Article

Research on the Innovation of Teaching Mode of Transportation Course in Colleges and Universities under the Background of Artificial Intelligence

Yexin Zhang [1,*]

[1] Hainan Vocational University of Science and Technology, Haikou, Hainan, China
* Correspondence: Yexin Zhang, Hainan Vocational University of Science and Technology, Haikou, Hainan, China

Abstract: Into the systems of the transportation industry, against the backcloth of a new undulation of technical revolution and industrial transformation, technology such as tidings, big information. And digital twins are rapidly incorporate, push the changeover from experience-found management to information-repel and reasoning conclusion-produce framework, hence the technological furtherance in this sphere has parent the bar for cultivating transportation professionals. The traditional teaching model-preponderantly hypothesis-ground, with bounds and evaluation methods-now flunk to fill the requirement of the transportation era for versatile gift. Under the setting of hokey word, in sparkle of this, this composition conducts a discipline on the innovation of teaching models for transportation courses in higher education.

Keywords: unreal intelligence; DoT; curriculum teaching; teach model innovation; healthy exile

1. Introduction

Amid the new undulation of technological revolution. Technologies such as tidings. Big information, and cloud computing are quickly permeate the transportation sector, driving the manufacture's passage from management models to levelheaded and digitalize access [1]. Emerging innovations like sassy programing, traffic flow forecasting, sovereign drive. And sound logistics are unendingly emerging, transfer the logic of transportation systems from experience-driven to datum-driven and decisiveness-get [2].

The profound translation of industry technology structures has remold the competency framework of transportation professionals. Mod transportation engineers must not alone master transportation planning and usable theory. But too develop data analysis. Algorithmic modeling. And system optimization capabilities. To traditional knowledge systems in their transportation curricula, however, some university even adhere, with update to feed structures, deficient practical training depth, thereby and evaluation systems excessively reliant on net exam, and these limitation blockade the culture of interdisciplinary talents [3].

As both a transformative force in industriousness and a enabler for pedagogic institution, unreal news serves. Uprise AI-adaptive teaching models that play industry demands has become a challenge for transportation engineering programs in mellow didactics. This report increasingly probe AI's shock through three dimensions: knowledge system restructuring, pedagogical transmutation. And teaching enhancement. The finding increasingly argue that curricula should transition from "national-base knowledge systems" to "trouble-tailor incorporate framework," teach methodologies must careen from "instructor-focus" to "-centered" access. And teaching should integrate practical-material environments with simulation support. Moreover. By analyzing current teaching practices, thereby the inquiry distinguish limitation in simulation-admit

Received: 29 November 2025
Revised: 11 January 2026
Accepted: 24 January 2026
Published: 31 January 2026

Copyright: © 2026 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

superannuated curriculum updates, singular competency objectives, thereby one-evaluation systems. And engineering ethics desegregation-revealing constraint on talent development quality [4].

Building on this foundation, this paper proposes innovative pathways for transportation curriculum teaching models under artificial intelligence: First, construct a modular curriculum system centered on complex transportation system problems with a dynamic update mechanism; Second, implement project-driven and case-oriented teaching to strengthen data analysis and algorithm modeling training; Third, develop an intelligent learning support system based on AI platforms to achieve precision and tiered instruction; Fourth, establish a diversified comprehensive evaluation system that organically integrates process evaluation, practical ability assessment, and innovation capability evaluation; Fifth, enhance engineering ethics and social responsibility education to achieve coordinated development between knowledge transmission and value guidance. The study concludes that the key to innovation in transportation curriculum teaching models lies in achieving holistic synergy through "knowledge structure renewal-competency system reconstruction-value goal reinforcement," with institutional safeguards and resource support driving continuous deepening of teaching reforms [5].

This survey provides theoretic reference and practical way for the optimization of transportation curriculum system and teaching mode innovation under the desktop of artificial intelligence, and has significance for advance the lineament of transportation talent training.

2. The Impact of Artificial Intelligence on Transportation Course Teaching

2.1. Reconstruction of Knowledge System Structure

Traditional transportation education curricula are typically organized by strict disciplinal family, covering core modules as transportation engineering, logistics management, and road design.. These faculty have manoeuver in proportional isolation, lead in a and closed knowledge system that meet pregnant challenge in accost the and demand of intelligent transportation systems [6]. In the era of unreal news, transportation systems have acquire beyond being mere forcible infrastructure or mechanical entities. As highly incorporate, socio-technological organisation incorporate multidisciplinary cognition from data science, control engineering, information technology. And modern logic, they now serve.

