

Research on Practical Dilemmas and Optimization Paths of Industry-Education Integration in Private Universities under the AI+EOBE Model

Yingmei Cao^a

Liaoning Communication University (LNCU), Shenyang, Liaoning 110000, China

^a44755365@qq.com

Abstract

In the era of digital economy, artificial intelligence promotes the digital transformation of higher education. Industry-education integration serves as a vital approach for private universities to cultivate application-oriented talents and resolve the mismatch between university-enterprise supply and demand as well as homogenized talent training. Outcome-Based Education (EOBE) centers on competency output and emphasizes backward design and continuous iteration, which fits the school-running orientation of private universities to serve regional industries. At present, industry-education integration in private universities is confronted with problems such as superficial integration, lagging training systems, rigid evaluation mechanisms and insufficient digital empowerment. Existing studies mostly explore intelligent education and outcome-oriented education separately, while in-depth research on industry-education integration that couples AI and EOBE for private universities remains scarce. Adopting literature analysis, questionnaire-interview survey and case study methods, this paper analyzes practical dilemmas based on the institutional characteristics of private universities, and constructs an iterative closed-loop optimization system of AI+EOBE. It enriches relevant theories and provides practical references for industry-education integration in private universities.

Keywords

AI+EOBE, Outcome Based Education, private universities, industry education integration, digital transformation.

1. Introduction

Against the backdrop of digital economy, artificial intelligence drives the digital transformation of higher education. Industry-education integration is an important path for private universities to cultivate application-oriented talents and address the mismatch between university-enterprise supply-demand and homogenized talent cultivation. Outcome-Based Education (EOBE) focuses on competency output, highlighting backward design and continuous iteration, which conforms to the orientation of private universities to serve regional industries. Currently, industry-education integration in private universities suffers from superficial integration, outdated training systems, rigid evaluation mechanisms and inadequate digital empowerment. Most existing researches discuss intelligent education and outcome-oriented education independently, lacking in-depth studies on industry-education integration with deep coupling of AI and EOBE targeting private universities. Therefore, this paper adopts literature analysis, questionnaire-interview and case study methods. Based on the institutional features of private universities, it analyzes practical dilemmas and constructs an iterative closed-loop optimization system of AI+EOBE.[1] This research enriches relevant

theoretical achievements and offers practical references for industry-education integration practices in private universities.

2. Core Concepts and Theoretical Foundation

2.1. Definition of Core Concepts

Outcome-Based Education (EOBE): A standardized talent-training model targeting students' ultimate competency outcomes and post adaptability outcomes. It is realized through backward teaching design, whole-process education management and continuous quality improvement. Its core features are outcome orientation, student-centeredness and continuous optimization.

AI-Empowered Education: Leveraging artificial intelligence technologies including big-data analysis, intelligent practical training, dynamic monitoring and intelligent evaluation to realize digitalized, precise and efficient upgrading of teaching design, learning status management, practical training education and outcome assessment.

AI+EOBE Integrated Model: A new closed-loop talent-training model that takes EOBE-oriented educational objectives as core guidance and AI digital technologies as supporting tools, so as to reconstruct the whole process of talent cultivation, university-enterprise collaboration, teaching implementation and quality evaluation.

Industry-Education Integration in Private Universities: An application-oriented education mode in which private universities cooperate with regional enterprises. Through resource sharing, co-education via projects, co-construction of practical training platforms and talent delivery, it realizes accurate docking among education chain, talent chain and industrial chain.

2.2. Core Theoretical Support

This research is grounded on Outcome-Based Education Theory, Educational Digital Transformation Theory, University-Enterprise Collaborative Education Theory and Industry-Education Integration Ecosystem Theory. These theories provide theoretical support for the feasibility and rationality of empowering industry-education integration in private universities via AI+EOBE, ensuring rigorous logic and scientific conclusions of this study.[2]

2.3. Adaptability of AI+EOBE for Empowering Industry-Education Integration

Traditional industry-education integration is plagued by pain points including supply-demand mismatch, ambiguous evaluation, delayed iteration and loose collaboration. EOBE addresses the problems of vague educational objectives and deficiency of outcome orientation, whereas AI technologies make up for drawbacks such as imprecise education process, delayed data monitoring and subjective evaluation. The integration of both enables objective realization of "target precision, process digitalization, scientific evaluation and long-term collaboration", which is highly adaptive to the reform demands of industry-education integration in private universities.

