

Research on the Construction of Project-Based Curriculum System for Applied Undergraduate Education under the Background of Industry-Education Integration

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Abstract

With the transformation and upgrading of China's economic structure, the demand for high-quality applied talents in society is becoming increasingly urgent. However, the traditional undergraduate education model is difficult to meet the needs of the industry, and the reform of education and teaching is urgent. Taking Guangdong University of Technology as an example, this paper focuses on the construction of project-based curriculum system for applied undergraduate education under the background of industry-education integration, systematically analyzes the existing problems of the current curriculum system, and proposes a curriculum reform plan oriented by market demand, based on work process logic and students' cognitive laws. The research aims to improve students' practical and innovative abilities and promote the transformation of education and teaching models through theoretical construction, school-enterprise cooperation, resource matching and evaluation system optimization. The results show that the construction of project-based curriculum system can effectively promote the organic connection of education chain, talent chain and industry chain, and provide reference for the reform of applied undergraduate colleges.

Keywords: industry-education integration, applied undergraduate, project-based curriculum system, educational reform, Guangdong University of Technology

1. Introduction

In recent years, China's higher education has encountered significant structural contradictions, with the prominent issue of graduates' employment quality being out of touch with market demand.[1] This disconnection has led to an urgent need for reform in the educational sector to better align with the demands of the industry. In response to this challenge, the Chinese government has introduced a series of policies to promote the transformation of local undergraduate colleges towards an applied type, emphasizing the core role of industry-education integration in talent cultivation.[2]The "Guiding Opinions on Guiding Some Local Ordinary Undergraduate Colleges to Transform to Applied Type" issued in 2015 clearly proposed the "comprehensive promotion of case teaching and project teaching," marking the project-based curriculum system as a key measure for cultivating applied talents. Subsequently, in 2017, the "Several Opinions on Deepening Industry-Education Integration" further emphasized that deepening industry-education integration is a core measure to solve the contradiction between talent supply and demand.[3] These policies have set the direction for higher education institutions to actively explore and practice the integration of industry and education, aiming to improve the quality of talent cultivation and enhance the employment competitiveness of graduates.

Guangdong University of Technology, as a representative of applied undergraduate colleges in Guangdong Province, has actively explored the construction of a project-based curriculum system. The university aims to enhance students' professional abilities and industrial adaptability through curriculum reform. This exploration is of great significance for promoting the transformation and upgrading of higher education and cultivating high-quality applied talents that meet the needs of the industry. The project-based curriculum system is an important means to achieve the integration of industry and education. It focuses on practical teaching, emphasizes the cultivation of students' practical abilities and innovative spirit, and enables students to better adapt to the needs of the industry.[4] Through the construction of a project-based curriculum system, colleges can better integrate

theoretical teaching with practical teaching, allowing students to master professional knowledge and skills in practical projects, and improve their comprehensive abilities and employment competitiveness.

This paper is based on the educational reform practice of the School of Computer Science at Guangdong University of Technology. It systematically discusses the construction path, implementation strategy, and reform effect of the project-based curriculum system. The aim is to provide theoretical support and practical reference for similar colleges, promoting the in-depth development of industry-education integration and the improvement of talent cultivation quality. The reform of the curriculum system is an important part of the transformation and development of higher education. By constructing a project-based curriculum system, colleges can better meet the needs of the industry, cultivate high-quality applied talents, and promote the development of higher education. This paper will elaborate on the construction path and implementation strategy of the project-based curriculum system, and analyze its reform effect, providing reference for the reform and development of higher education.

In summary, the construction of a project-based curriculum system under the background of industry-education integration is of great significance for promoting the transformation and upgrading of higher education, cultivating high-quality applied talents, and meeting the needs of the industry. This paper will provide a detailed discussion on this topic, hoping to provide useful reference and inspiration for the reform and development of higher education.

2. Research Background and Current Situation

2.1 Research Background

In recent years, China's higher education has faced significant structural contradictions, with the prominent issue of graduates' employment quality being out of touch with market demand. This disconnection has led to an urgent need for reform in the educational sector to better align with the demands of the industry[5]. In response to this challenge, the Chinese government has introduced a series of policies to promote the transformation of local undergraduate colleges towards an applied type, emphasizing the core role of industry-education integration in talent cultivation.