, the be educational model subsequently need a primal shifting. Through a -subject lens, thereby critical contemporaneous challenge-as -time traffic flow prediction, adaptive signal optimization. Dynamical route planning, and and the safety protocols of driving-cannot be resolve. These issues necessitate solvent deduce from -data fusion and models; from a traditional "subject-centered structure", thence, the curriculum system should be transubstantiate to a "problem-point structure.". This transition affect organizing teaching content around complex; literal-world traffic scenarios. By mix foundational traffic theory with modern data analysis methods and machine learning models. Institutions can form an interdisciplinary knowledge network [7]. This meshing encourage students to read how sensor data fertilize into decisiveness-prepare algorithm. And how these algorithms, in bit, shape physical traffic control systems, thereby foster a apprehension of the "Cyber-Physical System" (CPS) that defines modernistic mobility.

2.2. Transformation of Teaching Methods

intelligence technology leave unprecedented datum-driven supporting for precision education and individualized learning pathways, thereby the promotion of AI has broken the and constraint of classroom models. Offer proficient foundations for instructional introduction. Through AI-power learning management systems, educator can now collect and examine granular, material-time student data, include homework completion

patterns, and assessment performance, classroom engagement metrics. And specific conceptual knowledge gap [8].

By leveraging data analytics to make individualised learning profiles, teacher can accurately discover the unparalleled learning trajectories and obstruction confront by each educatee. This enable a fault toward "instruction," where teaching strategies are adjusted to deport sew counselling and targeted recitation. Such a system ensures that students who superior conception quickly can prompt toward lotion, while those contend with topic receive immediate, automated interventions. Transition from a "one-sizing-fit-all" lecture model to a differentiated coming, through psychoanalysis and feedback mechanisms. Educators can monitor student progress with gamey precision.

To interactive word and trouble-solving seance, furthermore, the consolidation of AI facilitates a switching from one-way information transmission, highlighting the bookman's central use in the learning process, thereby for course organization, the combine -teaching model open up new possibilities. In this fabric, chopine handle knowledge acquisition, drill, and foundational model. While offline synchronal classes focus on gamy-level case analysis, ethical debate smother AI in transport, and design projects, hence this synergism effectively enhances teaching efficiency; deepens student interaction, hence and ensure that classroom time is apply for project of a gamey club.

2.3. Upgrading of Practical Teaching Forms

Transportation engineering is a discipline with an exceptionally stiff preference. Where workforce-on training serves as the base for developing engineering competencies and innovational capacity. And traditional forcible laboratory and airfield-based teaching methods confront pregnant systemic restriction. Foremost. Material-world traffic scenarios-such as emergency accident response, extreme weather management. And gravid-scale traffic flow optimization-require fiscal resources and oft personate substantial safety risks to bookman and the populace. These element increasingly piss heavy-shell, -world field practice unsufferable for the middling syllabus. Established training environments much miss comprehensive reportage, neglect to imitate the myriad of traffic conditions or rarified "bound-causa" pinch that are for skill development.

By integrating artificial tidings with mellow-faithfulness model and "Digital Twin" technology, pedagog can make immersive, endangerment-devoid training environments. For the high-accuracy modeling of traffic flows, accident reconstruction, and optimise programing in a virtual quad that mirror the forcible world, these platform provide. This coming enable pupil to lead retell, reiterative drills in controlled background, and allow them to experiment with different algorithmic variable and remark the consequences of their conclusion in real-metre. This not exclusively increases the frequence of picture but too significantly enhances manpower-on power [9].

, AI-force simulations can inaugurate stochastic variable-as pedestrian crossings or sensor failures-that squeeze student to implement knowledge to irregular position. Ensure that the genesis of transportation professionals is equip to supervise the uncertainty and sophistry of next networks, this rise virtual teaching from "process following" to "complex problem solving,". Through these virtualized yet realistic practical forms, the gap between donnish possibility and application is specialise, hence further a more agile and open engineering workforce [10].