3. Current Status of Industry-Education Integration in Private Universities Under the AI+EOBE Model

3.1. General Development of Industry-Education Integration in Private Universities

Driven by national policies for industry-education integration and educational digitalization, most private universities promote industry-education integration based on their application-oriented positioning. They have initially built an integrated education framework of "teaching-practical training-internship" through university-enterprise agreements, internship bases, on-campus practical training platforms and industry-oriented curriculum

adjustment. Nevertheless, restricted by school-running resources, institutional constraints and imbalanced discourse power between universities and enterprises, the overall quality of industry-education integration remains low with prominent formalism. Most cooperation merely stays at superficial levels such as plaque-hanging, internship placement and enterprise campus lectures, lacking deep co-education mechanisms. Talent training schemes fail to well match regional post standards; curriculum updates lag behind industrial technologies; practical training projects lack real-world industrial scenarios. Poor adaptability between industry and education leads to weak educational effectiveness, failing to achieve deep coordination among education chain, talent chain and industrial chain.[3]

3.2. Application Status of AI+EOBE Model

With the popularization of outcome-oriented education concepts and artificial intelligence technologies, many private universities have begun to explore the application of AI+EOBE in industry-education integration. In terms of EOB practice, most universities have specified outcome-oriented and competency-output educational objectives in talent-training schemes. Some majors sort out graduation requirements and curriculum requirements according to post competencies and make preliminary attempts on backward teaching design. Technologically, universities have successively introduced AI learning-status analysis, digital practical training platforms, intelligent assessment, virtual simulation and other tools for teaching management, learning monitoring and practical teaching.

However, the overall application is fragmented and formalistic. On the one hand, concepts and technologies are separated: AI is only treated as an ordinary teaching auxiliary tool, without applying data to support EOB-oriented outcome output, objective decomposition and continuous improvement. On the other hand, AI tools are not deeply connected with key links including curriculum practical training, university-enterprise co-education and outcome evaluation. A closed-loop education system of “industrial objectives-AI empowerment-data monitoring-evaluation-iteration” has not been established. Generally, the AI+EOBE model is still in the initial exploratory stage.

3.3. Statistics and Analysis of Survey Data

Questionnaire surveys and in-depth interviews are combined for empirical validity and rigor. Survey respondents cover multiple private universities across regions, involving universities, teachers, students and enterprises to avoid one-sided perspectives. The survey focuses on six core dimensions: cognition of AI+EOBE concepts, adaptability of curriculum systems, implementation effects of university-enterprise collaboration, teachers’ digital teaching competency, status of intelligent evaluation and supporting conditions for industry-education integration. Questionnaire data quantifies current situations, existing weaknesses and implementation effects, while in-depth interviews dig into real pain points, bottlenecks and core demands of teachers, students and enterprises in actual cooperation and education. After obtaining valid samples, data sorting, statistical analysis and cross-comparison are conducted to identify practical problems and underlying causes of industry-education integration empowered by AI+EOBE in private universities. It provides solid empirical evidence for subsequent dilemma analysis, cause exploration and optimization path proposal, guaranteeing authentic, practical and reliable research conclusions.

4. Practical Dilemmas and Causes of Industry-Education Integration Under the AI+EOBE Model

4.1. Conceptual Cognition Dilemma: Superficial Integration and Divided Educational Orientations

The primary prominent problem is superficial conceptual cognition and divided educational orientations between universities and enterprises. Within universities, most administrators and teachers simply interpret EOBE as competency-oriented teaching reform, without fully grasping core logics of backward design, outcome output and continuous improvement. Meanwhile, AI technologies are narrowly regarded as auxiliary tools for classroom attendance checking, homework marking and online teaching. The integrated thinking of “AI data serves outcome achievement, and outcome objectives guide teaching reform” has not been formed. From enterprises’ perspective, cooperating enterprises mostly regard university-enterprise cooperation merely as talent recruitment channels. They lack awareness of pre-training for post competencies and participation in formulating outcome standards, and do not incorporate students’ post competency outcomes into corporate educational responsibilities. Cognitive divergence among multiple subjects leads to the phenomenon of “disconnection” between AI empowerment and EOBE orientation. Disunited top-level educational objectives and fragmented bottom-level reforms fundamentally hinder deep advancement of industry-education integration.

