

# *Teaching Reform and Exploration of C Language Programming Design Based on Dual System Teaching Mode*

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**Abstract:** The teaching reform of C Language programming based on dual teaching mode is one of the exploration topics of teaching in universities. This paper studies the dual system at home and abroad, with the help of the information teaching platform with the assistance of enterprises, campuses and front-line teachers, formulates the feasible dual system teaching reform plan, and carries out the reform practice and exploration in the practical teaching. In the project reform plan, the proportion of process assessment is increased, the comprehensive evaluation system is constructed, and the online curriculum resources are reconstructed. The effect of the teaching reform scheme of the dual system mode has been analyzed through research and evaluation, and a series of innovation points have been refined in the paper. The teaching effect of the dual system teaching mode shows that: the students' enthusiasm is improved, the learning interest is strong, the comprehensive evaluation system is more reasonable, and the role in the basic teaching is obvious.

## 1. Introduction

### 1.1 Research Background

China's talent training measures in higher education are multi-faceted, but the overall goal is to focus on the leaders in a discussion with Peking University in May 2018, "What people to cultivate? How to cultivate people? For whom to cultivate people?" [1]The leader is instead.

The Dual System is a vocational training model originated in Germany. The so-called Dual System is actually the "2-2-2" model: two school subjects, two teaching sites, and the dual learning identity is [2]. One dollar refers to the school, the main function is to impart professional knowledge related to the occupation; the other dollar is the enterprise and other off-campus training places, the

main function is to allow students to receive professional training in vocational skills in the enterprise. The Dual System is a teaching mode, but also a school-enterprise cooperation system, that is, enterprises and schools jointly shoulder the task of cultivating talents, and organize teaching and post training according to the requirements of enterprises for talents.

In the 1980s, China began to study and introduce the Dual System education model. Its main participants are vocational schools. After 40 years of wind and rain, the Dual System provides a way for the development of vocational education in China, and now it also provides a reference for Sino-foreign cooperation and school-enterprise cooperation. More and more institutions of higher learning in China are gradually in line with international standards and accepting the dual education and teaching model.

Since the beginning of 2017, Qingdao University of Science and Technology has cooperated with the Sino-German Ecological Park, and conducted exploration and pilot projects in education, teaching and vocational practice. To better serve the campus and cultivate dual education teaching mode, choose public basic compulsory courses of C programming as dual teaching mode curriculum reform, hope to explore can realize basic curriculum teaching and vocational education teaching effectively, realize professional knowledge training and engineering application ability of double promotion, teaching methods, teaching content, teaching practice, teaching assessment mode of effective attempt, for the subsequent professional courses and other public basic courses in German campus dual teaching provide theoretical support and resource sharing.

## 1.2 Current Status of Dual System at Home and Abroad

The Dual System originated in Germany with a history of 400 years. It has trained a large number of technical and engineering talents for Germany, which is an effective training mode of the German craftsman spirit.

China introduced Dual System training mode in vocational colleges to cultivate professional quality and professional knowledge of engineering talents, related vocational colleges for discussion and exploration, such as Jiangsu open university in the Dual System teaching mode in the training course exploration [2], Qinghai qaidam vocational college in the dual curriculum teaching mode theory research [3], Zhuhai technician college put forward the Dual System curriculum teaching reform strategy [4], and so on.

Compared with the dual teaching mode of vocational and technical colleges, the proposal and research of the Dual System, especially the exploration of talent training, is slow and late, and there is no teaching mode of the Dual System basic curriculum available for reference or reference. Based on this topic, the teaching Exploration and Research of "C Language Programming Design" of Basic Curriculum Based on Dual System Teaching Mode is proposed, which provides theoretical and practical support for the relevant teaching reform and innovation of colleges and universities through the exploration of Dual System teaching mode of public basic curriculum[5].

## 1.3 Research Significance of the Subject

The main research significance of the project is reflected in the following aspects:

(1) Compare the differences between the dual teaching mode of the public basic course "C Language Program Design" and the general teaching mode in colleges and universities, implement the teaching mode reform and effective exploration of the dual public basic curriculum, and optimize and reform the engineering talent training of the Dual System teaching mode[6].

(2) Through the Dual System "C language programming" of the basic curriculum and knowledge deconstruction, reconstruction, gradually put forward and explore the Dual System of teaching theory and teaching practice application ability, through the teaching reform to improve students'

case modeling, data analysis ability and computing thinking ability, rich Dual System teaching mode.

