Journal of International Education and Development
2025, VOL. 9, NO. 2, 67-70
DOI: 10.47297/wspiedWSP2516-250016.20250902

Research on the Mechanism and Path of OBE-CDIO Concept in Knowledge and Skill Cultivation in the Context of Educational Integration

Weimin Wu[1], Min Zhao[2]

[1]School of Intelligent Manufacturing, Hunan Financial & Industrial Vocational-Technical College, Hengyang, 421002, China;

[2]School of Modern Logistics, Hunan Financial & Industrial Vocational-Technical College, Hengyang, 421002,China

ABSTRACT
In educational integration, the OBE-CDIO concept offers an innovative path for talent cultivation. OBE focuses on learning outcomes, ensuring students meet social demands. CDIO emphasizes practical abilities and problem-solving. Combined, they enhance both knowledge and skills. This paper analyzes the OBE-CDIO mechanism, proposes a talent cultivation model, and highlights its advantages in improving educational quality and efficiency. The research aims to aid educational reform and cultivate innovative talents.

KEYWORDS
Educational Integration; OBE; CDIO; Knowledge and Skill Cultivation; Talent Cultivation Model

1 Introduction

Educational reform deepens, focusing on integration to improve talent quality. OBE emphasizes clear goals, student outcomes, aligning education with industry demands. CDIO, in engineering education, fosters practical skills and problem-solving through conception to operation. Combining OBE and CDIO leverages both, ensuring goal clarity and practical ability cultivation. This integrated approach nurtures talents with strong theoretical foundations and practical skills, meeting socio-economic needs.

2 Overview of the OBE-CDIO Concept

2.1 OBE Concept

The OBE (Outcome-Based Education) concept, also known as outcome-focused education, is a reverse instructional design approach that determines expected learning outcomes based on real-world demands and subsequently establishes training objectives, reverse-designing the training plan. The core of this concept lies in setting clear learning outcomes and ensuring that students can achieve these goals through a series of educational activities and assessment mechanisms.

The OBE concept emphasizes the clarity and measurability of educational goals, ensuring that educational outcomes meet the needs of society and the employment market. In educational practice, teachers need to clarify students' learning goals and design teaching activities and assessment methods based on these goals to ensure that students can acquire the required knowledge and skills.

2.2 CDIO Concept

The CDIO (Conceive-Design-Implement-Operate) concept, which stands for conception, design, implementation, and operation, is an engineering education concept proposed by the Massachusetts Institute of Technology (MIT) and the Royal Institute of Technology in Sweden. This concept uses the product development cycle from research to operation as a carrier, allowing students to actively learn and acquire knowledge through practical experience from project design to project operation, enhancing their knowledge application abilities and practical experience.

The CDIO concept requires students to learn through practical operation, improving their professional skills through continuous practice and reflection. It emphasizes the cultivation of engineering practice abilities, requiring students to fully participate in all stages, such as conceptual design and operational implementation, thereby developing their ability to solve complex engineering problems.

2.3 Combination of OBE and CDIO Concepts

The OBE and CDIO concepts share similar goals in cultivating students' practical abilities and qualities but have different focuses. OBE pays more attention to the achievement of learning outcomes, measuring educational

effectiveness through specific learning goals. In contrast, CDIO focuses more on the cultivation of engineering practice abilities, emphasizing practical operation and the ability to apply knowledge. In educational practice, combining the OBE and CDIO concepts can better comprehensively cultivate students' learning outcomes and engineering practice abilities.

Teachers can set specific learning goals based on the OBE concept while using the CDIO concept to design practical courses, allowing students to learn and apply knowledge through practice, thereby comprehensively enhancing students' overall qualities. In this way, students can not only master the necessary knowledge and skills but also improve their problem-solving abilities through practical.

3 Application Mechanism of OBE-CDIO Concept in the Context of Education-Industry-Research Integration

3.1 Clarifying Cultivation Objectives and Demands

In today's trend of increasingly integrated education, clarifying cultivation objectives and demands has become a primary task. This process cannot be achieved without in-depth market research and close communication with employers. By broadly collecting information on industry trends, market demands, and future technological directions, educational institutions can more accurately grasp the specific requirements of the market for professionals. This encompasses not only the mastery of professional skills but also various aspects such as overall quality, innovation ability, and team collaboration ability.

Based on this, educational institutions can scientifically and reasonably determine the orientation of professional talent cultivation, ensuring that the talents cultivated closely meet market demands and possess high employment competitiveness and career development potential.

