprises. However, the teaching effectiveness of job internships is not always as sa-tisfactory as expected, mainly due to the following issues [5] [6].

#### 2.1. Insufficient Integration between Universities and Enterprises

In the current internship, due to the lack of effective cooperation mechanisms between universities and enterprises [7], the connection between universities and enterprises is not deep enough, making it difficult to establish a stable cooperative relationship. In the process of formulating internship training plans, universities often follow the model of theoretical courses within the school, lacking substantive participation and guidance from enterprises, resulting in an incomplete understanding of the training objectives of internships by enterprises [8], and not caring about how to cultivate students' engineering practical abilities. In addition, when enterprises arrange internship positions and work tasks for students, they always concern about the students' personal safety and the enterprise's production progress, so they often assign some simple and repetitive tasks to the students. These job positions are sometimes not related to the student's major, resulting in the student's internship experience not fully reflecting their learned knowledge. This not only prevents students from truly participating in the actual work of the enterprise, but also prevents the enterprise from discovering potential talents from interns, causing certain losses to both the school and the enterprise.

#### 2.2. Monotonous Internship Management Model

In job internships, students are assigned to different companies and positions,

and university mentors establish contact with students through Chaoxing teaching platforms and WeChat groups. However, students rely on the supervision of enterprises in their daily internships, making it difficult for university mentors to pay full attention to and guide students throughout the entire process [9]. Meanwhile, due to the fact that enterprises usually have their own production tasks and work arrangements, guiding internships is not the main content of their work, so they cannot provide students with real-time comprehensive guidance. This leads to many students being unable to receive timely answers and assistance when encountering difficulties and doubts during the internship process. In addition, due to the lack of regular communication mechanisms between universities and enterprises, universities are unable to fully understand students' internship performance, job completion status, and existing problems.

### 2.3. Difficulty in Implementing Process Evaluation

At present, the main basis for internship evaluation is the internship certificate, internship report, and internship diary provided by students, and there is no specific evaluation method for the actual performance of students during the internship process, which inevitably leads to unreasonable evaluation results of student internships [10]. In addition, job internships are usually arranged at the end of the second semester of the third year of university. At this time, many students spend their energy preparing for postgraduate entrance exams, going abroad, and job seeking, and do not fully devote themselves to off-campus internships. Some students have the phenomenon of compiling internship records and plagiarizing internship reports. In this situation, relying only on internship records, reports, and other materials to evaluate internships cannot truly reflect the student's internship situation, which can easily lead to student contempt and a perfunctory attitude towards internships. If a company accepts such interns, it will inevitably feel disappointed with their work attitude, which may lead to the company's unwillingness to accept more interns, thereby affecting the internship opportunities for subsequent students and adversely affecting the reputation of the university.

#### 3. Researches on the Reform of Internship Teaching

# **3.1. Construct a Talent Cultivation Method for University** Enterprise Integration

Relying on modern industry, we will jointly build "courses, teams, and bases" with automobile enterprises, and build a collaborative education mechanism of "internship plan consultation—teaching resource sharing—internship base coconstruction—career planning co-guidance—internship quality feedback" [5]. Regular exchanges and discussions between universities and enterprises, sorting out typical job types [11], determining an annual internship task list, and developing an annual internship plan. Under the university-enterprise collaborative education mechanism, universities and enterprises work closely together to determine the knowledge, skills, and quality requirements that graduates majoring in vehicle engineering should possess based on the "output-oriented" engineering education concept and the engineering needs of enterprises. According to these requirements, both universities and enterprises jointly develop internship teaching content and internship training programs. During the implementation of internships, industry and enterprise experts are regularly invited to review and revise the training programs, ultimately forming a professional training plan for vehicle engineering internships. Continuous improvement is made during implementation to ensure the cultivation of applied talents that meet the needs of the automotive industry.

# 3.2. Universities Enterprise Collaboration to Build a High-Level Teaching Staff

The university and the enterprise construct a combined full-time and part-time teaching staff by hiring part-time teachers from enterprises, collaborating on research projects, and assigning teachers to work in enterprises. The research direction of university mentors covers various fields of product development, including product design, processing and manufacturing, quality control, simulation, testing, etc. They have a solid foundation in professional knowledge, are familiar with industry development trends and new technologies, and can effectively answer students' questions in different fields and positions, ensuring good practical teaching quality. Excellent enterprise engineers and managers are invited to serve as enterprise mentors for vehicle engineering internships. By regularly organizing teaching and research activities, and exchanging teaching experiences and teaching contents, a flexible teaching team consisting of university teachers, enterprise experts, and engineers is established.

## 3.3. Universities Enterprise Collaboration to Build Job Internship Contents

Following the talent cultivation philosophy of "diligence and sincerity, thick learning and application" and the educational positioning of "high-quality applied innovative talents" in our university, the Vehicle Engineering major cultivates high-level engineering applied talents, enabling them to have knowledge and abilities in the fields of vehicle and component design, manufacturing, research and development, testing, quality control, etc. Through corporate visits or expert symposiums, we conducted research on the professional field of vehicle engineering and job capabilities, gaining an in-depth understanding of the real needs of enterprises. Both universities and enterprises jointly identified five typical job types and typical work contents for internship positions. Following the basic approach of "position—work tasks—professional abilities" [12], organize the teaching and practice of job internships with work tasks as the main line, and promote project-based curriculum reform [13], as shown in Table 1. According to the different stages of the internship, the course content is divided into four modules: internship preparation, job recognition, work practice, and report

summary. Module one enables students to understand the internship plan and requirements. Module two enables students to understand corporate culture and regulations, understand job positions, and are able to develop work plans. Module three uses real enterprise projects as carriers to break down projects into specific job responsibilities and rotate students among different positions. Module four involves summarizing and analyzing the problems encountered during the internship and making continuous improvements.