(3) Through the comprehensive reconstruction and exploration of teaching content, gradually combine the project training with teaching knowledge, modularity and process orientation, and realize the comprehensive reform and exploration of the Dual System teaching mode, teaching method, teaching content and teaching evaluation in strengthening the effective construction of teachers.

## **2. Research Content and Objectives**

### **2.1 Subject Research Content**

The research content mainly includes the following three aspects:

(1) Study the difference between the Dual System teaching mode and the traditional teaching mode, and put forward the effective attempt of the Dual System teaching mode. Dual System teaching mode is to realize the professional knowledge, basic knowledge and technical skills, practical application, and the traditional teaching mode to cultivate students' learning ability, innovation ability and application ability is given priority to, through the comparison of different modes, to the C language program design as an example to explore the public basic curriculum in the dual teaching mode of effective reform and innovation[7].

(2) Research comb compare mature "C programming" curriculum resources such as curriculum, teaching content, teaching methods, assessment methods, etc., does not conform to the Dual System teaching mode of resource library realize deconstruction reconfiguration[8], so as to explore the suitable for Dual System teaching mode of various resources, and launched in the sino-german campus try to practice.

(3) The research of the dual training mode, through the research of German Dual System teaching architecture and vocational colleges dual teaching results, put forward the Dual System of universities training mode, form the basis of the dual teaching characteristics, and improve the mutual win and mutual benefit cooperation mode, cultivate students' knowledge, application and ability of comprehensive engineering talents[9].

### **2.2 Subject Research Objectives**

The research objectives mainly focus on three aspects:

(1)The teaching exploration of the basic course "C Language programming" based on the Dual System teaching mode, and studies the teaching content, teaching methods and assessment methods suitable for the Dual System, so as to realize the teaching goal of resource database deconstruction and reconstruction.

(2)Study how to cultivate students' unity of basic knowledge and professional knowledge, technology and engineering under the Dual System, and explore the effective connection goals of the unity of basic course teaching, knowledge type and application under the Dual System.

School-enterprise cooperation and trust under the Dual System is the basis of teaching. The mutually beneficial cooperation mode between universities and enterprises is studied to realize the characteristic goal of Dual System teaching.

## **3. Project Design Scheme**

The topic is a cooperation topic with the Sino-German Dual Engineering College to study the teaching reform and exploration of the Dual System teaching mode in the basic curriculum. The

main scheme design and research methods are as follows:

### **3.1 Bipartite System of Education and Teaching Strategy**

To study the similarities and differences between the dual teaching mode and the existing teaching mode of higher education in China, and to implement the teaching reform and exploration in the Sino-German dual Engineering College, and to design the dual education teaching strategy suitable for colleges and universities. The demand for talents in the dual-system teaching mode of colleges and universities is the unity of professional knowledge and applied skills, and the effective connection between professional knowledge and applied skills. Therefore, fully consult a large number of materials, understand the training methods of the Dual System of countries, universities and vocational colleges, fully discuss with the campus leaders, investigate the talent training needs of the Dual System of teaching mode, and complete the reserve of first-hand materials for the deconstruction and reconstruction of the curriculum.

### **3.2 Reconstruction and Integration of Course Resources**

Integrate the online resources of C Programming, discuss with experts, and realize the resource library reconstruction of C Programming. Under the premise of fully reflect enterprise vocational technical requirements, revise the syllabus under the dual teaching mode, design both basic knowledge and professional skills unified teaching content (such as intelligent vending machine, iterative solution algorithm, intelligent voting system practical, engineering and innovative), cases, such as PDCA, flipped classroom, online interactive information teaching method, increase skills, application knowledge process and practical ability, and optimize the assessment of different items in the total weight ratio. To change the traditional teaching mode, to explore the application ability, practical ability and practical ability as the focus of the reform, and to complete the construction of the Dual System teaching reform resource base of "C Language Program Design".

### **3.3 Study the Dual Teaching Effect of Basic Course C Programming**

After the dual teaching, send an anonymous survey questionnaire, analyze the data indicators, and output the effect diagram of the dual teaching mode. According to the research of the school-enterprise professional leaders and the feedback of the renderings, the dual teaching effect of C Language programming design is evaluated, and the imperfections are supplemented, so as to design the unified dual teaching mode of knowledge and application skills.

