



# Research on the Practice Model of Mathematics Teacher Education Internship: Integrating the CDIO Concept and Ideological and Political Education

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**Abstract.** Educational internship is an important part of the practice for mathematics teacher education talents, playing an irreplaceable role in the cultivation of professional abilities for pre-service teachers and the improvement of ethical literacy. Based on the requirements of the "one commitment and three competencies" of the accreditation of teacher education programs, this study combines the CDIO engineering education philosophy with the value orientation of the ideological and political education of the curriculum. It creates a systematic education internship system for mathematics teacher education majors which consists of 4 phases: Conceptualizing, building a model, practicing and improving the effect.

**Keywords:** Mathematics teacher education major; Educational internship; CDIO concept; Curriculum ideological and political education

## 1 Introduction

Educational intern is one of important courses of pre-service teacher practical education and good approach to improve teaching ability of pre-service teachers. It helps pre-service teachers become qualified teachers, playing a positive role in enhancing the professional beliefs of pre-service teachers, optimizing the knowledge structure of pre-service teachers, and cultivating the professional sentiments of pre-service teachers<sup>[1]</sup>.

Based on the developmental model of interaction between individuals and systems in ecological systems theory and developmental psychology, CDIO concept stresses active learning by doing hands-on work and making organic connection among different courses<sup>[2]</sup>. With the advancement of teaching reform in recent years, an increasing number of higher education institutions have begun to adopt the CDIO concept to carry out reform of practical courses. [3-5] have carried out CDIO in practical teaching in disciplines of industrial design, electronic information engineering, neurology clinical clerkship and so on. Core Strategies: Build a competence-oriented practical teaching system, use a project/task-driven teaching approach, reverse design a teaching program, and improve a process-oriented, diversified assessment and quality management system, which can help enhance students' hands-on skills, professional qualifications and comprehensive thinking capabilities.

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At the same time, ideological and political education for pre-service teachers is also an important path for the construction of teaching teams and the continuous improvement of China's education level. [6-7] have also pointed out that the moral cognition of pre-service teachers and the improvement of their moral quality are not only conducive to the construction of a high-quality teacher team and the development of the education cause but also help to train talents for national development and social progress.

In view of this, this study focuses on "construction and practice of an educational internship system for mathematics teacher education majors integrating the CDIO concept and ideological and political education", and through project-driven and full-cycle practice, it improves the mathematics teaching skills and innovation ability of pre-service teachers. At the same time, by organically combining ideological and political elements, it enhances the sense of ethics and educational value of vocational skills; Effectively solves the problem of separation of competency training and value shaping in the traditional internship; Fully meets the requirements of "one commitment and three competencies".

## 2 Construction Framework of the 4D Integration Educational Internship System

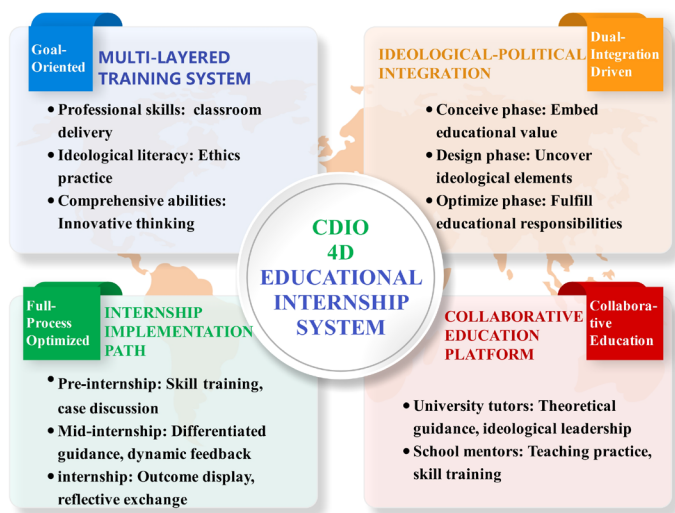


Fig. 1. 4D Integration Educational Internship System

Under the guidance of the core principle of combining the CDIO concept and ideological and political education, the construction of the educational internship teaching model for mathematics teacher education majors follows the "4D Integration" framework of goal orientation, dual-integration drive, full-process optimization, and collaborative education. As shown in Fig. 1, the whole plan generally include the following four parts.

