Education Reform and Development, 2026, Volume 8, Issue 6
https://ojs.bbwpublisher.com/index.php/ERD
Online ISSN: 2652-5372
Print ISSN: 2652-5364

Analysis of Paths for Artificial Intelligence Technology to Improve the Quality of Vocational Undergraduate Automotive Education

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Abstract: The new energy vehicle industry is a strategic emerging industry in China, and the demand for interdisciplinary skilled talents is increasingly urgent. The country is vigorously promoting artificial intelligence to drive educational reform, which has opened up a new track for the teaching innovation of automotive majors in colleges and universities. Combining the development needs of the automotive industry and the characteristics of vocational undergraduate education, this paper analyzes the necessity of artificial intelligence technology empowering vocational undergraduate automotive education, sorts out the practical problems existing in current applications, and puts forward specific practical paths from the perspective of actual teaching implementation. It is expected to provide useful references for the high-quality development of vocational undergraduate automotive education with the help of artificial intelligence technology.

Keywords: Artificial intelligence technology; Vocational undergraduate; Automotive education; Quality improvement; Talent cultivation

Online publication: July 20, 2026

1. Introduction

The automotive industry is a core part of China's strategic emerging industries. It is currently undergoing a comprehensive transformation from traditional fuel vehicle manufacturing to new energy vehicles and intelligent connected vehicles. Technologies such as autonomous driving, intelligent cabins, and vehicle-road coordination have become the mainstream of industrial development. Vocational undergraduate education is a new education system proposed to adapt to the shortage of high-level skilled talents in China, aiming to cultivate high-level technical and skilled talents. The "Outline of the Plan for Building a Leading Country in Education (2024–2035)" issued by the state clearly proposes to implement the education digitalization strategy and promote artificial intelligence to drive educational reform. Based on the school-running positioning and talent training goals of vocational undergraduate automotive education, this paper analyzes the feasible paths for artificial intelligence technology to improve education quality from the actual teaching operation level,

so as to help cultivate high-quality interdisciplinary talents suitable for the development of the intelligent automotive industry.

2. Practical necessity of AI empowering vocational undergraduate automotive education

2.1. Intelligent transformation of the automotive industry forces the upgrading of talent training

Intelligent connected vehicles integrate artificial intelligence technologies such as sensors, deep learning, edge computing, and big data analysis, which have fundamentally changed the post-structure of the automotive industry. Demand for basic posts such as traditional vehicle maintenance and mechanical assembly has decreased, while engineer posts such as intelligent system calibration and Internet of Vehicles operation and maintenance have increased rapidly. The training goal of vocational undergraduate automotive education is high-level technical and skilled talents, requiring students to not only master the core technologies of new energy vehicles, but also have the ability to apply artificial intelligence technology, process vehicle data, and troubleshoot faults of vehicle intelligent systems [1]. The integration of artificial intelligence technology into automotive education is an inevitable choice for vocational undergraduate colleges to keep up with industrial transformation and cultivate talents suitable for post needs. Students can master cutting-edge industrial technologies in advance and improve their employment competitiveness.

2.2. Internal requirement for the digital transformation of vocational undergraduate education

Vocational undergraduate education emphasizes the integration of practical ability and innovative ability, and improving school-running quality through digital transformation has become the pursuit of colleges and universities. As the core tool of education digitalization, artificial intelligence technology can solve the problems of low teaching efficiency, uneven resource allocation, and insufficient personalized training in vocational undergraduate automotive education. Vocational undergraduate automotive education should conform to the trend of education digitalization, apply artificial intelligence technology to teaching, and promote the transformation of education mode from “standardization” to “personalization” and from “theory-led” to “integration of theory and practice”.

2.3. Key means to solve the practical pain points of traditional automotive education

Traditional vocational undergraduate automotive education faces many pain points. In particular, the procurement cost of new energy vehicle training equipment is high, so it is difficult for schools to provide sufficient equipment for students’ practical operation. In addition, the practical training of automotive majors has potential safety risks. For example, in high-voltage training, improper operation by students may cause electric shock, equipment damage and other safety problems. In addition, the teaching mode is homogeneous. Teachers usually adopt a unified teaching process and content, but students have different foundations and abilities, so their learning requirements are naturally different. Artificial intelligence technology can solve the above teaching problems through virtual simulation, data monitoring, intelligent evaluation and other

functions, and improve the quality and efficiency of education and teaching [2].