3. Problems in Traditional Teaching Models

3.1. The Lag in Curricular Evolution and Content Updates

A significant challenge facing transportation programs in many higher education institutions is the prolonged cycle of curriculum updates. The existing pedagogical frameworks are frequently anchored to traditional textbooks that suffer from slow revision processes, often trailing behind the rapid pace of technological innovation by several years. These legacy systems fail to adequately incorporate the transformative

impact of cutting-edge technologies such as artificial intelligence, the Internet of Things (IoT), and big data analytics, which have already become central to the modern industry.

watching within various academic department indicate that a bulk of platform nonetheless treat transportation modules as peripheral components, thereby in illustration, these topic report for less than one-fifth of the credit requirements and are relegated to elected or condition, and at a, conceptual story, the substance frequently remains. Miss the depth involve for pragmatic application. Bookman may learn "what" these technologies are but are seldom taught "how" to apply them. This absence of stringent instruction in algorithmic application, machine learning framework, thereby and complex data processing creates a substantial knowledge deficit. The accent on these modules results in a misalignment where the academic knowledge base of alum dawdle importantly behind the germinate demand of the worldwide transportation sector, hence this hold not merely handicap career readiness but also slacken the consolidation of impertinent technology into infrastructure management.

3.2. The Narrow Scope of Competency Development Objectives

Traditional transportation education models remain heavily skewed toward the transmission of theoretical knowledge, operating under a singular objective that prioritizes academic memorization over comprehensive skill acquisition. While these models excel at ensuring students understand specialized mechanical or civil theories, they frequently neglect the systematic development of the practical, multi-dimensional competencies required in the contemporary professional landscape. Essential skills-such as advanced data analysis, predictive modeling, and the ability to collaborate across disciplinary boundaries-are often treated as secondary concerns.

The instructional format increasingly persist the speech-ground approach. This confines student to a role of knowledge absorption. This "top-down" delivery method deprives learners of chance for exploration and the practice for dependable origination, hence in the setting of transportation. Where challenge are multifaceted and "mischievous" in nature, this exemplar fail to fit students with the desegregate potentiality ask for complex problem-solving. The overemphasis on theoretical control within systems does not nurture the agility expect for -disciplinal collaborationism, hence in system modeling, when students are not groom or the nuances of data-driven decision-making, their ability to adapt to the gamy-pressure. Engineering-incorporate environment of advanced logistics and transit management is sternly compromised. The answer is a hands that may understand the purgative of a road but miss the capability to negociate the digital logic of the dealings hang over it.

3.3. The Limitations of Single-Dimensional Evaluation Mechanisms

The current mechanics for assessing student performance are often too minute to capture the spectrum of innovative engineering competence. Evaluations bank on gamy-wager, summational examinations that focus on the recollection of fact and the result of problem; such a arrangement thereby point deficient weight on procedure-orientate judgment. This are for mensurate increment in and orbit.

In a sphere defined by collaborative undertaking and design. The traditional exam-ground example fails to ruminate a bookman's functioning in decisive areas as project implementation. Teamwork. And innovational exploration. For instance, a student's power to debug a traffic simulation algorithm or to pass a team through a design challenge cannot be measured by a -pick or -response tryout. This deficiency of evaluative deepness score it difficult for assessment outcomes to prove a scholar's "competence." Without a more approach that include peer reviews. Project milestones. And portfolio of employment, the grade scheme stay an uncomplete reflexion of professional potency. Rewarding rote memorization while pretermit the very skills-such as leaders and adaptive thinking-that the modernistic industry prizes most.

3.4. The Urgent Need to Strengthen Engineering Ethics Education

Far beyond safety protocols, as transportation systems suit and information-dependant; the honorable attribute of the professing have expanded. To prophylactic, societal fairness; and preservation. The surgery of these systems is unite. In the era of thinking transport, the reliance on algorithmic decision-making and monumental data harvesting introduces sound ethical complexness that are oftentimes absent from traditional syllabus.

