

## *Original Paper*

# Research on the Academic Growth and Engineering Ability Cultivation of Students in Private Universities Based on the Concept of “CDIO-F”

Yufan Yang<sup>1\*</sup>

<sup>1</sup> Urban and Rural Construction Department, Southwest Jiaotong University Hope College, Sichuan, China

\* Yufan Yang, Urban and Rural Construction Department, Southwest Jiaotong University Hope College, Sichuan, China

Received: June 28, 2023      Accepted: August 15, 2023      Online Published: November 07, 2024  
doi:10.22158/wjeh.v6n6p10      URL: <http://dx.doi.org/10.22158/wjeh.v6n6p10>

### ***Abstract***

*The CDIO concept is an advanced engineering education concept. Private universities are an important component of higher education in China, and academic growth and engineering ability are key indicators for cultivating engineering college students. However, in private universities, the academic growth and engineering ability cultivation of engineering students cannot fully meet the needs of society. Therefore, the cultivation of students' academic growth and engineering ability has become an urgent issue to be solved. On the basis of the CDIO concept, the paper adds a feedback link and proposes a CDIO-F engineering education model. By demonstrating the compatibility of the CDIO-F concept with students' academic growth and engineering ability cultivation, a CDIO-F based model for private university students' academic growth and engineering ability cultivation is established. This provides new ideas for the cultivation of engineering majors in private universities.*

### ***Keywords***

*CDIO-F concept, Private universities, Academic growth, Engineering Ability Development*

## **1. Introduction**

Since its introduction to China in 2005, Shantou University College of Technology has first carried out the CDIO engineering education reform. Since then, the CDIO engineering education model has rapidly spread in China, and its advantages in engineering talent cultivation have been proven through nearly two decades of application. In order to adapt to the current situation of engineering construction

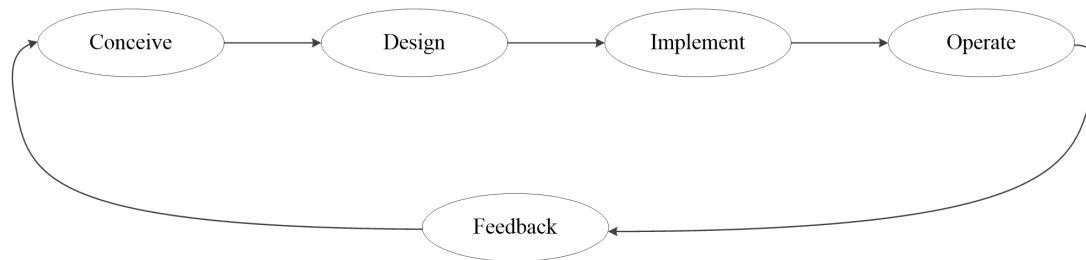
in China, the urgent task of higher engineering education in China is to cultivate Chinese engineers who are in line with international standards as soon as possible.

China's higher education is transitioning from a stage of popularization to a stage of popularization, and receiving higher education is increasingly becoming a common demand of the people. Private universities are an important component of higher education in China. As of the end of 2021, there are a total of 764 private universities in China, accounting for 25.37% of the total number of higher education institutions in the country. The development of students after graduation is an important criterion for measuring the concept, mode, quality, and effectiveness of talent cultivation in schools and majors. However, with the continuous expansion of enrollment in higher education in recent years, the following "strange phenomena" have emerged: on the one hand, the number of college graduates is constantly increasing, leading to many phenomena such as difficulty in finding employment in majors and unemployment upon graduation; On the other hand, some enterprises, high-tech industries, and others often experience talent shortages and "insufficient food", resulting in a supply-side structural contradiction between the supply of college graduates and the demand of the labor talent market. Ultimately, the reason for this phenomenon is that the students trained by universities cannot fully meet the talent needs of the market and employers. Therefore, applying the CDIO-F engineering education model to the cultivation of students in private universities can provide experience and reference for the development of training plans for engineering college students, and enrich the methods for universities to cultivate students' academic growth and engineering abilities.