4.2. Educational System Dilemma: Outdated Training Schemes and Insufficient Industrial Adaptability

Existing talent-training systems for industry-education integration in private universities mostly follow traditional discipline-oriented frameworks without systematic backward reconstruction guided by EOBE, resulting in poor industrial adaptability. In terms of training scheme design, most majors arrange teaching contents centered on knowledge points rather than decomposing vocational competency outcomes and graduation competency outcomes according to post demands of regional industrial chains. This leads to ambiguous talent-training objectives and unclear standards for competency output. In curriculum and practical training systems, curriculum content updates lag behind industrial technological iteration; theoretical courses occupy a large proportion while digital and intelligent practical courses are insufficient. On-campus AI-driven virtual simulation training mostly adopts standardized universal projects instead of real corporate projects and post scenarios, which causes competency gaps between students and actual job requirements. For industry-education connection, teaching cycles, practical training arrangements and talent output rhythms fail to match corporate production and employment cycles, reducing the precision of integrated education and making it difficult to realize the EOBE goal of “graduation with competency and immediate post adaptability”.

4.3. Collaborative Mechanism Dilemma: Loose University-Enterprise Linkage and Lack of Long-term Effectiveness

Current university-enterprise collaborative education in private universities is characterized by superficial cooperation, loose linkage and lack of long-term guarantee, which cannot support the closed-loop AI+EOBE education model. Cooperation is mostly limited to signing agreements, setting up training bases and student internships. Enterprises seldom participate in revising talent-training schemes, curriculum development, practical teaching and outcome assessment. Cooperation is mostly university-driven with passive corporate participation. In terms of digital collaboration, most AI-enabled industry-education resource platforms and online practical-training platforms are only open internally. Barriers in data, resources and projects between universities and enterprises prevent post-demand data from feeding back to

university teaching design and outcome objective iteration. Stable communication channels, project co-education, benefit-sharing and responsibility-sharing mechanisms are absent. Enterprises have no clear incentives, institutional constraints or benefit guarantees for participating in education, so their enthusiasm cannot be sustained. It is hard to form normalized, long-term and in-depth collaborative education.

4.4. Teacher Competency Dilemma: Shortage of Compound Teachers and Insufficient Technical Implementation Capability

The shortage of compound teaching faculty constitutes a key human-resource bottleneck for AI+EOBE implementation. Current dual-competency teachers in private universities have single-faceted competency structures. First, most full-time teachers are engaged in theoretical teaching with limited front-line corporate work experience. They are unfamiliar with new industrial technologies, equipment and post competency standards, making it difficult to conduct backward teaching design targeting industrial competency outcomes. Second, teachers' digital teaching competencies are insufficient. They can only operate basic intelligent teaching software but lack practical capabilities for AI-based learning-status data analysis, intelligent practical-training curriculum design and digital outcome evaluation. Third, institutional teaching research training focuses on conventional teaching reforms, lacking special training systems for EOBE-oriented teaching design and AI-empowered industry-education integration. Existing teaching faculty cannot satisfy three-dimensional education requirements of "outcome-oriented design, industrial practice and intelligent empowerment", which becomes a critical bottleneck for new-model implementation.

4.5. Evaluation-System Dilemma: Absence of Intelligent Evaluation and Unfulfilled Quality Closed-loop

A whole-process, intelligent and closed-loop evaluation system matching AI+EOBE has not been established, disabling the iterative mechanism for education quality. Current teaching evaluation in private universities mainly adopts summative assessment such as final written examinations, focusing on knowledge memorization rather than core outcomes including post adaptability, practical capabilities and innovation abilities. For intelligent evaluation, big-data-supported AI technologies are not fully utilized to dynamically monitor and record students' whole-process data of classroom performance, practical operations, project outputs and post adaptability. Evaluation is subjective, result-oriented and one-sided. Evaluators are mainly on-campus teachers, lacking weights for assessment from corporate tutors, industrial standards and post outcomes, so students' industrial adaptability cannot be objectively measured. Moreover, there exists no closed-loop of "evaluation-analysis-rectification-optimization". Evaluation results cannot drive curriculum reform, practical-training upgrading and educational objective optimization, which violates the core EOBE requirement of continuous iteration.

4.6. Guarantee-Mechanism Dilemma: Insufficient Resource Input and Imperfect Institutional System

As self-funded institutions, private universities face objective constraints of limited resource investment and weak institutional guarantees for AI+EOBE-driven industry-education integration. In hardware resources, digital practical-training equipment of most universities is outdated. AI virtual-simulation platforms, intelligent industry-education docking systems and big-data learning-status analysis systems are underdeveloped with inadequate computing power and resources to support regular intelligent education. In terms of funding, school funds are mainly allocated to routine teaching operations. Special funds for digital reform of industry-education integration, teacher AI competency training and university-enterprise joint projects are insufficient. Institutionally, teaching management rules, university-enterprise

cooperation incentives, teacher assessment regulations and education-quality supervision systems tailored for AI+EOBE are missing. Reforms lack institutional basis, assessment constraints and incentive guidance, leading to formalism and preventing normalized and iterative operation of the new model.

