

Exploration on Application-Oriented Curriculum Reform in CDIO Mode——Taking the Course “Ceramic Material Process Foundation” as an Example

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Abstract: Under the background of application-oriented transformation in local colleges and universities, the reform of curriculum teaching oriented to applied talent training is imperative. Taking the course of "Ceramic Material Process Foundation" as an example, this paper attempts to introduce the CDIO mode, makes some thinking and proposes corresponding countermeasures from the aspects of teaching content, teaching methods, practice system project operation, evaluation system and teacher team.

1. Introduction

CDIO is an international engineering teaching model created by the engineering education reform research teams of four universities including the Massachusetts Institute of Technology in the early 20th century. CDIO refers to Conceive, Design, Implement and Operate, which is new achievement of international engineering education reform in recent years. The CDIO mode advocates project-orientation, integrates curriculum theoretical knowledge into actual project operation, familiarizes students with the project process so that students learn in an active, practical and cooperative way to inspire thinking. The key to teaching reform based on CDIO mode is to break the inherent logic and integrity of subject knowledge structure, reconstruct a teaching system with project as the main line, and integrate training objectives of knowledge, ability and quality into project carrier through the adjustment, optimization and reorganization of related courses.

In practical curriculum construction, based on the CDIO mode, the professional elective course “Ceramic Material Process Foundation” of Crafts and Arts Department of the School of Fine Arts of Honghe University is constructed from the aspects of teaching content, teaching methods, practice system project operation, evaluation system and teacher team, which plays a guiding and exemplary role in curriculum construction of the college.

2. Status and role of the curriculum

"Ceramic Material Process Foundation" is a professional elective course for crafts and arts major. Its purpose is to enable students to fully understand and recognize the types, characteristics and performance of ceramic materials, understand the influence of process factors on the structure and performance of ceramic products, optimize formulas and improve performance of ceramic materials, and initially grasp basic knowledge and

ability to formulate and develop ceramic materials. It serves as a connecting link between the preceding and the following in subject knowledge, and provides a knowledge reserve and platform for the follow-up course study.

3. The main problems in the curriculum teaching

1. Among the existing teaching materials of ceramic materials, almost all of them are theoretical textbooks, there is no practical teaching materials, and the existing theoretical textbooks are mostly written for engineering students, which makes the teaching content of this course not in line with design disciplines and industry practice.
2. At present, the teaching process is still divided into two stages: theory and practice. The curriculum content still focuses on integrity of the knowledge system. There is no organic connection between the practice links and practice link often strays from the point.
3. Off-campus training links are insufficient. It fails to closely integrate the current development needs of the ceramic industry and the knowledge, ability, quality requirements and professional position ability required for the corresponding jobs, thereby truly cultivating students' practical application ability.
4. Most full-time teachers are cultivated and trained by the "school to school" disciplinary system. Lacking industry experience and workplace technical norms, it is difficult for them to guide practice.

4. Curriculum reform program

According to the curriculum characteristics and problems in teaching of "Ceramic Material Process Foundation", the specific reforms include:

1. Teaching content

According to the characteristics and needs of CDIO mode and art product design students, the textbook contents should be reconstructed, and the teaching contents should be divided into four modules of basic knowledge (type, characteristics and performance of ceramic materials), professional skills (material preparation process), comprehensive application (blank, glaze configuration and improvement), innovative practice (product design and production) (see Table 1). Relevant practical projects should be introduced according to characteristics of each major so that practical contents are closely linked to current development needs of the ceramic industry. At the same time, the latest information, latest achievements and local contents of ceramic industry related materials should be timely incorporated into the teaching activities, so that students can understand the market dynamics and consumer needs, have the foundation for multiple follow-up development while having foundation of the curriculum knowledge.

