



Research on Teacher Training of Industry-University Cooperation in Automobile Electronic Control

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Abstract. Construction of high-level teachers plays a significant role in promoting the development of universities, this paper analyzed the necessity of implementing the teacher training of automobile electronic control specialty, including the needs of automobile economic development, automobile enterprise development and university development. Then the construction path of high-level teachers in automobile electronic control specialty was put forward, including improving the practical ability and comprehensive quality of teachers, improving the evaluation system of teachers, encouraging automobile electronic control specialty teachers to study in automobile enterprises, strengthening the construction of teachers' morality and style, and improving the teacher training mechanism. Finally, in order to evaluate the effect of this teacher training of automobile electronic control, teachers' self-evaluation questionnaire, theoretical knowledge and on-site practical ability test were adopted to evaluate the teachers with and without teacher training. The results showed that teacher training has improved teachers' teaching interest and improved teachers' theoretical knowledge and practical ability.

Keywords: industry-university cooperation, collaborative education, teacher training, automobile electronic control, theory and practice

1 Introduction

In order to promote the reform of talent training in universities, the Ministry of Education has put forward the project of cooperation between industry and university, which promotes the organic connection between talents and industry through the methods of government building, enterprise support and university docking, and improves the quality of talent training with the latest needs of industrial and technological development. The collaborative education project of industry-university cooperation includes six research contents: teacher training, new engineering construction, reform of teaching content and curriculum system, construction of practice conditions and off-campus practice base, innovation and entrepreneurship education reform, and innovation and entrepreneurship joint fund. Among them, the teacher training project is one of the most important research contents in the cooperative education project of industry-university. Excellent college students need to master solid professional knowledge and basic skills,

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have a strong sense of comprehensive innovation, work independently, and have a high sense of social responsibility and good cultural literacy [1-3]. To cultivate excellent college students, we must cultivate a team of teachers with both theoretical and practical teaching abilities. Teacher training plays a vital role in the development of teachers and universities. Universities should strengthen the construction of teaching staff and improve the professional quality and teaching level of teachers, which is of great significance for cultivating talents that meet the needs of society, promoting the discipline construction of schools and enhancing the overall competitiveness of schools [4-6].

In order to realize the talent training goal in the field of automobile electronic control, teachers of mechanical engineering college of Jinan University need to solve the problem of cultivating innovative ability and practical ability, and the key to solve this problem lies in the cultivation and construction of "double-qualified" teaching team. Shandong Xingyuan Intelligent Network Technology Co., Ltd. launched a collaborative education project of industry-university cooperation. Especially in the teacher training program, they focus on the current technical hotspots in the automotive electronic control industry, and help improve the technical and curriculum construction level of front-line teachers. Teachers related to automotive electronic control in the school of mechanical engineering actively participated in the teacher training project of Shandong Xingyuan Intelligent Network Technology Co., Ltd., with complementary advantages. In the direction of vehicle engineering and automotive electronic control, the automotive electronic theory possessed by college teachers can promote the research and further promotion of related automotive electronic control equipment of Shandong Xingyuan Intelligent Network Technology Co., Ltd. But, it is a shortcoming for teachers to apply the scientific research results of automobile electronic control to teaching so as to improve students' innovation and practical ability, which is the advantage of Shandong Xingyuan Intelligent Network Technology Co., Ltd.. This teacher training project closely focuses on the knowledge of automobile electronic control, which provides important help to improve the practical teaching level of front-line teachers and also promotes the theory of automobile electronic control in enterprises.

2 Problems in the Construction of Teaching Staff of Automobile Electronic Control Specialty

The level of universities largely determines the quality of their personnel training. High-quality teachers are an important pillar of universities. At present, there are still the following problems in the construction of teaching staff of automobile electronic control specialty, as shown in Figure 1.