5. Optimization Paths for Industry-Education Integration Under the AI+EOBE Model

5.1. Concept Empowerment: Deepen Integrated Cognition and Unify University-Enterprise Educational Consensus

To resolve cognitive separation and superficial conceptual integration, systematic concept reshaping and consensus building should be carried out. Within universities, special training and teaching seminars on EOBE-oriented teaching design, AI-empowered education and industry-education integration reform should be regularly organized. Teachers shall establish new educational thinking: “industrial demands define outcomes; outcome objectives determine teaching; data empowerment promotes improvement”.^[4] The inherent perception of regarding technologies merely as tools and education as formalism should be eliminated. For university-enterprise collaboration, regular communication platforms should be built. Corporate technical specialists and human-resource managers shall be invited to participate in education reform discussions, clarifying enterprises’ main responsibilities in outcome-standard formulation, practical teaching and outcome evaluation. Educational consensus centered on post competency outcomes and supported by digital empowerment shall be reached to break ideological barriers and lay cognitive foundations for in-depth implementation.

5.2. System Reconstruction: Backward Design of Education System to Meet Industrial Talent Demands

Following the core EOBE logic of backward design, talent-training systems for industry-education integration shall be comprehensively reconstructed, taking regional industrial-chain post competency standards, corporate talent demands and career-development outcomes as top-level objectives. First, universities shall cooperate with industries and enterprises to sort out core graduation outcomes and post competency outcomes for each major, and reversely deduce and optimize talent-training objectives, curriculum systems, practical-training projects and teaching contents. Second, curriculum structures shall be optimized: obsolete theoretical contents shall be reduced; cutting-edge courses such as AI application, industrial digital practice and post-oriented intelligent training shall be added. A four-tier curriculum system shall be constructed: general courses, core major courses, digital practical-training courses and corporate project-oriented courses. Third, practical-training systems shall be reconstructed. Real corporate intelligent projects, digital production cases and post-oriented practical tasks shall be integrated into daily practical teaching. Immersive training shall be conducted on AI virtual-simulation platforms to realize precise alignment among teaching contents, practical-training scenarios, competency outputs and industrial post requirements.

5.3. Mechanism Innovation: Build Intelligent Collaborative Platforms and Establish Long-term University-Enterprise Linkage Mechanisms

To address loose university-enterprise cooperation and lack of long-term effectiveness, digital collaborative carriers shall be built and dual-subject co-education mechanisms shall be improved. On the one hand, exclusive AI-enabled digital industry-education collaborative platforms shall be developed to break data barriers between universities and enterprises.

Post-demand data, talent-standard data and project resources from enterprises shall be interconnected with university teaching resources, learning-status data and outcome data. Functions including joint lesson preparation, online practical training, joint research and co-evaluation of outcomes shall be supported to improve collaborative education efficiency. On the other hand, in-depth university-enterprise cooperation modes such as industrial colleges, order-oriented classes, joint research and co-built practical-training bases shall be promoted, abandoning superficial plaque-hanging cooperation. Meanwhile, long-term mechanisms for benefit-sharing, responsibility-sharing and outcome co-evaluation shall be established. Corporate educational subsidies, talent-delivery benefits and project-cooperation rights shall be clarified to fully stimulate enterprises' enthusiasm for deep participation and build a sustainable and iterative university-enterprise collaborative education ecosystem.

5.4. Teacher Competency Improvement: Establish a Compound Teacher Training System

Systematic and regular training systems for dual-competency teachers shall be constructed to meet compound education requirements of AI+EOBE and make up for teacher competency deficiencies. First, special competency training shall be implemented: teachers shall receive regular training on EOBE-oriented teaching design, backward curriculum reconstruction, AI teaching tool application, big-data learning-status analysis and intelligent practical-training design, to improve their digital education and outcome-design capabilities. Second, corporate temporary-post practice shall be enforced: professional teachers shall regularly work in front-line corporate posts to get familiar with industrial intelligent technologies, post competency standards and industrial trends and accumulate practical industrial experience. Third, two-way faculty employment between universities and enterprises shall be promoted. Corporate technical experts shall be hired as off-campus tutors for practical teaching and project guidance; university teachers shall participate in corporate R&D projects. Bidirectional competency improvement shall be realized to cultivate compound dual-competency teaching faculty suitable for digital industry-education integration reform.