Furthermore, the setting of cultivation objectives must possess forward-looking, stability, and posteriority. Forward-looking means that the cultivation objectives should be able to foresee future industry trends, ensuring that the talents cultivated remain competitive in the coming years or even longer. Stability requires that the cultivation objectives remain relatively stable over a certain period to avoid unnecessary disturbances to teaching and students caused by frequent changes. Posteriority emphasizes that the cultivation objectives need to be tested through practice, with continuous adjustment and optimization based on graduates' employment situations, employer feedback, and other information to ensure continuous improvement in education quality.

Meanwhile, formulating distinctive cultivation programs that combine the school's orientation, industry development, and disciplinary characteristics is crucial for achieving cultivation objectives. This requires educational institutions to innovate in curriculum design, teaching methods, practical teaching, etc., forming unique cultivation models and competitive advantages to provide more high-quality professionals for society.

3.2 Constructing an Integrated Curriculum System

Constructing an integrated curriculum system is key to the application of the OBE-CDIO concept. The curriculum system should be divided into theoretical and practical courses, with reverse design and forward implementation to achieve teaching objectives. Theoretical courses should cover the basic theories and methods of professional knowledge, while practical courses should correspond through CDIO projects, enabling students to learn by doing and enhancing their practical abilities.

3.3 Strengthening Practical Teaching and School-Enterprise Cooperation

Practical teaching is an important component of the OBE-CDIO concept application. Through school-enterprise cooperation, online and offline teaching resources for integrated classroom teaching, practical projects, training projects, and graduation designs are jointly built, with a student-centered approach to carefully designing the teaching implementation process for pre-class, in-class, and post-class activities.

3.4 Establishing an Evaluation and Feedback Mechanism

An evaluation and feedback mechanism is crucial for ensuring the effective implementation of the OBE-CDIO concept. By establishing systematic evaluation standards and processes, comprehensive evaluations are conducted on students' basic personal abilities, interpersonal abilities, product, process, and system construction abilities, as well as subject knowledge, with records of students' achievement. Meanwhile, evaluation results are fed back to students, teachers, and other stakeholders to promote continuous improvement.

4 Pathway Research of the OBE-CDIO Concept in the Context of Education-Industry Integration

In the context of education-industry integration, the pathway research of the OBE-CDIO concept primarily encompasses the following aspects.

4.1 Formulating a Talent Cultivation Plan Based on the OBE-CDIO Concept

Formulating a talent cultivation plan based on the OBE-CDIO concept is the first step in implementing this concept. By conducting research and analyzing industry demands, one can clarify the professional orientation and training objectives of talents and formulate a specific cultivation plan. This plan should encompass various aspects such as curriculum systems, teaching content, teaching methods, practical teaching, assessment, and feedback.

For instance, in the field of Information and Computational Science, an applied talent cultivation plan based on the OBE-CDIO concept can be formulated. This plan should be oriented towards actual job demands, with a clear professional positioning. Through comprehensive market research and visits to employers, it aims to cultivate talents with socialist core values, solid mathematical foundations, rigorous logical thinking abilities, and proficiency in the basic theories, methods, and skills of information and computational science. Meanwhile, professional courses are divided into mathematics courses and computer software courses, with each course developing an OBE-based syllabus. Students' practical abilities are enhanced through CDIO projects.

4.2 Implementing Project-Based Learning and Practice

Implementing project-based learning and practice is the core of the OBE-CDIO concept. Through project-driven learning, students apply knowledge in practice, enhancing their abilities to solve real-world problems. Projects can originate from actual corporate demands, scientific research projects, or academic competitions. By fostering university-enterprise cooperation and industry-academia-research integration, students are provided with abundant practical opportunities.

For example, in the field of Data Science and Big Data Technology, project-based learning and practice can be carried out based on teachers' scientific research projects. Students can participate in tasks such as the architectural design of big data platforms, data collection, storage and management, data analysis, and visualization. Through hands-on operation, they improve their abilities in big data processing and analysis. Additionally, by participating in academic competitions and innovation and entrepreneurship projects, students enhance their team collaboration and innovation abilities.

4.3 Strengthening Faculty Development and Capability Enhancement

Faculty development is a crucial guarantee for the effective implementation of the OBE-CDIO concept. By strengthening teacher training, introducing high-level teachers, and conducting teaching research and reform, the professional quality and teaching abilities of teachers can be enhanced. Additionally, teachers are encouraged to participate in corporate practice, scientific research projects, and industry-academia-research cooperation, thereby improving their practical and innovative abilities.

For instance, in the field of Information and Computational Science, enterprise experts can be invited to campus for lectures, collaborative research, and guiding student practice. Meanwhile, teachers can be selected to participate in domestic and international academic conferences and training, enhancing their academic and teaching abilities. Through university-enterprise cooperation and industry-academia-research integration, teachers' practical experience and innovation abilities are strengthened.