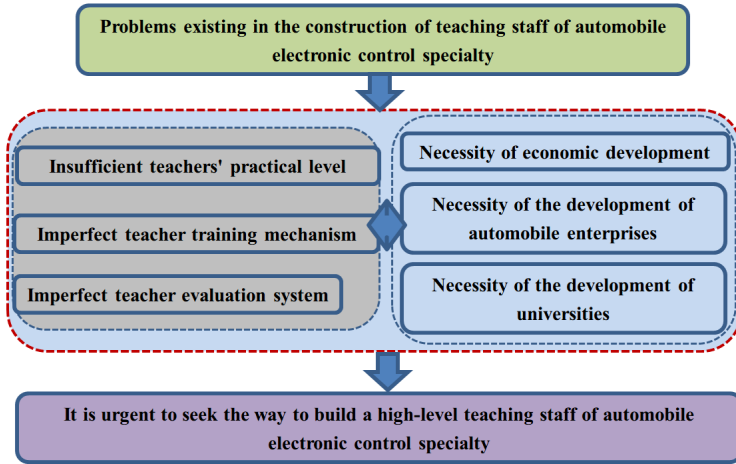


Fig. 1. Contradiction between demands and problems in construction of teaching staff of automobile electronic control specialty.

2.1 Lack of Practical Level of Teachers Majoring in Automotive Electronic Control

The structure of teaching staff and the skill level of teachers in automobile electronic control specialty are very important for cultivating students' professional skills. In reality, there are some problems, such as the unreasonable structure of the teaching staff and the lack of teachers' skill level. Some teachers have the advantages of rich teaching experience and strong professional teaching ability, but the integration of practical teaching methods in the teaching process is insufficient, which makes it difficult for them to give effective guidance on automobile practical skills to students, thus affecting the teaching quality of automobile electronic control specialty.

2.2 Imperfection of Training Mechanism for Teachers Majoring in Automotive Electronic Control

It is an important means to improve teachers' teaching level to carry out teacher training for automobile electronic control specialty. In order to improve the skills of automobile electronic control specialty teachers, many universities vigorously carry out teacher training. However, in the process of implementing teacher training, the training content is out of line with the needs of automobile enterprises and the actual teaching needs of automobile electronic control specialty, which leads to the training content can't meet the actual teaching needs of automobile electronic control specialty teachers. The training method is too traditional, and the automobile-related knowledge explained is too old, lacking innovation and pertinence, which affects the enthusiasm and initiative of teachers' training and leads to poor training effect.

2.3 Imperfection of Evaluation System of Teachers Majoring in Automotive Electronic Control

A sound evaluation system can effectively improve the teaching level and skills of automobile electronic control specialty. However, many evaluation systems are not perfect, and the corresponding supervision and management mechanism can't be formulated according to the actual needs of strengthening the teaching staff of automobile electronic control specialty. The evaluation index design of automobile electronic control specialty teachers is too simple, and the evaluation results are often not comprehensive, which can't fully reflect the teaching level and practical ability of teachers.

3 Necessity of Implementing Teacher Training of Industry-University Cooperation and Collaborative Education in Automobile Electronic Control Specialty

3.1 Need of Automobile Economic Development

The development of automobile economy needs the support of new technologies and theories, which need the research and application of vehicle-related technicians. In the process of automobile economic development, vehicle technical innovation promotes economic development, and economic development in turn promotes vehicle technical innovation. Only by combining with enterprises to carry out teacher training for automobile electronic control specialty can we cultivate a team of technical innovative teachers who meet the needs of automobile industry development.

3.2 Necessity of the Development of Automobile Enterprises

With the intensification of international competition, automobile enterprises are facing increasing pressure. In order to maintain their core competitiveness, automobile enterprises must attach importance to their own human resources. And the most fundamental thing is to increase the introduction of talents, which is mainly to recruit graduates majoring in automobile electronic control in universities. In order for graduates to have rich knowledge of automobile design theory and practical experience in automobiles, it requires that the teaching teachers of automobile electronic control specialty must have rich practical experience in enterprises.