3. Existing problems in the application of AI technology in vocational undergraduate automotive education

3.1. Superficial integration of the curriculum system and AI technology, teaching content out of line with industrial reality

Vocational undergraduates have been offered new majors such as new energy vehicle engineering technology and intelligent connected vehicle engineering technology, but the application of artificial intelligence technology in professional teaching remains superficial [3]. For example, after explaining intelligent diagnosis and Internet of Vehicles, there is a lack of practical operation projects and algorithm application training. In addition, enterprise technology updates and iterates rapidly, while the curriculum system updates slowly. What students learn is difficult to connect with the latest working scenarios and technical requirements of enterprises.

3.2. Unbalanced combination of virtual and reality in practical teaching, formal application of intelligent training

Most virtual training platforms for automotive majors in vocational undergraduates present fixed scenarios and tasks, while the actual working conditions of enterprises are more complex. Some colleges adopt basic simulation software without upgrading the training platform with generative artificial intelligence and digital twin technology, resulting in solidified training scenarios and operation processes [4]. In addition, some colleges rely too much on virtual training and replace physical practice with virtual operation, which leads to students' insufficient cognition of real vehicle structure and equipment feel, and their practical operation ability and problem-solving ability are difficult to train [5].

3.3. Insufficient ability of teachers in AI-integrated teaching, difficulty in implementing practical teaching

Most teachers of automotive majors in vocational undergraduates graduate from traditional majors such as vehicle engineering and electrical engineering. Their knowledge system focuses on mechanical and electrical fields, and their mastery of the principles, application tools and teaching integration methods of artificial intelligence technology needs to be improved [6]. Some teachers can only use basic simulation software, cannot carry out data-driven teaching with the help of intelligent teaching platforms, and cannot integrate artificial intelligence technology into practical training and curriculum design [7]. In addition, some teachers lack opportunities to practice in intelligent automobile enterprises, so it is difficult to carry out the integrated teaching of "artificial intelligence + automotive majors".

4. Specific teaching implementation paths for AI technology to improve the quality of vocational undergraduate automotive education

4.1. Accurately grasp the learning situation with AI and implement layered teaching with integrated theory and practice

Teachers can directly integrate artificial intelligence technology into daily classroom teaching. The intelligent teaching platform can analyze the learning situation, push personalized resources for students, and realize human-computer interaction to assist students' learning.

In classroom teaching, teachers can first collect students' preview data, historical scores and homework completion through the intelligent platform. The platform generates a knowledge mastery portrait for each student through big data analysis [8]. According to the analysis results of the platform, teachers adjust the focus of classroom explanation, focus on common problems and answer individual questions separately. The platform can also automatically push differentiated learning resources for different students to meet the learning needs of students with different backgrounds.

In the integrated theory and practice class, teachers can integrate AI diagnosis tools into theoretical explanations. For example, when teaching the course of automobile fault diagnosis, teachers connect intelligent diagnosis equipment on site, collect vehicle operation data, analyze data characteristics in real time through AI algorithms, and synchronously explain the judgment logic of faults [9]. Students can follow the teacher's operation, view data visualization results on their terminals, and understand the application method of theoretical knowledge in practical operation. The AI teaching assistant can also answer students' questions in real time, supplement operation steps, and reduce the teacher's tutoring pressure. For example, in the practical operation of high-voltage harness connection, teachers can use AI tools to monitor the standardization of students' operations. When students operate non-standard, AI will remind them in time to guide them to complete the practical operation.

4.2. Create immersive, safe practical training based on generative AI + digital twin

Practical teaching is the core link of vocational undergraduate automotive education. The combination of artificial intelligence and virtual simulation technology can solve the problems of high training cost, high safety risk, and a single scenario, allowing students to complete high-quality practical training in an immersive environment.