The "Guiding Opinions on Guiding Some Local Ordinary Undergraduate Colleges to Transform to Applied Type" issued in 2015 clearly proposed the "comprehensive promotion of case teaching and project teaching[6], "marking the project-based curriculum system as a key measure for cultivating applied talents. Subsequently, in 2017, the "Several Opinions on Deepening Industry-Education Integration" further emphasized that deepening industry-education integration is a core measure to solve the contradiction between talent supply and demand. These policies have set the direction for higher education institutions to actively explore and practice the integration of industry and education, aiming to improve the quality of talent cultivation and enhance the employment competitiveness of graduates.

Guangdong University of Technology, as a private of applied undergraduate colleges in Guangdong Province, has actively explored the construction of a project-based curriculum system. The university aims to enhance students' professional abilities and industrial adaptability through curriculum reform. This exploration is of great significance for promoting the transformation and upgrading of higher education and cultivating high-quality applied talents that meet the needs of the industry. The project-based curriculum system is an important means to achieve the integration of industry and education. It focuses on practical teaching, emphasizes the cultivation of students' practical abilities and innovative spirit, and enables students to better adapt to the needs of the industry. Through the construction of a project-based curriculum system, colleges can better integrate theoretical teaching with practical teaching, allowing students to master professional knowledge and skills in practical projects, and improve their comprehensive abilities and employment competitiveness.

In addition to policy support, the transformation of higher education institutions towards an applied type also requires the joint efforts of schools and enterprises. School-enterprise cooperation is an important way to achieve industry-education integration. Through school-enterprise cooperation, colleges can better understand the needs of the industry, optimize the curriculum system, and cultivate talents that meet the needs of the industry. At the same time, school-enterprise cooperation can also provide students with more practical opportunities, enabling them to better adapt to the work environment after graduation.

Furthermore, the construction of a project-based curriculum system also requires the support of teaching staff. Teachers need to have both theoretical knowledge and practical experience to better guide students in practical projects. Therefore, higher education institutions need to strengthen the construction of the teaching staff, improve the practical ability and teaching level of teachers, and provide stronger support for the construction of the project-based curriculum system.

In summary, the construction of a project-based curriculum system under the background of industry-education integration is of great significance for promoting the transformation and upgrading of higher education, cultivating high-quality applied talents, and meeting the needs of the industry. This paper will provide a detailed discussion on this topic, hoping to provide useful reference and inspiration for the reform and development of higher education.

2.2 Research Current Situation

Domestic and international research has shown that project-based teaching can effectively improve students' practical abilities and innovative awareness. However, existing research mostly focuses on the reform of single courses, lacking systematic discussion on the overall design of the curriculum system. Some colleges in Guangdong Province have tried project-based teaching, but due to factors such as insufficient teaching staff and insufficient in-depth cooperation between schools and enterprises, the curriculum system still has problems such as fragmentation and superficiality.[7] Therefore, how to construct a systematic and market-oriented project-based curriculum system has become the focus and difficulty of current educational reform.

In recent years, with the continuous deepening of educational reform, more and more higher education institutions have begun to explore the construction of a project-based curriculum system. Some colleges have achieved certain results in this area. For example, some colleges have established a project-based curriculum system oriented by market demand, which has effectively improved students' practical abilities and employment competitiveness. However, there are still some problems in the construction of the project-based curriculum system. For example, some colleges lack systematic planning and design in the construction of the curriculum system, resulting in the fragmentation and superficiality of the curriculum system.[8] In addition, some colleges lack in-depth cooperation with enterprises, and the curriculum content and teaching process are not well connected with the actual work process, resulting in students' practical abilities and employment competitiveness not being effectively improved.

In response to these problems, some scholars have proposed suggestions and countermeasures. For example, some scholars believe that higher education institutions should strengthen systematic planning and design in the construction of the project-based curriculum system, and build a systematic and market-oriented curriculum system. At the same time, higher education institutions should also strengthen in-depth cooperation with enterprises, and ensure the connection between curriculum content and professional standards, teaching process and work process.[9] In addition, some scholars also believe that higher education institutions should strengthen the construction of the teaching staff, improve the practical ability and teaching level of teachers, and provide stronger support for the construction of the project-based curriculum system.