3.3 Necessity of University Development

Teachers are not only disseminators of theoretical knowledge, but also researchers and pioneers of theory and technology. The knowledge dissemination of teachers majoring in automobile electronic control shows the soft power of universities in this discipline, while the scientific research achievements of teachers majoring in automobile electronic control are the hard power of the school, which indicates the scientific research ability of the school in the direction of automobile electronic control. Only by going

deep into automobile manufacturing enterprises and entering automobile production workshops can teachers truly understand the current status of automobile technology and master the application of automobile technology. And teachers can improve their technological ability and integrate new technologies into the teaching of automobile electronic control specialty and the training of employees in automobile enterprises. The construction of universities needs comprehensive teachers, and in the direction of automobiles, it needs high-level teachers of automobile electronic control specialty.

4 Construction Path of High-Level Teachers in Automobile Electronic Control Specialty

Based on the problems existing in the construction of teaching staff of automobile electronic control specialty in the background of application-oriented society, universities should actively explore the deep cooperation between schools and enterprises, unite with automobile enterprises, explore effective paths for the construction of teaching staff, and improve the training quality of skilled talents of automobile electronic control specialty. The specific construction path of high-level teachers in automobile electronic control specialty is shown in Figure 2.

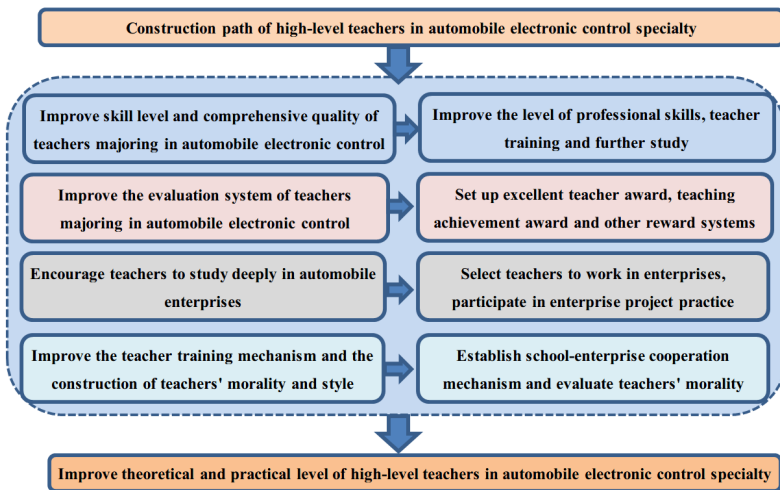


Fig. 2. Construction path of high-level teachers in automotive electronic control specialty.

4.1 Improve the Skill Level and Comprehensive Quality of Teachers Majoring in Automotive Electronic Control.

Strengthening the training of teachers is an effective way to improve the skill level of teachers majoring in automobile electronic control. The construction of teaching staff of automobile electronic control specialty needs to pay attention to unreasonable structure of teaching staff and insufficient practical teaching ability. Teachers need to

constantly improve their professional skills to meet the needs of the development of automobile industry. Therefore, strengthening the training and further study of teachers majoring in automobile electronic control is the basis for improving the level of teachers. Schools can regularly organize training courses related to automobile electronic control specialty, invite experts from automobile industry to teach teachers, and improve the professional and skill level of automobile electronic control professional teachers. At the same time, the school can also encourage teachers to participate in various advanced courses of automobile electronic control specialty to improve their academic level.

4.2 Improve the Evaluation System for Teachers Majoring in Automotive Electronic Control and Establish an Incentive Mechanism.