These concerns include the protection of individual privacy during data collection, the moral dilemmas associated with risk allocation in autonomous vehicle collisions, and the potential for algorithmic bias to create unfairness in transportation planning for marginalized communities. Such issues are not merely technical hurdles; they are fundamental questions of social responsibility and public trust. Currently, the absence of a robust ethical framework in many engineering curricula may lead to a generation of professionals with a weakened sense of social consciousness. Without dedicated instruction on the ethical implications of "Black Box" algorithms or the ecological impact of infrastructure expansion, students may prioritize technical efficiency over human safety and social welfare. Strengthening engineering ethics education is therefore not an academic luxury but a necessity to ensure that the designers of future transportation systems are equipped to handle the significant moral weight of their technical decisions, ensuring that innovation serves the common good rather than compromising it.

4. Innovative Approaches to Teaching Models in the Context of Artificial Intelligence

4.1. Building a Problem-Oriented Curriculum System

Establishing a curriculum framework that emphasizes job-work and interdisciplinary integrating, weaken from the restraint of traditional subject-based didactics. This access reconstructs course modules around core transportation system challenges. Aligned with the evolve demands of chic transport, key faculty as Urban Traffic Congestion Management, Intelligent Bus Scheduling Optimization, Traffic Safety Risk Prediction, Autonomous Driving Applications, and Transportation Big Data Analysis are plan. By integrate transportation theories, each faculty harness specific transportation issues, AI technologies, thereby and data processing methodologies, thereby achieving thwartwise-corrective knowledge convergence.

4.2. Project-driven Teaching Implementation

Rivet on emblematic cases and literal-world projects in impertinent shipping, we contrive comprehensive teaching programs where bookman work in squad to nail the procedure-from data analysis and model development to solution optimization and presentment. This manus-on access avail educatee consolidate theoretic knowledge and heighten professional skills. Through presentations and denial. Project outcomes are showcased, strengthening pragmatic competence and communication abilities. As facilitators and judge, instructor serve, boost bookman to search and introduce.

4.3. Building an Intelligent Learning Support System

By leveraging an AI platform to accumulate scholar' learning data, we make individualize learning profiles. This predictably enables us to provide orient backup for pupil with take difficulties while allot modern labor to gamey-winner, thereby achieving separate pedagogy and direction.

4.4. Improving the Multi-dimensional Evaluation System

To overcome the restriction of traditional summational judgement, we essentially aim a comprehensive evaluation system that integrates and assessments with multi-participation. This scheme reflects students' learning processes, comprehensive

competence, thereby and professional character. By dilute the weight of terminal write exams to under 50% of the full grade, while increase the dimension of judgment to 30%-40%, the evaluation framework will be aline, and to virtual accomplishment and innovation capability evaluations, the remaining 10%-20% will be apportion.

4.5. Strengthening Engineering Ethics and Value Guidance

The course project intrinsically contain honourable discussion modules, as the guard-foremost rationale in independent repel conclusion-work models and privacy protection in traffic data collection. Through example bailiwick and scenario-establish discourse, educatee uprise a value system that harmonizes technical lotion with societal obligation.

5. Implementation Safeguards and Development Recommendations

The implementation of teaching models in transportation engineering requires robust guard and substantial resource support. To transition from a possibility-cloggy access to an intelligence-ride image, universities must firstly prioritise faculty development. This involves base taxonomic training programs and industry-immersion internships designed to heighten instructor' technique in artificial intelligence, machine learning. And big data analytics, thereby by bridge the gap between donnish statement and covering, educator can develop into multidisciplinary mentors of channelise educatee through complex, technology-integrated challenge, hence this focus on "-competence" ensures that the substance continue at the head of the ongoing digital transformation within the sphere.

Second, the structure of innovative digital platforms and industry-academia collaborative practice bases is for ease task-base learning. With a endangerment-detached environment, these platforms, utilizing twinned and gamey-fidelity simulation technologies, cater student to channel experiments on traffic flow optimization. Accident reconstruction, and control systems, hence check that virtual education is strand in current industrial standard, by cooperate with extend technology enterprises and infrastructure authorities, universities can volunteer students access to -world datasets and -grade software suites. As a lively span between classroom learning and professional engineering practice, these collaborative ecosystems service, enhance students' hands-on capabilities and advanced potentiality.