In addition to domestic research, foreign research on project-based teaching is also constantly deepening. Some foreign scholars have proposed that project-based teaching can not only improve students' practical abilities and innovative awareness but also cultivate students' team cooperation ability and problem-solving ability.^[10] At the same time, some foreign scholars have also conducted in-depth research on the construction of the project-based curriculum system, and proposed some valuable suggestions and countermeasures. For example, some foreign scholars believe that higher education institutions should strengthen cooperation with enterprises, and jointly develop curriculum content and teaching plans to ensure that the curriculum content and teaching process are better connected with the actual work process.

In summary, the research on project-based teaching and the construction of the project-based curriculum system has achieved certain results, but there are still some problems and challenges. In the future, higher education institutions need to further strengthen systematic planning and design, deepen cooperation with enterprises, and improve the construction level of the project-based curriculum system to better meet the needs of the industry and cultivate high-quality applied talents. This paper will further explore the construction path and implementation strategy of the project-based curriculum system, and provide reference for the reform and development of higher education.

3. Research Content

This paper focuses on the construction of a project-based curriculum system for applied undergraduate education under the background of industry-education integration, taking Guangdong University of Technology as an example. The research aims to address the existing problems in the current curriculum system and propose a curriculum reform plan oriented by market demand, based on work process logic and students' cognitive laws. The following sections will elaborate on the objectives, construction path, project planning and implementation, and implementation guarantee of the project-based curriculum system.

3.1 Objective Setting

The construction of the project-based curriculum system aims to achieve the following goals:

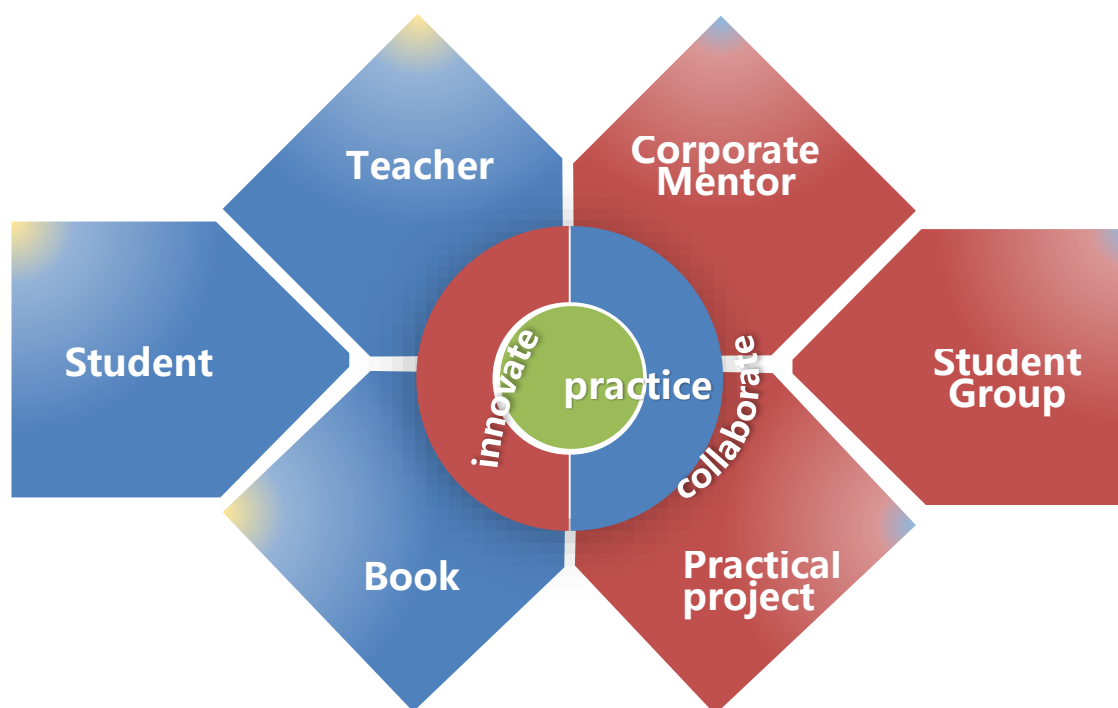


Figure 1. Objective Setting

3.1.1 Role Transformation

In the traditional education model, teachers are mainly knowledge transmitters, and students are passive learners. However, in the project-based curriculum system, the roles of teachers and students will be transformed. Teachers will become guides who provide guidance and support to students, while students will become the main body of practice, actively participating in project implementation and problem-solving. This role transformation will enable students to better develop their practical abilities and innovative spirit, and improve their learning enthusiasm and initiative.