It is necessary to improve the evaluation system and establish the incentive mechanism for the teachers of automobile electronic control specialty. Through the establishment of incentive system, the enthusiasm and initiative of improving the quality of teachers majoring in automobile electronic control can be improved, and the level of teachers can be effectively improved. To establish an incentive mechanism, it is necessary to give priority to rewards. Schools can set up reward systems such as excellent teacher award and teaching achievement award to commend and reward outstanding teachers of automobile electronic control specialty. These measures can enhance the enthusiasm of teachers to actively strengthen their teaching ability, enhance the sense of honor of "double-qualified" teachers, optimize the effect of school-enterprise cooperation, and improve the level of teachers of automobile electronic control specialty.

4.3 Encourage Teachers Majoring in Automobile Electronic Control to Study Deeply in Automobile Enterprises.

Automobile enterprises are the main employment places for students majoring in automobile electronic control. In order to narrow the gap between education and the actual job requirements of automobile enterprises, personnel training should be closely combined with the needs of automobile enterprises. Therefore, strengthening the in-depth cooperation between schools and enterprises and improving the teacher training mechanism are effective ways to build a high-level teacher team. Schools can cooperate with automobile enterprises, improve the talent training scheme, optimize the teaching content and improve the teaching methods according to the skills needs and professional quality requirements of actual jobs in automobile enterprises. At the same time, schools and automobile enterprises can jointly carry out teaching and scientific research activities of vehicle specialty. According to the needs of automobile enterprises' projects, combined with teachers' own wishes and scientific research direction, teachers majoring in automobile electronic control are selected to participate in enterprise project practice and improve their practical ability and academic level. The school can also invite senior technicians from automobile enterprises to give lectures and guidance to teachers majoring in automobile electronic control, so as to improve their professional

knowledge and skills, promote the development of "double-qualified" teachers, and enhance their practical teaching level and social service ability.

4.4 Improve the Teacher Training Mechanism of Automobile Electronic Control Specialty.

Universities are encouraged to establish cooperation mechanisms with relevant automobile enterprises in the aspects of enrollment and employment, personnel training scheme formulation and teacher team construction. Automobile enterprises should deeply participate in the process of high-quality education development, especially in the process of training teachers of automobile electronic control specialty. It is necessary to highlight the dual-subject training of schools and automobile enterprises, improve the training mechanism of teachers, ensure the full participation of teachers.

4.5 Strengthen the Construction of Teachers' Morality and Style of Automobile Electronic Control Specialty.

Teachers of automobile electronic control major should complete the fundamental task of cultivating students. As a guide for students, teachers have an important influence on the growth and development of students. Schools can organize teachers majoring in automobile electronic control to participate in various forms of activities to build teachers' morality and style, guide teachers to establish a correct concept of education, and enhance their sense of responsibility and mission. At the same time, the school should also establish a strict assessment mechanism of teachers' morality and style to assess and evaluate the teachers' morality and style, so as to ensure the overall quality of the teachers' team of automobile electronic control specialty.

5 Self-Evaluation and Test of Teachers on Training Program of Automobile Electronic Control

5.1 Self-Evaluation of Teachers

The teacher training project carried out by the School of Mechanical Engineering of Jinan University and Shandong Xingyuan Intelligent Network Technology Co., Ltd. is mainly to improve teachers' theoretical knowledge and practical ability. In order to test the effect of teacher training, ten teachers who participated in the teacher training were selected to conduct a self-evaluation questionnaire survey. Questionnaire survey includes the improvement of theoretical knowledge, disassembly and assembly ability, operation ability of automobile electronic control, etc., to evaluate teachers' achievement of theoretical knowledge and practical ability. 10 self-evaluation questionnaires were distributed and 10 were collected. The results of teachers' self-evaluation are shown in Table 1.

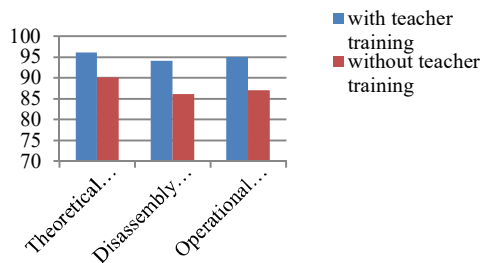
Table 1. Teachers' self-evaluation of theoretical knowledge and practical ability of automobile electronic control.