### **3.4 Flowchart of the Reform Scheme Based on the Dual-Element System Teaching Mode**

Figure 1 is a flow chart of the reform scheme based on the Dual System teaching mode. In the reform plan of the Dual System teaching mode, several steps are mainly classified: basic research, design and reform scheme, reform scheme implementation, effect feedback, design scheme optimization, design scheme verification and data resource summary. Among them, the basic research should analyze the current situation at home and abroad, the reform plan design should extensively listen to the opinions of the campus, expert groups and front-line teachers, and the effect feedback should not only include teaching results but also include students, enterprises and professional feedback. Of course, in the summary of data resources, the basic documents such as the teaching syllabus should be included, as well as the survey questionnaire data and other online tests, experimental reports and various shared online courseware resources in the teaching.

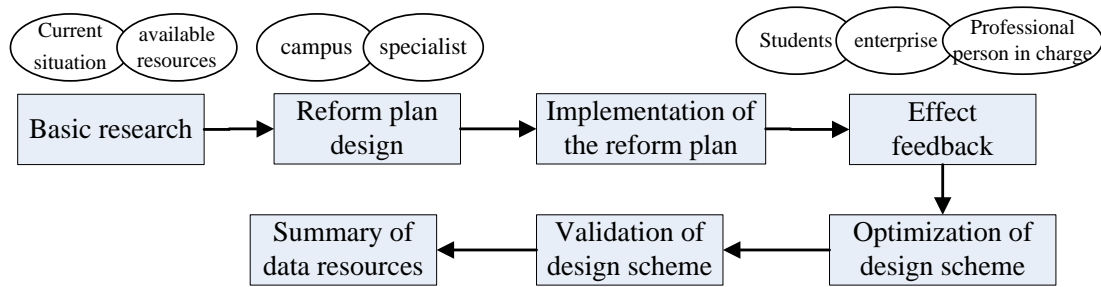


Figure 1: Flow chart of the reform plan

#### 4. Project Implementation Effect and Analysis

The effect of the subject teaching reform is supported by the effective research data formed. Design research questionnaire in the form of anonymous, design mainly reflects the course main content and evaluation system, curriculum teaching system and dual cohesion, teaching mode recognition radio mode, course main characteristics and the overall evaluation adopts more choice mode, and the course target effect using matrix radio mode research, received effective questionnaire a total of 111.

(1) Students believe that "the main content of the course and the evaluation system is reasonable and clear" accounted for 78.38%, and the more reasonable proportion accounted for 17.12%, which shows that the reform and exploration of the Dual System teaching mode has been recognized by students. The reform assessment and evaluation system tends to the process evaluation and the comprehensive evaluation, which not only gets the support of the students, but also improves the students' enthusiasm and practical ability. See Figure 2 for details.

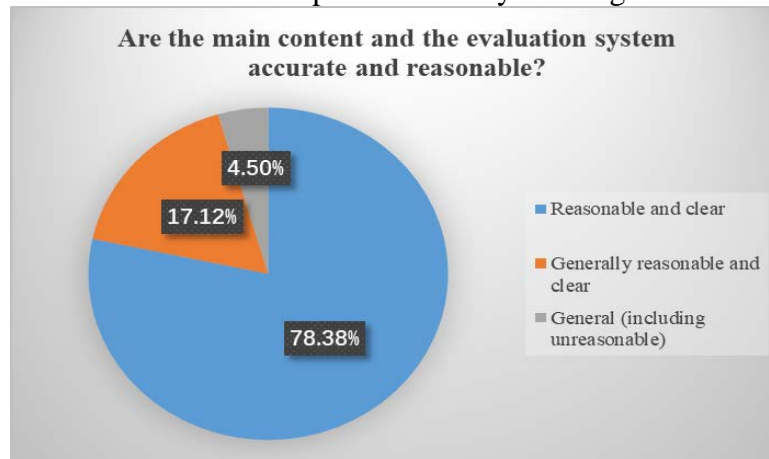


Figure 2: Are the main content and the evaluation system accurate and reasonable?

(2) The curriculum teaching system and the Dual System account for 69.37%, while 30.63%. It shows that the exploration of the dual teaching mode in the first phase of teaching reform is successful, and 100% of the professional students effectively take into account the dual teaching in Chinese and German campus in teacher teaching. See Figure 3 for details.