3.1.2 Ability Improvement

Through typical work task training, the project-based curriculum system aims to cultivate students' practical abilities, innovative abilities, and team cooperation abilities. In the process of project implementation, students need to apply the knowledge and skills they have learned to solve practical problems, which can effectively improve their practical abilities. At the same time, students need to think independently and propose innovative solutions in the process of project implementation, which can cultivate their innovative abilities. In addition, students need to cooperate with each other in the process of project implementation, which can strengthen their team cooperation abilities.

3.1.3 Industry-Education Collaboration

The project-based curriculum system emphasizes the deep cooperation between schools and enterprises to ensure the connection between curriculum content and professional standards, teaching process and work process. Through school-enterprise cooperation, colleges can better understand the needs of the industry, optimize the curriculum system, and cultivate talents that meet the needs of the industry. At the same time, school-enterprise cooperation can also provide students with more practical opportunities, enabling them to better adapt to the work environment after graduation.

3.2 Curriculum System Construction Path

3.2.1 Design of Talent Training Objectives Based on Industrial Demand

Through market research and job analysis, the typical work tasks of core positions in the software engineering major are clarified, such as software development and project management. Based on this, the professional skills and professional literacy that students need to master are determined. For example, for the position of "software designer", it is necessary to focus on cultivating the abilities of requirement analysis, system design, and team cooperation. This design of talent training objectives can ensure that the curriculum content is closely related to the actual work needs, and cultivate students' practical abilities and employment competitiveness.

3.2.2 Curriculum Design Based on Work Process Logic

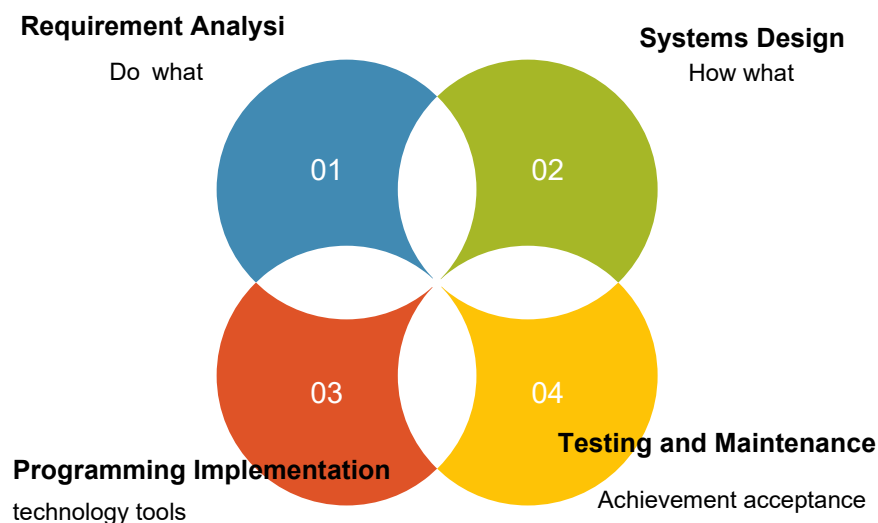


Figure 2. Workflow

The work process corresponding to the major is decomposed into four major modules: "requirement analysis → system design → coding implementation → testing and maintenance". Each module corresponds to a core course, such as "UML Object-Oriented Analysis and Design" and "Software Project Management". The course sequence is arranged according to the work process to ensure the consistency of teaching and professional practice. This curriculum design can help students better understand the work process and improve their practical abilities.

3.2.3 Three-Stage Ability Training System Based on Students' Cognitive Laws

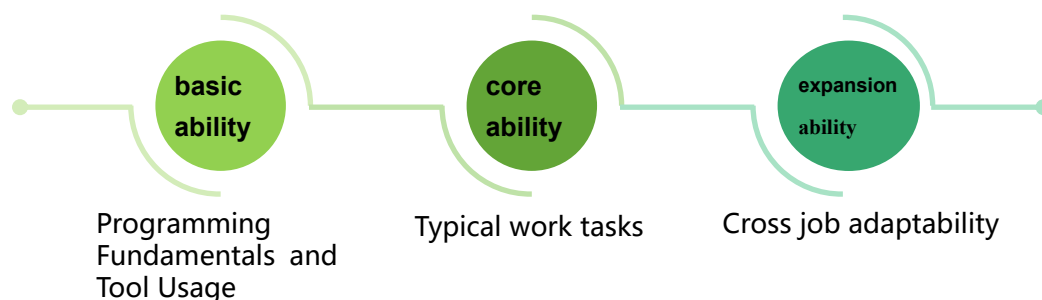


Figure 3. Curriculum system

According to students' cognitive laws, a three-stage curriculum system of "basic ability → core ability → expansion ability" is constructed.

