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Four teaching models based on CDIO - taking the course of audit practice as an example

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Abstract: In the implementation process of the “Audit Practice” course at J School, the application of the smart driven CDIO concept focuses on building “four field” situational teaching, effectively promoting the improvement of teaching quality, and confirming the coupling between CDIO concept and “four field” teaching. In teaching practice, efforts should be made to achieve precise teaching implementation through smart classrooms driven by small data and integrated with big data.

Keywords: wisdom driven; CDIO; four field linkage; teaching mode

1. Introduction

Education, technology, and talent are the fundamental and strategic supports for the comprehensive construction of a socialist modernized country. The Opinion on Strengthening the Construction of High skilled Talent Team in the New Era (2022) proposes to build a high skilled talent training system with industry enterprises as the main body, vocational schools (including technical colleges, the same below) as the foundation, and government promotion combined with social support. The survey shows that the practical training mode of low-level skills training commonly found in vocational education is facing changes, and there is a huge space for organic coupling and positive interaction between educational elements such as vocational education courses, majors, textbooks, and teachers and regional economic and industrial elements (Jiang Shihui, 2023).

The CDIO engineering education model is a result of recent international engineering education reforms. CDIO stands for Conceptual, Design, Implement, and Operate. The CDIO philosophy emphasizes the entire lifecycle of product development and operation as the carrier, allowing students to learn professional knowledge in an active, practical, and organically connected way between courses, focusing on the cultivation of students’ basic knowledge, personal skills, interpersonal abilities, and professional ethics. At present, research on the application of CDIO concept mainly focuses on engineering education majors and course teaching, especially the integration and utilization of practical teaching resources inside and outside the school. For example, Huang Meigen *et al.* (2023) found that “CDIO practical teaching mode can promote students’ transformation from passive coping practice to



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independent exploratory practice, effectively enhance students' participation enthusiasm, process cooperation, and innovative output of results, and significantly improve the effectiveness of practical teaching." Li Yingjie *et al.* (2024) found that "the integration of CDIO concept into practical teaching has achieved a systematic reform of practical teaching mode, including sorting out talent training programs, optimizing practical teaching content, updating practical teaching concepts, and emphasizing the localization theory of teaching objectives for students' learning autonomy. The characteristics of research are not yet mature.

This article mainly relies on the reform of J School's "Audit Practice" course in the construction of smart classrooms, reflects on the coupling between CDIO concept and "four field" teaching, applies the coupling principle of the two, objectively analyzes the shortcomings of the "four field" teaching, and forms suggestions and conclusions. The collaborative teaching model of self-directed learning, classroom teaching, on campus practical training, and off campus internships that this article aims to construct is conducive to enriching the practical implementation of CDIO concepts.

2. Feasibility of smart driven CDIO "Four Field" teaching model from J School Practice

The reform of the "Audit Practice" course at J School has gone through a long process, relying on the concept of smart classroom to build a mixed offline and online curriculum, gradually constructing a "four field" linkage teaching mode of smart driven self-learning, classroom learning, on campus practical training, and off campus practice.

J School purchased the Foster Audit Platform in 2022 to integrate audit skills competitions with certified public accountant audit practice learning. Teachers can accurately analyze students' learning situations before, during, and after class through classroom assignment records, and can use learning process data to adjust classroom teaching and on campus training, providing an important guarantee for continuous improvement of teaching implementation effectiveness.

Driven by intelligent means, students are able to smoothly complete the conceptual, design, operational, and implementation stages emphasized by the CDIO concept in the "four sessions" of self-directed learning, classroom learning, on campus training, and off campus practice, achieving the goals or outcomes of the course. The main causes include: (1) Intelligence driven self-directed learning, which is conducive to guiding students into learning new technologies and tools, and more effectively stimulating self exploration. (2) The intelligent and dynamic classroom learning greatly enriches the ways of classroom interaction, and the interaction between students forms an important element of the classroom. The career awakening effect of the classroom is quite significant. (3) Intelligent on campus training, online interaction and other team interaction methods are conducive to achieving training goals more efficiently. (4) The intelligent and dynamic off campus internship, with remote meetings between school and enterprise mentors and real-time online observation, enables the internship process to always be "assessable, measurable, and adjustable".

The practice of J School provides an example of the "conception, design, implementation, and operation" elements advocated by the CDIO concept of smart driving. This teaching model can also be seen as an effective connection path between teaching and learning in four places: self-directed learning, classroom learning, on campus practical training, and off campus practice.