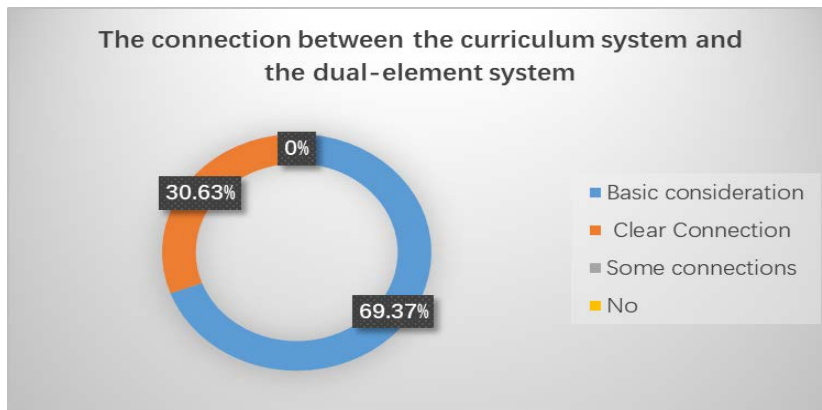


Figure 3: The connection between the curriculum system and the dual-element system

(3)The reformed teaching mode is recognized, with 77.48%; the overall evaluation of knowledge and professionalism, technical and 61.26% in engineering application, which may be related to comprehensive defense and information teaching to realize the rationality of curriculum system and knowledge structure design; see Figure 4.

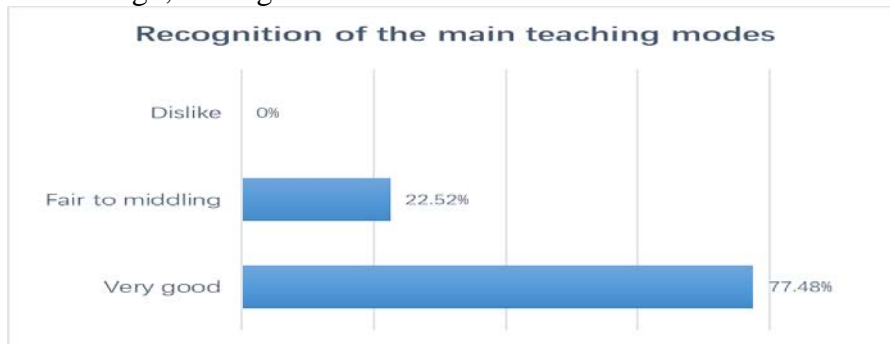


Figure 4: Recognition of the main teaching modes

(4) In the "main characteristics and overall evaluation of the course", most indicators are more than 60%, and only the "teaching case is close to the professional characteristics", which is less than 35%. The reason is that there are many teaching majors, and the teaching cases are difficult to meet the requirements of students of all majors; see Figure 5.

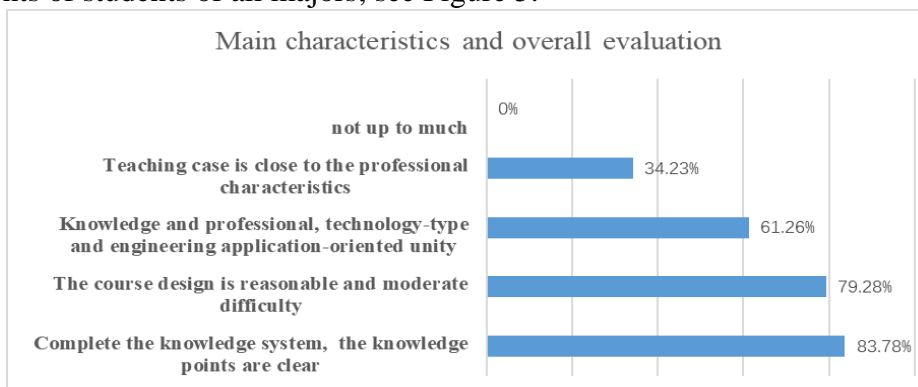


Figure 5: Main characteristics and overall evaluation

(5)In the degree of course goal achievement, almost all the indicators of knowledge goals, ability and emotional goals respectively reached more than 90%. Additional research items: whether the campus has implemented the Dual System of teaching, such as enterprise training, the recognition is more than 95%, which should be related to the campus and other enterprises to implement teaching

and training, which is also a good embodiment of the Dual System of teaching mode in the curriculum teaching. See Table 1 for details.