### **2.1 Construct a Goal-Oriented Multi-Level Training System Factors**

Centered on the "One Commitment and Three Competencies" requirements of the accreditation of teacher education programs, a three-dimensional goal system is established, namely professional skills, ideological and political literacy, and comprehensive abilities.

### **2.2 Promote a Dual-Integration Driven CDIO-Ideological and Political Integration Mechanism**

Project-based logic and value-guided logic of CDIO are both embedded in the entire internship process. In the Conceive stage, the educational value of mathematics education is integrated into the overall project design; In the Design stage, ideological and political elements in teaching content are systematically identified and integrated into the CDIO project framework; In the Implementation stage, pre-service teachers adhere to professional ethics and take on educational responsibilities to present classroom teaching and achieve project goals; In the Operation stage, teaching reflection and value sublimation are enhanced to achieve the closed-loop of CDIO projects and the organic unity of ideological and political education. Through the dual integration mode of "project as carrier + ideological and political infiltration", competency training and value shaping are integrated.

### **2.3 Establish a Full-Process Optimized Internship Implementation Path**

Based on the CDIO-guided internship process of preparation stage, midterm practice and post-internship reflection, the whole-process optimized implementation path is built. The preparation phase focuses on building up the basic mathematics teaching skills and ability of ideological and political elements integration of pre-service teachers through targeted skills training, case studies, and micro-teaching. The mid-term practice period project has been done with the CDIO project based learning; Problem solving demands and different dynamic improvement feedback mechanisms can be set according to different personalized development demands. The post-internship reflection stage is to promote the accumulation of teaching experience and the improvement of professional ability through achievements display, reflection exchange, summary improvement activities, etc.

### **2.4 Build a Multi-Stakeholder Collaborative Education Platform**

A four-party collaborative education mechanism is established: university tutors, primary and secondary school supervisors, internship schools and pre-service teachers to support the effective implementation of CDIO project-based internships.

### 3 Practice of the CDIO-Ideological and Political Integration Internship System

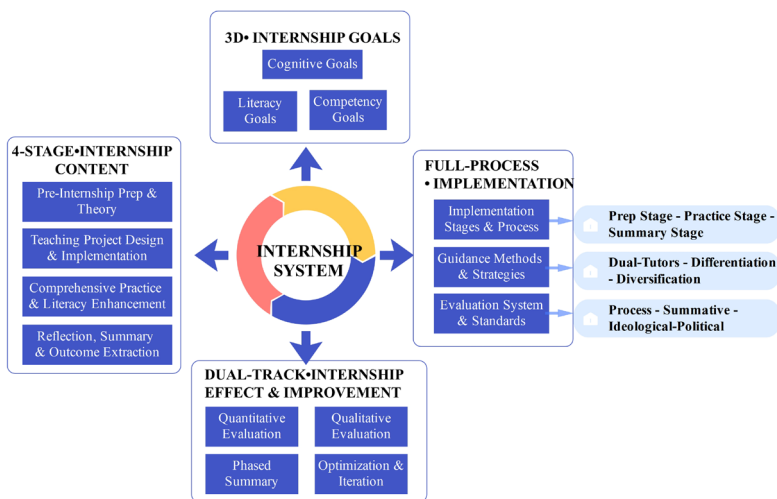


Fig. 2. Practice of the CDIO-Ideological and Political Integration Internship System for Mathematics Teacher Education Majors

#### 3.1 Three-Dimensional · Educational Internship Goals

As shown in Fig. 2, the teaching internship goals are divided into three mutually supportive and organically unify.

(1) Cognitive Goals: Master the main contents of the middle school mathematics curriculum standards, understand the educational value and inherent ideological and political elements of mathematics; Be familiar with the basic process of CDIO project practice, be able to Design comprehensive teaching projects according to the characteristics of mathematics teaching and demonstrate the ability to be designed.