3. Analysis of the insufficient development of CDIO's "Four Field" teaching model

Based on our tracking and analysis of the teaching process and effectiveness data of the "Sales and Collection Cycle" in J School's "Audit Practice" program, which aims to cultivate applied professional audit talents, we evaluated the effectiveness of the "four sessions" from two dimensions: teaching implementation efficiency (evaluated based on the time it takes for more than 80% of students to complete the required tasks) and student learning effectiveness (evaluated based on the overall accuracy of students completing the corresponding test questions within the specified time). Analysis shows that the efficiency of teaching implementation and the effectiveness of student learning are relatively low in the self-directed learning field. For example, in the pre class self-directed learning stage taught in the business cycle audit chapter, some online teaching case resources are outdated, and there is a serious lack of real examples such as the application of big data audit technology, which makes it difficult to stimulate students' interest in self-directed learning. Also, the low efficiency of classroom teaching and the low effectiveness of off campus internships are also worthy of attention. For example, in the classroom of risk assessment and risk response content, due to the need to balance the learning outcomes of most students, the pace of the class is intentionally slowed down, and even some more complex content is deleted to some extent, resulting in a coexistence of "not enough to eat" and "not enough to eat" among students. Furthermore, there are still issues with the mismatch between on campus training content and teaching materials, mainly due to the inability of the training platform to keep up with the speed of integrating new technologies, standards, and concepts into the industry. This has resulted in insufficient effectiveness of on campus training in correcting students' "ideas" and improving their "designs". Finally, the depth of off campus on-the-job internships is limited, and students face fewer complex situations and problems. It is also necessary to keep up with the trend of integrating industry review and technology flow and consider "classified training".

Analysis suggests that in the implementation process of CDIO's "four field" teaching model, sometimes the understanding of the trend towards intelligence is relatively one-sided. For example, some teachers are satisfied with only a partial understanding of the smart classroom and regard "uploading learning resources to the teaching platform" as the entirety of smart teaching. Sometimes, they overemphasize the role of smart means and results, and lack necessary guidance for students. Especially, some teachers lack leadership in the conception, design, operation, and implementation process emphasized by CDIO's philosophy.

4. Conclusion

The construction of the "four fields" driven by intelligence is an important condition for the implementation and effectiveness of CDIO's concept. The "four sessions" of self-directed learning, classroom teaching, on campus practical training, and off campus internships provide a natural and excellent showcase for the CDIO concept. Under the trend of intelligence, the dynamic cycle of the "four fields" has favorable conditions for information exchange, and students have the opportunity to actively and creatively play a constructive role in the teaching implementation process. The interaction between teaching and learning is no longer limited to physical classrooms, which is conducive to continuously promoting higher-level "conception", "design", "operation", and "implementation" in a cyclical process. If the construction of "fields" is lacking or there are problems with the linkage of

various “fields”, the implementation of CDIO concept will become empty talk, especially for on campus and off campus internship and training fields. If they cannot respond to real job needs and cannot reflect the “integration of data and intelligence” elements endowed by the times, then the “four fields” are bound to be inefficient.

The role of the practical teaching system with the deep participation of enterprises is worthy of attention. The combination of education and productive labor is the core content of Marxist educational thought. Marx pointed out in his “Capital” that “the future education sprouts from the factory system. It is not only a method to improve social production, but also the only method to cultivate well-rounded people.” Marx’s “education” here is a grand educational concept, but this theory has the most perfect fit with vocational education. For vocational education, the campus where the teaching field is located has already faced many challenges, and the important value of enterprise participation in educational design must be highly valued. At present, driven by intelligence, the government, government, schools, and enterprises continuously input their talent needs for different specifications and standards into universities, and continue to influence teachers’ teaching behavior and methods, promoting teachers to better play a leading role. This is the practical measure to enhance the “four field” teaching mode.

It is of great practical significance to scientifically reconstruct the curriculum system based on the linkage or balance of the “four fields”. Intelligent motivation itself cannot achieve demand-oriented curriculum restructuring. Curriculum restructuring is a proactive and valuable professional labor of educators. Teachers can reconstruct courses based on the changes in job groups connected to their respective majors and the professional skills supported by each course. When applying the CDIO concept in the “four field” linkage teaching mode for different courses, it is necessary to design the “four field” space and duration reasonably based on the needs of course objectives and the different stages of students’ academic development. The interactive relationship between in class, in class, and outside of school should be handled reasonably, and students’ self-learning ability should be fully valued and developed to meet their comprehensive development needs.

The CDIO “four field” teaching model based on intelligent driving is an effective path to promote the implementation of OBE concept. The effective linkage of the “four fields” will inevitably be accompanied by the design and implementation of curriculum process arrangements based on course objectives and talent cultivation objectives. The traction effect of off campus internship fields on on on campus internships, independent learning, and classroom learning fields essentially provides an inevitable choice for the OBE concept in the process of achieving course objectives. Therefore, the “four field” linkage teaching mode based on the CDIO concept can essentially provide vivid and beneficial references for the implementation of talent cultivation mode and deepening the integration of industry and education under the OBE concept. The “linkage” principle and needs of the “four fields”.

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