Table 1: Course objective effect

Title/Options	Achieve	Completely achieve	Blurring	Did not reach
Knowledge objectives: Basic knowledge	54.05%	41.44%	2.70%	1.80%
Knowledge objective: an understanding of the grammar rules	50.45%	42.34%	4.50%	2.70%
Ability objective: Case modeling	48.65%	41.44%	3.60%	6.31%
Ability objective: Programming	47.75%	39.64%	6.31%	6.31%
Ability goal: thinking ability and practical ability	55.86%	40.54%	1.80%	1.80%
Emotional goals: Traditional culture	50.45%	42.34%	4.50%	2.70%
Emotional goals: to connect theory with practice	45.95%	47.75%	5.41%	0.90%
Emotional goals: rules and consciousness	47.75%	45.95%	4.50%	1.80%
Emotional goals: teamwork	52.25%	40.54%	6.31%	0.90%
Emotional goals: Craftsman spirit	49.55%	45.05%	3.60%	1.80%
Emotional goals: innovation ability	52.25%	42.34%	4.50%	0.90%
Additional objectives: whether the campus dual-element system is implemented, such as enterprise training	52.25%	43.24%	3.60%	0.90%

## 5. Research and Innovation Point

### 5.1 Innovation Point

(1) Through the research of dual teaching mode and the implementation of vocational colleges, reference sino-german dual engineering institute of talent training scheme, put forward basic courses "C programming" in the Dual System mode of teaching reform scheme and teaching exploration, improve the basic curriculum and professional courses, achieve teaching, knowledge and professional, technical and engineering applied talents.

(2) In the Dual System teaching mode reform, gradually form Shared material resources, construction suitable for Dual System enterprise "C language programming" course case library and teaching design, course handouts, video, micro courseware, test library, teaching methods and a series of digital resources, including and gradually realize the unity of resources and teaching effect.

(3) Gradually explore the application of the Dual System teaching mode in higher education teaching, form the teaching reform idea of the basic curriculum group under the Dual System teaching mode, and gradually adjust the micro-courseware, teaching design, teaching methods, intelligent question bank, assessment methods to form an effective Dual System teaching mode.

### 5.2 Project Results

(1) Form an effective dual teaching mode for basic course teaching and optimized teaching program. Through the preliminary research and teaching reform exploration of the Dual System teaching mode, and the teaching practice of comparing the general teaching mode of colleges and universities and connecting with the needs of enterprises, the effective and feasible Dual System education teaching concept and teaching mode of colleges and universities can be formed.

(2) Form a series of dual teaching mode of C programming curriculum digital resources,

including the syllabus reform syllabus (including university-enterprise cooperation needs), increase practical, skilled micro courseware, Dual System reform teaching method of effective teaching design, complete teaching calendar, modular teaching notes, easy to push teaching video (including pre-class preview, review, after class, classroom interaction, online test), pay attention to the process and stage and focus on knowledge and innovative application ability, and strengthen the knowledge and skills of digital test bank and a series of shared results.

(3) Design "C program " basic curriculum dual teaching evaluation table, pay attention to the process assessment and results assessment, theoretical assessment and practice assessment, basic knowledge and technology application practical skills unified assessment, completely change the "paper" assessment mode, to each process of teaching link give different weight value, and through the fine tuning of teaching practice, gradually form a scientific and reasonable weight distinguish degree and proportion.

(4) Design the online teaching courseware of "C Language programming" course, appropriately apply the Internet mobile technology platform to construct information resources; develop the intelligent question bank and paperless examination system of "C Language programming" course, and gradually transition to the intelligent problem setting and paperless assessment of the Internet;

## 6. Conclusion

The research takes the public basic course "C Language programming" as the landing point, takes the Dual System teaching mode as the main research focus, taking into account the school-enterprise cooperation and the effect of teaching implementation, the implementation scope and application value are mainly reflected in the following aspects:

(1) The Dual System teaching mode is a new teaching method which is different from the current teaching mode of colleges and universities. The subject research explores a new mode and new means in some majors / teaching links, so as to optimize the teaching indicators, realize the unification of professional knowledge and basic knowledge, technical type and innovative engineering talent training mode, and realize the connection between the talent training of colleges and universities and the talent needs of enterprises.

(2) In the public basic curriculum, on the basis of research results can be moderately promoted to such as higher mathematics, university English in public basic courses, realize the organic combination of basic courses and professional courses, basic knowledge and innovation practice ability of effective unity, explore the Dual System teaching mode of basic curriculum teaching reform scheme.

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