Basic Ability Courses: Focus on programming basics and tool usage, such as "JavaScript Programming". These courses aim to provide students with a solid foundation in programming and tool usage, which is essential for their subsequent learning and practice.

Core Ability Courses: Focus on typical work tasks, such as "Software Designer Certification". These courses aim to cultivate students' core abilities in solving practical problems and improve their professional skills.

Expansion Ability Courses: Strengthen cross-position adaptability, such as "Innovation and Entrepreneurship Practice". These courses aim to expand students' knowledge and skills, and cultivate their innovative abilities and entrepreneurial spirit.

3.3 Project Planning and Implementation

3.3.1 Project Content Design

Real enterprise projects, such as e-commerce platform development, are selected as teaching carriers. Through task decomposition, theoretical knowledge and practical skills are integrated. For example, in the "Web Design" course, students need to complete the complete project process from requirement analysis to front-end development. This project content design can enable students to better understand the actual work process and improve their practical abilities.

3.3.2 Situation Creation and Resource Matching

School-Enterprise Co-construction of Training Bases^{**}: Introduce enterprise mentors to participate in teaching and provide a real working environment. This can enable students to better understand the actual work environment and improve their practical abilities.

Virtual Simulation Platform^{**}: Use information technology to simulate complex work scenarios, such as big data analysis. This can provide students with more practical opportunities and improve their practical abilities.

3.3.3 Evaluation System Optimization

A multi-dimensional evaluation system of "quantitative + qualitative" and "teachers + enterprises + students" is constructed.

Quantitative Evaluation: Project result completion and code quality. This can objectively evaluate students' practical abilities and learning outcomes.

Qualitative Evaluation: Team cooperation and innovative thinking. This can comprehensively evaluate students' comprehensive abilities and qualities.

Enterprise Evaluation: Professional literacy and job adaptability. This can evaluate students' employment competitiveness and professional development potential.

3.4 Implementation Guarantee

3.4.1 Teacher Team Building

Cultivate "dual-teacher and dual-ability" teachers through two-way communication between schools and enterprises. This can improve the practical ability and teaching level of teachers, and provide stronger support for the construction of the project-based curriculum system.

3.4.2 Continuous Improvement Mechanism

Regularly collect feedback from students and enterprises, and dynamically adjust curriculum content. This can ensure that the curriculum content is constantly optimized and updated, and better meet the needs of the industry and students.

In conclusion, the construction of a project-based curriculum system under the background of industry-education integration is a complex and systematic project. It requires the joint efforts of schools, enterprises, and teachers to continuously explore and practice, and improve the quality of talent cultivation.

4. Conclusions

This study takes Guangdong University of Technology as an example and constructs a project-based curriculum system based on industry-education integration, achieving the following results:

Firstly, the curriculum system is systematic. By designing the curriculum with a work process orientation, the problem of traditional curriculum fragmentation is solved. This systematic curriculum design enables students to better understand the work process and improves their practical abilities.

Secondly, students' abilities are significantly improved. The participation in practical courses is increased by 30%, and the award rate of subject competitions is increased by 25%. Through the project-based curriculum system, students' practical abilities, innovative abilities, and team cooperation abilities are effectively cultivated, which improves their comprehensive abilities and employment competitiveness.

Thirdly, school-enterprise cooperation is deepened. Cooperation agreements have been signed with 5 enterprises, and 3 training bases have been jointly built. Through school-enterprise cooperation, the connection between curriculum content and professional standards, teaching process and work process is ensured, which cultivates students' practical abilities and employment competitiveness.

In the future, it is necessary to further explore the integration of cross-disciplinary courses and the mechanism of in-depth enterprise participation to continuously optimize the training model of applied talents. By continuously improving the project-based curriculum system, we can better meet the needs of the industry and cultivate more high-quality applied talents.

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