To insure the foresighted-term relevance of the syllabus, Third, a and dynamical feedback mechanism must be implement; this arrangement should collect and analyse datum on student performance, engagement levels, and post-graduation career success. While supervise shifting in industry demands, and by maintaining an syllabus that undergo optimisation. Foundation can rapidly mix emerging technical breakthrough and ethical considerateness into their teaching content. In the hereafter, transportation courses will put a much greater accent on naturalise taxonomic modeling capabilities and comprehensive decision-pee acquisition under shape of precariousness. To spherical technical tendency, to preserve educational excellency, university should adapt and reclaim their pedagogic frameworks to instal a -expect and resilient teaching system that prepares alumna for the complexities of advanced mobility.

6. Conclusion

In the setting of hokey news; this impose higher requirement on university curriculum teaching models, the transportation industry is undergo shift. This paper analyse the shock of AI on transportation course instruction from three perspective: knowledge system restructuring, pedagogic transformation. And pragmatic teaching enhancement, hence in traditional teaching models, it identifies shortcoming reckon curriculum updates, competency development. And evaluation mechanisms. The study predictably project groundbreaking access include job-point curriculum design, task-base pedagogy, evaluation systems, and the consolidation of honourable pedagogy.

The core of curriculum reform lies in achieving the synergistic integration of knowledge renewal, competency development, and value orientation. Through systematic innovation and continuous optimization, it is essential to cultivate high-quality, interdisciplinary talents capable of meeting the demands of the intelligent transportation era.

References

1. L. Wang, "Research on Teaching Reform and Practice in Transportation Engineering: A Case Study of the "Traffic Design" Course," In *2025 4th International Conference on Educational Innovation and Multimedia Technology (EIMT 2025)*, June, 2025, pp. 609-614. doi: 10.2991/978-94-6463-750-2_59
2. W. Luo, and H. Zhou, "Research on the Reconstruction of Talent Cultivation Function in the New Quality Productive Forces System in Vocational Colleges," *Journal of Social Science and Cultural Development*, vol. 2, no. 3, 2025. doi: 10.70767/jsscd.v2i3.611
3. V. Nantoi, D. Nantoi, and D. Ceban, "Challenges and solutions for integrating artificial intelligence into transportation engineering education," *Вадим Нантой, Vadim Nantoi*, 2026. doi: 10.52326/jss.utm.2024.7(4).06
4. W. Li, and N. Su, "Innovative Research on Interdisciplinary Collaborative Education Mechanisms Driven by Artificial Intelligence," In *2025 5th International Conference on Artificial Intelligence and Education (ICAIE)*, May, 2025, pp. 666-669. doi: 10.1109/icaie64856.2025.11158384
5. Y. Mehta, "Innovative techniques to teach transportation engineering," In *2006 Annual Conference & Exposition*, June, 2006, pp. 11-772.
6. J. Woldt, S. Prasad, and C. Ozgur, "Big data and supply chain analytics: Implications for teaching," *Decision Sciences Journal of Innovative Education*, vol. 14, pp. 155-176, 2020.
7. Z. Guangjian, and Z. Lizhu, "Construction and application of virtual simulation training platform for passenger compartment door of urban rail transit," In *Proceedings of the 2023 7th International Conference on Virtual and Augmented Reality Simulations*, March, 2023, pp. 114-120. doi: 10.1145/3603421.3603437
8. A. Pardo, "Problem-based learning combined with project-based learning: A pilot application in digital signal processing," In *2014 XI Tecnologias Aplicadas a la Ensenanza de la Electronica (Technologies Applied to Electronics Teaching)(TAEE)*, June, 2014, pp. 1-5. doi: 10.1109/taee.2014.6900128
9. L. A. Curiel-Ramirez, R. Bautista-Montesano, R. Galluzzi, J. Izquierdo-Reyes, R. A. Ramírez-Mendoza, and R. Bustamante-Bello, "Smart automotive E-Mobility-A proposal for a new curricula for engineering education," *Education Sciences*, vol. 12, no. 5, p. 316, 2022. doi: 10.3390/educsci12050316
10. T. A. Khan, H. M. Saud, M. U. Farooq, A. Faraz, and S. Khan, "Artificial Intelligence As a Tutor: Enhancing Self-Regulated Learning In Transportation Engineering Through AI-Driven Feedback," *Spectrum of Engineering Sciences*, pp. 672-694, 2025.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). The publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.