5.5. Evaluation Innovation: Build an AI-Empowered Whole-process Closed-loop Evaluation System

Based on EOBE's continuous-improvement philosophy, big-data-driven AI technologies shall be adopted to construct a "whole-process, multi-subject, quantifiable and iterative" closed-loop outcome-evaluation system. In terms of evaluation dimensions, the limitation of traditional summative assessment shall be broken. AI-supported dynamic process evaluation shall be introduced. Big-data technologies shall record whole-process data of students' classroom learning, intelligent practical training, project practice and corporate internships, making learning traces traceable and competency performance quantifiable. In terms of evaluators, a three-dimensional evaluation subject system consisting of "on-campus teachers, corporate tutors and intelligent systems" shall be established. Students' post competency outcomes and graduation-requirement achievement shall be comprehensively assessed combining on-campus curriculum assessment, corporate post-practice evaluation and AI competency data analysis. For iteration mechanisms, educational weaknesses, curriculum defects and practical-training deficiencies shall be identified via evaluation data. A closed-loop improvement mechanism of "teaching implementation - intelligent evaluation - problem diagnosis - teaching optimization" shall be formed to continuously enhance talent-training quality.[5]

5.6. Guarantee Upgrading: Improve Multi-dimensional Long-term Guarantee Systems

Considering the institutional characteristics of private universities, long-term guarantee systems shall be built from institutional, funding, platform and assessment dimensions to sustain the AI+EOBE-driven industry-education integration model. Institutionally, management regulations for talent training, university-enterprise cooperation, teaching reform, teacher assessment and outcome evaluation shall be revised, specifying implementation standards, procedural norms and responsibility division for AI+EOBE education reform. In terms of funding, special funds for digital reform of industry-education integration shall be set up, prioritizing investment in intelligent practical-training platform upgrading, AI teaching-resource construction, teacher training and university-enterprise joint projects. For platform construction, digital teaching, intelligent practical-training and university-enterprise collaborative platforms shall be continuously optimized to guarantee effective technical empowerment. In assessment and incentive mechanisms, AI+EOBE teaching reform, university-enterprise collaborative education and outcome quality shall be incorporated into teachers' performance appraisal and merit evaluation systems. Positive incentives and rigid constraints shall be combined to promote normalized, standardized and iterative upgrading of AI+EOBE-driven industry-education integration reform.

6. Conclusion and Prospects

6.1. Research Conclusion

Against the background of educational digital transformation, this paper illustrates the adaptability of empowering industry-education integration in private universities via the AI+EOBE model. It systematically sorts out practical dilemmas and root causes from six dimensions: educational concepts, training systems, university-enterprise collaboration, teacher development, evaluation mechanisms and resource guarantees. A six-in-one optimization path covering concept, system, mechanism, teacher team, evaluation and guarantee is proposed to form a closed-loop digital industry-education integration education system. It provides theoretical support and practical solutions for high-quality development of industry-education integration in private universities.

6.2. Research Limitations

The survey sample of this research is limited. Differences in adaptability among private universities of various regions and types have not been fully refined. Future research can expand survey coverage and carry out differentiated and refined studies.

6.3. Research Prospects

With continuous iteration of artificial intelligence technologies, future research can further deepen the in-depth application of AI big-data and intelligent algorithms in industry-education education, precise evaluation and supply-demand matching. The AI+EOBE closed-loop education system will be continuously optimized to push industry-education integration of private universities toward digitalization, precision and high-quality development.

Acknowledgments

This research is supported by the research project entitled Innovative Practice of Industry-Education Integration in Private Universities Driven by AI+EOBE Model (Project No. LMJX2025157).

References

- [1] Guo, B., Chang, Z., & Wang, W. (2024). Dynamic benefit-allocation mechanism for industry-university-research deep integration from the perspective of innovation process. *Journal of Technology and Innovation Management*, 45(6), 612–623.
- [2] He, S. X., & Ji, T. (2020). Manifestations, causes and countermeasures of practical deviation of industry-education integration policy in vocational education. *Education and Vocation*, (12), 19–26.
- [3] Tang, H. Q., & Zhou, B. (2024). Construction of industry-education integration community: Form evolution, realistic inspection and path optimization. *Chinese Vocational and Technical Education*, (3), 21–27.
- [4] Zhang, Z. P. (2022). Connotation evolution, ideal pursuit, reality status and path choice of vocational education entering the 2.0 era of industry-education integration. *Adult Education*, (3), 66–73.
- [5] Zeng, L. X., & Xing, H. F. (2024). Endogenous dilemmas and development strategies of digital technology empowering the modernization transformation of higher education. *Jiangsu Higher Education*, (08), 71–77.