Modules	Teaching projects	Teaching tasks	Teaching contents	
Internship preparation	Project 1: Internship mobilization	Task 1: Internship Awareness	Internship plan, management, discipline, and assessment methods	
	Project 2: Safety education	Task 1: Safety production rules and regulations	Basic knowledge of safety, safety regulations and rules	
		Task 2: Basic knowledge of laws and regulations	Laws and regulations related to job internships	
	Project 3: Basic professional knowledge	Task 1: The current situation of the automotive industry	The current development status and trends of the automotive industry	
		Task 2: Comprehensive Basic Professional Knowledge	Basic knowledge of product design, manufacturing, testing, etc	
Work cognition	Project 4: Get to know internship companies	Task 1: Understand the basic information of the enterprise	Corporate culture, organizational structure, business philosophy	
		Task 2: The rules and regulations of the enterprise	Code of conduct and regulations for interns	
	Project 5: Get to know internship positions	Task 1: Job responsibilities and tasks	Job scope, workflow, and task requirements	
		Task 2: Develop a work plan	Development of work plan	
Work practice	Project 6: Design and development positions	Task 1: Automotive component design	Modeling, calculation, and documentation of components	
		Task 2: Structural analysis of automotive components	Strength analysis of key components and preparation of analysis report	
		Task 3: Automotive component design verification	Design process and result proofreading, drawing verification	
	Project 7: Manufacturing process positions	Task 1: Automotive component process design	Process flow design, process card, tolerance analysis	
		Task 2: Process Control of Automotive Parts	Process inspection supervision, production data analysis, and process improvement	
	Project 8: Quality management positions	Task 1: Automotive component quality planning	Quality review standard development, planning report preparation, and document management	
		Task 2: Process quality inspection of automotive components	Process inspection standard development, process inspection, and process inspection records	

Гаble 1. Proje	ct based 1	teaching o	content f	for job	internships.
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	Project 9: Experimental	Task 1: Automotive component testing	Test plan development, equipment usage, data analysis, and report preparation	
and testing positions Project 10: Business management positions	Task 2: Testing equipment maintenance	Equipments maintenance, inspection checklist completion		
	Project 10: Business management positions	Task 1: Production and operation management	Compilation of production and operation plans and statistical reports	
		Task 2: Human resource management	Employee change handling, recruitment management, attendance management, and file management	
		Task 3: Production site management	Implement 5S management on the production site and maintain it	
Report and Summary	Project 11: Report writing	Task 1: Engineering project analysis	From any perspective, conduct a specific analysis of a certain work task during the internship	
		Task 2: Internship Summary Report	Write a summary report based on daily internship records	
	Project 12: Report defense	Task 1: Internship Report PPT	Internship report PPT writing	
		Task 2: Internship Report and Defense	Internship summary report and defense	

# 3.4. Integrating Ideological Literacy Education to Achieve All-Round Education

Internship is the core course that supports the comprehensive development of "knowledge, ability, and quality" in the cultivation of engineering and technological talents in vehicle engineering. In order to facilitate the smooth completion of internships by students, during the teaching process, we deeply explore the elements of ideological literacy, select typical cases around various aspects such as technological development, role models of the times, current affairs hotspots, and bottleneck technology, and form a typical case library. Gradually integrate the basic principles of interpersonal conduct, professional ethics and behavioral norms, scientific spirit and innovative consciousness, ideals and responsibilities into the entire internship process, and achieve the organic unity of moral education and engineering practice education [14].

# 3.5. Construct a Scientific and Reasonable Evaluation Method

The evaluation of the internships should emphasize process management, incorporate ideological literacy assessment assessments, and construct a tripartite evaluation mechanism consisting of universities, enterprises, and students. According to the knowledge, ability, and quality requirements stipulated in the professional training plan and the internship course syllabus, evaluation forms for the school, enterprises, and students are formulated separately based on the principles of scientificity, fairness, and operability, forming a multiple interactive evaluation system [15] for internships as shown in **Figure 1**. Items such as the growth of ideological literacy and the development of key abilities are added to the indicator system to enrich the content of evaluation. The evaluation subjects have also been changed from the original single evaluation by in-school mentors to a combination of enterprise mentors, in-school mentors, and self-evaluation by students. Integrating process assessment and outcome assessment to evaluate internships can comprehensively and scientifically reflect the effectiveness of practical and ideological education.



Figure 1. Evaluation of job internship teaching.

# 4. Conclusion

In the curriculum of vehicle engineering, job internship is a key part of achieving the training objectives of the major. Through continuous curriculum construction and reform exploration, the vehicle engineering internship has improved the practical teaching level of teachers through deep integration of industry and education, constructed dynamic and high-quality course resources with cutting-edge and innovative characteristics, and improved the teaching quality of the internship. In the future curriculum reform, it is necessary to gradually promote the active learning mode, adopt MOOCs, case-based, and project-based teaching methods, and make students the protagonists and active participants in teaching. Deeply explore excellent cases and typical deeds in the production process of enterprises, and continuously improve the ideological literacy of students. Deeply explore excellent cases and typical stories in the production process of enterprises, and continuously improve the ideological literacy of students.

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#### **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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