Relying on generative artificial intelligence technology, teachers build a dynamic virtual training platform, which can automatically generate different fault scenarios according to teaching needs [10]. For example, when carrying out high-voltage battery pack training, the platform can randomly generate faults such as excessive voltage difference of a single cell, failure of the thermal management system, and low insulation resistance. It can also simulate composite faults under real working conditions, such as fast charging of online car-hailing and low-temperature environments. Students wear VR devices to enter the virtual scene and complete fault troubleshooting, component detection, parameter debugging, and other operations in accordance with post-standard processes.

During the training, the platform will monitor students' operation steps in real time. Once there are problems such as illegal operation and wrong parameter setting, it will immediately send an early warning and provide step-by-step guidance [11]. After the training, the platform automatically collects operation data and fault troubleshooting results, generates a training report, and marks students' operation shortcomings. Students can repeat training on weak links according to the report.

4.3. Connect enterprise real scenes with AI and carry out post-adaptive practical training

Vocational undergraduate automotive education should take the opportunity of the construction of intelligent connected vehicle industry colleges, and cooperate with the government, automobile enterprises, research institutes and industry associations to establish an open and innovative industry college, share resources of all parties, build a digital talent training base, and make artificial intelligence a bridge connecting campus teaching and actual post-work of enterprises.

Colleges and universities can cooperate with new energy vehicle enterprises to open the school-enterprise data channel through the AI teaching platform, synchronize digital resources such as enterprise intelligent production lines, cloud diagnosis systems, and Internet of Vehicles operation and maintenance platforms into the classroom. The new technologies, processes and products of enterprise production and R&D are used as teaching resources to break the barriers between campus and enterprises [12]. Relying on the AI platform, teachers can disassemble the actual post tasks of enterprises, such as intelligent system calibration, Internet of Vehicles operation and maintenance, vehicle data processing, and vehicle performance testing, into standardized and process-oriented teaching modules. Students can operate intelligent equipment and software systems consistent with the actual work of enterprises on the platform, and complete practical tasks such as adaptive cruise calibration, radar detection debugging, fault code analysis, and network communication detection.

The AI platform will record students' operation processes, working hours, and standardization in real time in strict accordance with enterprise standards, and score students' operations. At the same time, enterprise technical experts are invited to participate in teaching guidance remotely through the cloud, and give front-line improvement suggestions for problems in students' operations. Students can also simulate enterprise post-rotation training through the AI platform, experience post-work such as fault diagnosis, data statistics, equipment calibration, and system debugging in turn, and be familiar with the post-process and work specifications of the intelligent vehicle industry chain [13]. This teaching mode breaks the barriers between the campus and enterprises. Students master the AI application skills and practical ability required for posts during school, and can quickly become competent for enterprise work after graduation.

4.4. Empower project-based teaching with AI and innovate industry-university-research practice

Vocational undergraduate automotive education focuses on the cultivation of innovative ability and engineering practical ability. Teachers should use artificial intelligence technology to build a hierarchical project-based teaching system, realize intercommunication and mutual employment between schools and enterprises, jointly build a technical innovation platform, and improve students' technological innovation and engineering practical ability.

Colleges and universities cooperate with enterprises and research institutes to integrate industry-university-research resources relying on the artificial intelligence platform, transform the actual topics in enterprise technology R&D and equipment optimization into advanced teaching projects, build a hierarchical project system, consolidate students' basic skills, exercise their comprehensive literacy, and cultivate their innovative ability [14]. Lower-grade students can carry out basic project training, such as vehicle sensor calibration, charging interface detection, and vehicle assembly and debugging. The AI platform provides operation specifications, data reference and real-time guidance for them; Higher-grade students undertake more challenging projects such as vehicle fault solution design, intelligent driving assistance system optimization, and battery performance improvement. Teachers and enterprise engineers guide students to use AI tools to analyze vehicle operation data, simulate technical improvement effects, and verify the feasibility of solutions. At the same time, the AI platform connects with the content of automotive industry skill competitions and vocational skill level certificate assessment, integrates competition projects and certificate examination standards into daily project teaching, realizes the integrated training of post-course-competition-certificate, and improves students' innovative thinking and engineering practical ability [15]. This project-centered teaching mode enables students to exercise their ability to solve complex

engineering problems in the integration of industry-university-research, and comprehensively improve their comprehensive professional literacy.