(2) Competency Goals: Obtain the main capabilities to independently accomplish mathematics teaching plan, class, learning condition analysis and teaching reflection; integrate ideological and political elements into teaching to achieve the integration of knowledge imparting and value guidance.

(3) Literacy Goals: Realize the educational concept of "student-centered development", and follow the teachers' professional norms and moral integrity, cultivate professional dedication, patriotic sentiments for the education cause, and have the concept of lifelong learning and continuous professional growth.

#### 3.2 Four-Stage · Internship Content

The main direction of focus on integrating and practicing CDIO projects and ideological and political education is to divide the internship content into four organic connection and progression.

Stage 1: Preparation before internship and theoretical study.

Stage 2: Teaching Project Design and Implementation.

Stage 3: The stage of comprehensive practice and literacy improvement.

Stage 4: summary, and achievement extraction.

### 3.3 Full-Process · Educational Internship Implementation

#### 1. Implementation Stages and Processes

The internship is in three parts and all together 14 weeks and it goes like this:

(1) Preparation stage (2 weeks): Carry out pre-internship training, conduct policy interpretation, theoretical learning and skill training, etc.

(2) Practice stage (11 weeks): In the first three weeks, observe the lectures and adaptive teaching to get familiar with the teaching environment and students; In weeks 4-8, conduct CDIO project-based teaching practice, complete at least 2 class hours of independent teaching each week, and participate in class management and teaching research activities. In the 9th week, conduct innovative teaching practice and preliminary achievement display.

(3) Summary Stage (1 week): write internship summary reports and teaching reflections, summarize the exchange and assessment of internship results, and hold internship feedback and experience sharing meetings.

#### 2. Guidance Methods and Strategies

Use a "dual tutors + differentiated guidance" model, combined with different guidance methods to improve the effectiveness of internships:

(1) Dual Tutor Guidance: University tutors focus on the guidance of theory, ideological and political thought and research methods, providing face-to-face guidance at least once a week. The primary and secondary school supervisors focus on teaching practice, skills training and daily work, providing professional support at least once a week.

(2) Diversified Guidance: Divided into three levels according to the ability levels and development needs of the pre-service teachers, that is, basic, improved, and innovative, and personalized guidance plans formulated respectively.

(3) Diversified guidance forms: take on different guidance forms, such as classroom observation, case analysis, special lecture, teaching seminar, etc. and peer mentoring, etc. Through activities such as collective lesson preparation and refinement, teaching observation and evaluation, promote the all-round development of pre-service teachers.

#### 3. Evaluation System and Standards

Build a three-dimensional evaluation system of "process-oriented evaluation + summative evaluation + ideological and political special evaluation" to ensure the comprehensiveness and scientific nature of the assessment:

(1) Process-oriented evaluation (50%) covers lecture records, quality of lesson plans, classroom teaching performance, correction of homework, participation in teaching research activities, reflection journals, etc., jointly assessed by dual tutors.

(2) Summative evaluation (30%): including internship summary report, teaching achievement display, public teaching performance, etc., and use the three parties to

evaluate the results of the evaluation: "self-evaluation by pre-service teachers + evaluation by two tutors + evaluation by students."

(3) Ideological and Political Special Evaluation (20%): Focuses on dimensions such as the practice of professional ethics, the integration of ideological and political elements, and educational effectiveness, and evaluation indicators such as caring for students, fair teaching, sense of responsibility, value guidance, etc.

## 4 Conclusion

According to the core orientation of combining the CDIO concept and ideological and political education, this study constructs a whole teaching system for the educational internship of mathematics teacher education majors. Practice shows that this internship mode can not only strengthen pre-service teachers' core teaching skills of mathematics, also improved their moral quality and comprehensive development capabilities, help them can make a good transition of the role and laid the foundation for its professional development. At the same time, the construction and practice of this model can provide reference for the reform of educational internship in teacher education major, and provide practical basis for carrying out the fundamental task of "fostering morality and cultivating people" and improving the quality of teacher training.

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