## **2. Analysis of the CDIO-F Concept and Its Compatibility with Students' Academic Growth and Ability Development**

### *2.1 CDIO-F Concept*

The CDIO (Concept Design Implementation Operate) engineering education concept refers to the engineering education model of conceptualization, design, practice, and operation, first established by four universities including Massachusetts Institute of Technology. The CDIO concept, as an important achievement of international engineering education and teaching reform, is an educational reform concept that emphasizes the important role of engineering basic education, teamwork, innovation ability, etc. in higher education, and has a certain degree of compatibility with the academic growth and ability development plans of private university students. However, college students have been on campus for three to five years, with a relatively long experience. Their academic performance is evaluated on a semester by semester basis. Therefore, this study adds feedback to the four stages of CDIO concept conceptualization design practice operation, forming the CDIO-F (Concept Design Implementation Operate Feedback) engineering education concept, which can achieve a dynamic engineering education model on a semester by semester basis.



**Figure 1. CDIO-F Mode Diagram**

## *2.2 Analysis of the Fit between the CDIO-F Concept and Students' Academic Growth and Engineering Ability Cultivation*

In private universities, the effectiveness of students' academic growth and ability development is directly related to their future development. Under the CDIO-F engineering education model, we refine the management of students' college careers on a semester by semester basis, and draw on the PDCA cycle principle to add a feedback link in the middle of each semester, so that the learning situation from the previous semester can be fed back to the next semester and provide reference for the development concept of the next semester. This is in deep agreement with the semester learning mode of students' academic growth and ability cultivation.

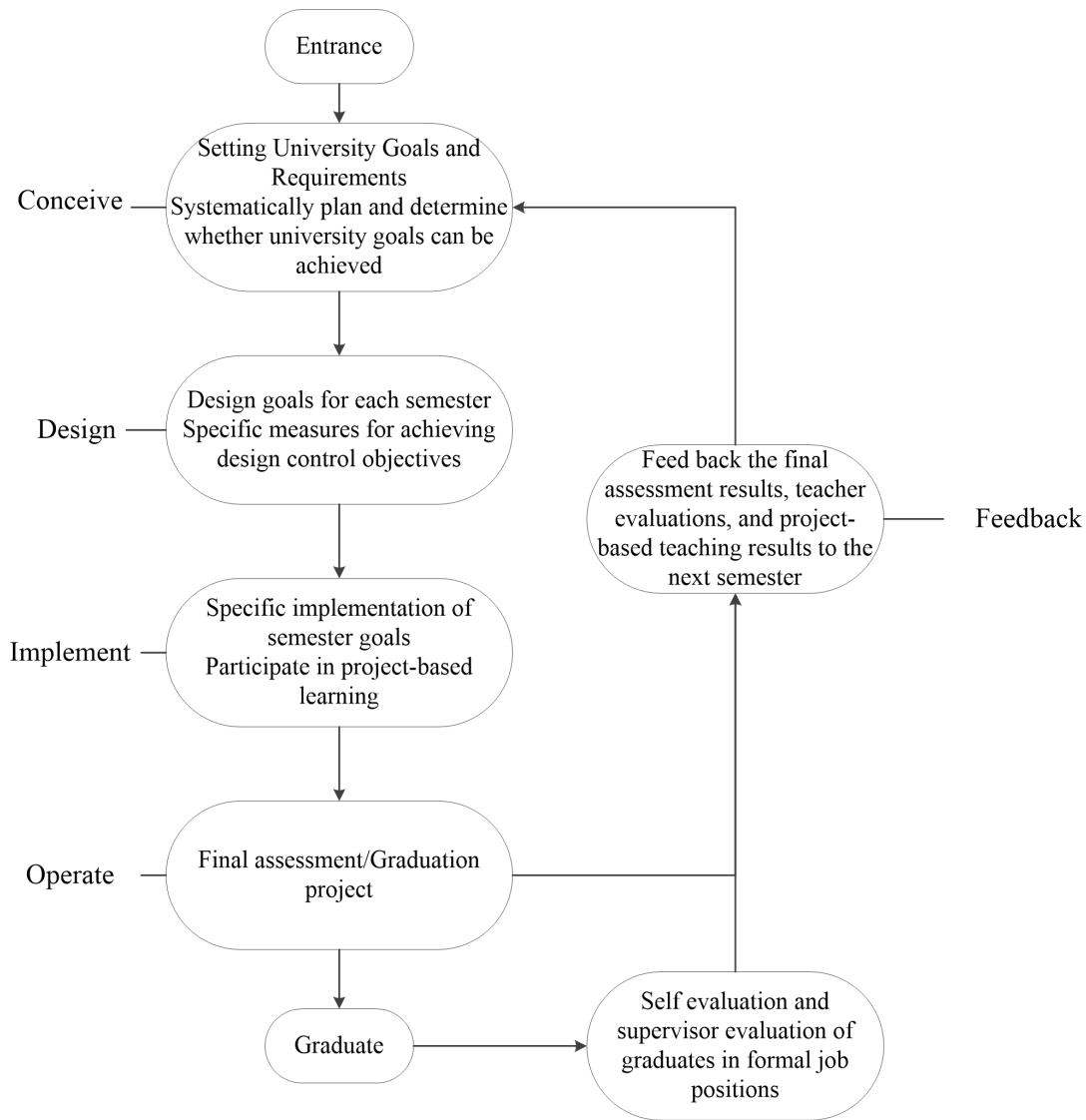
## **3. A Study on the Academic Growth and Engineering Ability Cultivation Model of Private University Students Based on the CDIO-F Concept**