Table 1 Contents and periods of each module of "Ceramic Material Process Foundation"

No.	Name	Content	Period	Remarks
Module 1	Basic knowledge	Types, characteristics and performance of ceramic materials	8	1. Learning locations: multimedia classroom, training center, practice base 2. Periods: including classroom and practical periods
Module 2	Professional Skills	Material preparation process, blank, glaze preparation principle, test piece production	16	
Module 3	Comprehensive application	Blank, glaze configuration and improvement	24	
Module 4	Innovative Practice	Product Design and Production	24	

2. Teaching methods

(1) According to the curriculum characteristics and CDIO spirit, case and discussion methods are the main methods for theoretical teaching. Case based teaching is vivid, concrete and easy to understand. Discussion based teaching can promote communication between teachers and students and among students, and develop students' expression ability and interpersonal skills.

(2) Field visits and on-site teaching. Arrange students to visit factory, fair and market, and move classroom to the scene, so that students can gain an intuitive impression, broaden their horizons and widen their knowledge scope.

(3) Regularly hold academic lectures. Well-known experts and scholars should be regularly invited to give lectures to broaden the professional vision of students and enhance students' understanding of the latest developments in the industry.

3. Practice system project operation

With complete project practice as the carrier, the curriculum system should be organically combined, which is

an important part of CDIO. Therefore, when carrying out project-based practical teaching, we must carefully consider choices of project and control implementation of the project.

(1) Choice of project. Students should be freely grouped to conduct market research within the curriculum scope following interested directions (glaze or blank), and then design the project according to the research results. Let students introduce how to implement it and actively put forward the expected technical difficulties. At this stage, the teacher's main task is to guide students in project conception and program design, so that the project closely links with the professional direction and industry needs.

(2) Implementation of the project. According to the pre-design plan, the students divide the project into different links according to the curriculum contents, and responsible person is elected for each link. Taking “Design and Production of Jianshui Purple Pottery Quadrangular Jar” as an example, according to the curriculum content, the practical project can be divided into material preparation, test piece design, improved design, and product application to form “four linking-ring” progressive practice teaching system (Table 2). At this stage, students serve as the main body, while the teacher plays the role of supervision and guidance. On the one hand, the teacher guides students and helps them solve problems; on the other hand, some difficulties that the students have not realized can be pointed out.

Table 2 Practice section of Jianshui purple pottery quadrangular jar design and production project

No.	Practice Project Name	Practice Hours	Practice Type	Learning location: training center, practice base
Link 1	Preparation of Jianshui Purple Pottery Material	6	Foundation	
Link 2	Test piece production and data collection	10	Verification	
Link 3	Blank ratio and improvement	22	Comprehensive design	
Link 4	Product trial production	24	Research innovation	

(3) Project reporting and summary. After the completion of the project, each group should report the implementation status of the project, display the project results, share feelings and experiences. Then, the teacher and other group members will comment from the aspects of completion status, teamwork and innovation awareness to help students sum up the experience and find the deficiencies.

4. Evaluation system

According to the teaching philosophy of CDIO mode, the evaluation system focuses on formative assessment. Therefore, the evaluation content is subdivided into ideas (proposals, research and analysis) accounting for 20%; design (diversity, originality) accounting for 20%; implementation (completion progress, design and production) accounting for 30%; operation (entity results, research reports or small papers) accounting for 30%. The evaluation form adopts the principle of combining comments with scoring. Industry experts are introduced as evaluation subjects.

5. Teaching team

(1) A teacher training plan should be formulated to arrange teachers to have enterprise internships in a planned and focused manner, thereby gaining rich engineering practice experience.

(2) Off-campus professionals should be invited to the school to give lectures and lessons about new technologies and new techniques in the industry so that teachers' quality is improved.

5. Conclusion

Practice has proved that the introduction of "CDIO" teaching mode into teaching, which takes project design as the orientation and students' practical ability training as the core concept, has improved teaching quality and strengthened students' personal ability and professional ability. Where, project selection is the key, the evaluation system is a guarantee. Also, it challenges teachers' ability.

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