Project	Very helpful	Generally helpful	No help
Increasing analysis ability	9	1	0
Grasping theoretical knowledge	8	2	0
Increasing teaching interest	10	0	0
Increasing operation ability	9	1	0
Ability to solve problems in automotive electronic control	10	0	0

From the self-evaluation of teachers in Table 1, it can be seen that teachers' teaching interest, theoretical knowledge and practical ability have been improved. This is because, through the teacher training of industry-university cooperation, teachers go deep into enterprises to investigate and learn, learn more new things of enterprises, and improve their interest in teaching. At the same time, they have a deep understanding of the manufacturing process of electronic control equipment, and their theoretical knowledge and practical ability have been improved, so that in the teaching process, they can combine theory with practice and bring more examples into classroom, and students' interest in learning, theoretical level and practical ability have also been improved.

5.2 Teachers' Theoretical Level and Practical Ability Test

In order to test teachers' mastery of theoretical knowledge, disassembly and assembly ability and operation ability of automobile electronic control, test papers and on-site practical ability tests were taken to evaluate 10 teachers with teacher training and 10 teachers without teacher training. The test results are shown in Fig. 3.

**Fig. 3.** Test results of teachers' ability with and without teacher training.

As can be seen from Fig. 3, the teachers who participated in the teacher training scored more than 90 points, which was significantly higher than that of teachers without teacher training, in the theoretical knowledge, the disassembling ability and operating ability of the electronic control system. Therefore, the teacher training has improved

teachers' theoretical level and practical ability, so that teachers can better impart theoretical knowledge and practical skills to students, thus improving students' ability.

6 Conclusions

Based on the education project of industry-university cooperation about teacher training of automobile electronic control, this paper puts forward the construction path of high-level teachers' team in automobile electronic control specialty, including improving the practical ability and comprehensive quality of teachers, perfecting the evaluation system of teachers, encouraging teachers to study in automobile enterprises, strengthening the construction of teachers' morality and style, and perfecting the training mechanism of teachers in automobile electronic control specialty. Finally, in order to evaluate the effect of this teacher training, teachers' self-evaluation questionnaire, theoretical knowledge and on-site practical ability test were adopted to evaluate the teachers with and without teacher training. The results showed that teacher training has improved teachers' teaching interest and improved teachers' theoretical knowledge and practical ability. This is of great significance to cultivate talents who meet the needs of society, promote the discipline construction of the school and enhance the overall competitiveness of the school.

Acknowledgments

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References

1. Liu Y., Yan S.Z., Yin H., Exploration and practice of collaborative education mode inside and outside the school based on new engineering [J]. *China University Teaching*, (4), 13-16 (2021).
2. Lin J.C., Li W.Z., Shi W.Q., etc., Construction of a new teacher training model under the background of cooperation in Industry-University-Research [J]. *Mold Manufacturing*, (10), 64-67 (2023).
3. Chu F.J., Ouyang X.D., Research on the integration of teacher training in colleges and universities under the background of coordinated development of education in Beijing, Tianjin and Hebei [J]. *Adult Education in China*, (23), 155-157 (2018).
4. Kapsung, Kim, Review of Research Trends Related to the Reform of the Teacher Training System [J]. *Korean Journal of Teacher Education*, 37 (1), 49-67 (2021).
5. Zhang G.Q., Guo L., Xiang Y.H., Practical teaching paradigm of training new engineering talents with dual talents [J]. *Exploration of Higher Education*, (8), 55-60 (2018).
6. Sassi E., Monroy G., Testa I., Teacher training about real-time approaches: Research-based guidelines and training materials [J]. *Science Education*, 89(1), 28-37 (2005).

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