### *3.1 Theory of Sustainable Development*

The cultivation of academic growth and engineering abilities is an important assessment content for engineering students in their university career, and it is also the core required in engineering projects. At present, universities mainly test students' learning outcomes on a semester or academic year basis, and test their academic growth and engineering abilities through final exams and assessments. The final test for engineering students is their job position after graduation. After graduation, students have a firsthand experience and the most authentic evaluation of whether the knowledge and abilities they have learned and developed in school can play a corresponding role in actual projects. Therefore, from the perspective of students, the effectiveness of their academic growth and engineering ability cultivation can be reflected from their assessment results during school and performance feedback in their work. On the other hand, teachers play a very important role in the feedback process during school, as they can evaluate students' engineering ability building from a more objective perspective. In the post graduation job position, the comprehensive evaluation of students' academic growth and engineering abilities by their direct supervisor during the entire university period is relatively accurate and representative.

In summary, based on the CDIO-F engineering education model, this paper establishes an engineering education model suitable for the academic growth and engineering ability cultivation of engineering

students in private universities throughout their entire life cycle of university career and career development. The main operating process of this model is shown in Figure 2.



**Figure 2. Academic Growth and Engineering Ability Training Model for Engineering Students in Private Universities**

#### 4. Conclusion

The paper takes the student career of engineering college students in private universities and a period of time after entering the work position as the research cycle, and establishes an engineering education model based on the CDIO-F concept. It proposes a new model for the academic growth and engineering ability cultivation of engineering college students, and provides ideas and methods for the development of training plans for engineering college students in private universities

## Acknowledgement

Thanks for the support of project launched by 2022 Sichuan Private Education Association(Project name: A Study on the Academic Growth and Ability Cultivation of Students in Private Universities Based on the Concept of “CDIO-F” - Taking Engineering Students as an Example; Project number: MBXH22YB327)

## References

- Chen, B. et al. (2017). Building a new model for cultivating students' engineering abilities based on the concept of “N-CDIO”. *Research in Higher Education of Engineering*, 5, 145-149.
- Du, Y. B. et al. (2018). The Historical Orientation and Development Trend of Higher Education in the New Era. *China Higher Education*, 12, 1-4.
- Gu, P. H. et al. (2012). CDIO in China (Part 1). *Research in Higher Education of Engineering*, 3, 24-40.
- Wang, Z.T. (2017). Research on Cultivating the Practical Innovation Ability of Local University Students Based on CDIO Concept. *Research and Exploration in Laboratory*, 36(7), 220-224.
- Sun L. et al. (2021). Discussion on the Interactive Mechanism of Graduate Quality Feedback for Teaching Reform in Universities. *Journal of Harbin University*, 3, 129-131.
- Tanveer, B., & Usman, M. (2022). An Empirical Study on the Use of CDIO in Software Engineering Education. *IEEE Transactions on Education*, 65(4), 684-694.  
<https://doi.org/10.1109/TE.2022.3163911>