5. Conclusion

Artificial intelligence technology provides a brand-new technical path for improving the quality of vocational undergraduate automotive education, and is the core means to adapt to the intelligent transformation of the automotive industry and implement the education digitalization strategy. Vocational undergraduate colleges and universities should base their goal on cultivating high-level technical and skilled talents, deeply integrate artificial intelligence technology into classroom teaching, practical training, and post-training, cultivate more high-quality interdisciplinary high-level technical and skilled talents for China's intelligent automotive industry, and help the high-quality development of the automotive industry.

Disclosure statement

The author declares no conflict of interest.

References

[1] Zhao Y, 2025, Research on Strategies for Improving the Teaching Quality of Automotive Professional Courses under the Background of AI Empowerment. Modern Vocational Education, 2025(16): 141–144.

[2] Deng R, Cen S, Ling X, 2025, New Quality Productivity Empowers the Optimization of "Wisdom +" Vocational Undergraduate Automotive Professional Skilled Talent Training System. Automotive Test Report, 2025(07): 97–99.

[3] Sun X, 2025, Research on Vocational Undergraduate Education Mode for the Field of New Energy Vehicle Engineering. Journal of Suzhou Vocational University, 36(01): 18–25.

[4] Li C, 2025, Research on the Development Path of Automotive Professional Vocational Education under the Background of Artificial Intelligence. Auto Time, 2025(03): 73–75.

[5] Zhang C, Li N, 2024, Employment Problems and Countermeasures of Automotive Majors from the Perspective of Vocational Undergraduates. Automotive Pictorial, 2024(11): 191–193.

[6] Zhang J, Wang L, Chen S, et al., 2024, Research on the Training Path of Top-notch Innovative Talents in Automotive Manufacturing for Vocational Undergraduates. Auto & Driving Maintenance (Maintenance Edition), 2024(09): 91–93.

[7] Yang H, Li P, Huang X, et al., 2024, Research on the "Industry-University-Research" Innovative Talent Training System for New Energy Vehicle Engineering Technology Major in Vocational Undergraduates. Modern Vocational Education, 2024(24): 45–48.

[8] Zhang F, 2024, Discussion on the Current Situation and Training Objectives of New Energy Vehicle Professional Talents in Vocational Undergraduates. Internal Combustion Engine & Parts, 2024(14): 146–148.

[9] Wen Y, Su N, Tian F, et al., 2024, Research on Innovative Practical Teaching Strategies for School-Enterprise Cooperation Projects of Automotive Majors in Vocational Undergraduates. Automotive Test Report, 2024(02): 97–99.

[10] Zhang J, Chen S, Li X, 2024, Research on the Training Path of Automotive Manufacturing Talents in Vocational Undergraduates Based on Industry-Education Integration. Automotive Test Report, 2024(02): 103–105.

[11] Fang L, Gao X, Zhao Y, 2024, Analysis on the Implementation Path of Talent Training for New Energy Vehicle

Technology Vocational Undergraduates. Automotive Practical Technology, 49(01): 193–196.

[12] Wang Y, Li P, Xie J, 2023, Innovation and Practice of Automotive Professional Teaching Mode under Digital Transformation. Modern Vocational Education, 2023(36): 118–121.

[13] Zhang Z, Sun X, 2023, Research on Talent Training Program and Curriculum Design of New Energy Vehicle Engineering Technology Major in Vocational Undergraduates. Automotive Maintenance Technician, 2023(12): 100–101.

[14] Niu X, Zhang Y, 2023, Construction of Vocational Undergraduate Curriculum System Oriented by Work Process — Taking New Energy Vehicle Engineering Technology Major as an Example. Vocational Education, 22(13): 3–7.

[15] Wu X, 2022, Research on the New Direction of Talent Training Mode of Automotive Professional Group under the Background of Vocational Undergraduate Education Transformation and Upgrading. Auto Time, 2022(22): 68–70.