4.4 Improving the Assessment and Feedback Mechanism

Improving the assessment and feedback mechanism is a key aspect of ensuring the effective implementation of the OBE-CDIO concept. By establishing systematic assessment standards and processes, comprehensive assessments can be conducted on students' basic personal abilities, interpersonal abilities, product, process, and system construction abilities, as well as subject knowledge. Meanwhile, assessment results should be fed back to students, teachers, and other stakeholders to promote continuous improvement.

For example, in practical applications of the CDIO concept, detailed assessment standards and processes can be formulated, including students' design abilities, implementation abilities, communication abilities, and innovation abilities. Through regular assessments, self-assessments and peer assessments by students, teacher evaluations, and other methods, a comprehensive understanding of students' learning situations and issues can be obtained. Additionally, assessment results should be promptly fed back to students and teachers, helping them adjust their learning plans and teaching methods, thereby improving learning effects and teaching quality.

5 Conclusion and Outlook

In the new era of educational integration, the OBE-CDIO concept brings innovative ideas and effective paths to the cultivation of knowledge and skills. This concept emphasizes Outcome-Based Education (OBE) and integrates the CDIO engineering education model of Conceive, Design, Implement, and Operate, dedicated to enhancing the quality of talent cultivation. By clarifying training objectives and demands, we can accurately orient the direction of education and ensure that teaching content is closely linked to social needs. At the same time, we build an integrated curriculum system that tightly combines theory and practice, forming a complete knowledge framework. Strengthening practical teaching and school-enterprise cooperation not only provides students with more practical opportunities but also promotes deep integration of industry, academia, and research. Additionally, establishing an evaluation and feedback mechanism ensures continuous improvement of the educational process, further enhancing the effectiveness and pertinence of education. However, there are also many challenges in implementation, such as the disconnection between theory and practice, a lack of teaching staff, barriers in school-enterprise cooperation, and imperfections in the evaluation and feedback mechanism. These issues need to be continuously explored and resolved in practice.

Looking forward, with the deepening of educational reform and continuous technological advancements, the application prospects of the OBE-CDIO concept in knowledge and skill cultivation will become even broader. We fully understand that only through continuous innovation and improvement can we better adapt to the needs of the times. Therefore, we will continue to deepen the application of the OBE-CDIO concept in talent cultivation, continuously optimize talent cultivation programs and teaching modes, and strive to cultivate more high-quality talents with innovative spirits and practical abilities. At the same time, we will actively address the challenges encountered in implementation, adopt more effective countermeasures, promote the wide application and in-depth development of the OBE-CDIO concept in the field of education, and make greater contributions to social progress and national prosperity.

Funding

2024 Scientific Research Planning Project of Hunan Vocational Education and Adult Education Society, "Research on the Mechanism and Path of reconstructing Vocational Knowledge and Skills based on OBE-CDIO Concept under the Integration of Industry and Education" (No.: XH2024076); 2024 Hengyang Social Science Fund project, " Research on the influencing factors and system Optimization of Hengyang Enterprises in the Integration of Industry and Education" (No.: 2024D015); 2024 Hengyang Science and Technology Bureau guiding plan project "Research on Mechanical Modeling and Simulation Method of High Temperature Spring Composite Shot Blasting Process" (No.: 2024013)

About the Author

Weimin Wu, Bachelor's degree, Associate Professor, Research direction or field of work: Mechanical design and manufacturing, vocational education.

References

[1] Dudley Robinson.Professor Linda Cardozo OBE MB ChB MD FRCOG, 15 September 1950–21 September 2023[J].BJOG: an international journal of obstetrics and gynaecology,2024,131(2):241-242.

[2] K. DEVI PRIYA, V. CHANDRA KUMAR. OBE-BASED PEDAGOGY AND ANALYSIS ON WEB APPLICATION DEVELOPMENT[J]. i-Manager s Journal on Software Engineering,2023,17(4):24-28.

[3] Yang Hao, Zhu Hui, Luo WanyingPeng Wentao. Design and practice of innovative practice workshop for new nurses based on creativity component theory and outcome based education(OBE) concept[J].BMC Medical Education,2023,23(1).

[4] Muhammad Zunair Zamir, Muhammad Irfan Abid, Muhammad Rayyan FazalMuhammad Ali Aqdas Rehman QaziMuhammad Kamran. Switching to Outcome-Based Education (OBE) System, a Paradigm Shift in Engineering Education[J].IEEE Transactions on Education,2022,65 (4):695-702.

[4] Meifang Jiang, Xiaochun Wu. Exploration and Practice of College English Multi-Blended Teaching Model Based on OBE Concept[J]. Open Journal of Modern Linguistics,2022,12(4):367-379.