

## Research and Implementation on Teaching Mode and Assessment Method of Program Design curriculum Based on Cooperative Work

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### Abstract

**This article deeply analyzes the characteristics of computer Program Design Curriculum and the learning characteristics of vocational students. The project team has set up a cross-professional curriculum information sharing platform for students who have difficulty learning and the teachers who have difficulty teaching. This platform allows teachers to conduct flexible collaborative teaching, and it also allows learners to collaborate and learn. The project team reformed the teaching mode of the program design curriculum with student-oriented educational principle, designed a set of evaluation methods suitable for program design curriculum, established a collaborative learning community. The project team conducted teaching implementation for students of three grades. Practice has proved that the teaching effect has been improved and the students' interest in learning has been greatly improved.**

### Keywords

**Program Design, Collaborative learning, Flexible collaborative teaching, Moodle platform, Assessment method.**

## 1. Introduction

### 1.1 Research Background

The computer program design course is a basic compulsory course for information technology majors and many engineering majors, as well as a pre-requisite course for many other follow-up majors. From the current higher vocational and technical colleges, information technology and related engineering professionals training program. From the current information technology program of higher vocational and technical colleges and related personnel training programs, The program design courses offered by higher vocational and technical colleges are: C, C++, C#, PHP, Java, Python etc. As the first computer language that college students contact after entering the school, the learning effect directly affects the learning interest of students' follow-up courses and the improvement of overall professional ability.

Program design courses have the following characteristics:

- (1) The course is very logical, abstract and difficult to understand. It requires students to have strong logical thinking ability and the spirit of research.
- (2) The course has a strong theoretical knowledge system, which requires students to concentrate on learning theoretical knowledge more durably.
- (3) Course content modules are highly correlated, and students need to have sustained patience in order to keep up with the teaching process and not fall behind.
- (4) The curriculum is very practical and requires students to have strong theoretical application skills.

Most students are difficult to adapt to the requirements of the course at first, the learning process is more painful, and the teacher's teaching is difficult to achieve the desired effect.

Therefore, the program design course has become a class of courses that students have to learn and work hard, which greatly affects students' follow-up interest.

## 1.2 High Vocational students' learning characteristics

Problems in the course of learning program design in vocational college students:

- (1) Higher vocational students generally have poor logical thinking ability, weak self-confidence, and lack of good study habits.
- (2) Higher vocational students have a poor theoretical foundation and cannot accept too much classroom teaching.
- (3) Higher vocational students have a good practical ability, preferring to learning while practice.
- (4) Some of the higher vocational students are not studying hard enough, it is easy to "return back".
- (5) The program design course is generally offered in the lower grades, and the lower grade students have not adapted to the teaching methods of the university.

## 1.3 Current teaching situation

- (1) Different professional program design courses are held by different teachers.
- (2) Teachers are teaching independently, sharing less teaching resources, and lacking the exchange of teaching experience. Not to mention the collective efforts to build a curriculum group, resulting in a certain amount of waste of resources. Some program design courses are still based on the theoretical knowledge system, and the teaching materials and teaching are centered on the theoretical knowledge system, emphasizing the coherence and integrity of theoretical knowledge. The theoretical knowledge of the class is too much, and the students have no clear learning goals. This method is difficult to stimulate students' interest in learning, and it is difficult for students to truly master the ability to develop practical projects.
- (3) Different students may have different adaptations or preferences for the styles of different teachers. The existing teaching arrangements make it impossible for students to choose the teacher who is suitable for their own way of accepting. They can only adapt to the teacher's style.
- (4) The course study is mainly based on individual students, and there is no cooperation in learning. As a difficult course, communication and mutual help between learners is very beneficial to improve students' learning and interest, but many schools lack such a communication platform.
- (5) The evaluation method is backward. At present, the assessment of some program design courses is still based on the closed-book theory assessment, lacking the assessment of practical ability. In order to pass the assessment, students tend to focus on the study of theoretical knowledge, and pay insufficient attention to the ability of project practice. Such guidance will enable students to focus on concepts, principles and model questions in the learning process, and develop the ability of practical projects. Not being effectively trained and improved.

## 2. Teaching reform for problems

Based on the above analysis, the project team carried out the following reforms and innovations in the program design course group, and tried to improve the teaching effect and learning effectiveness of the program design course group through these reforms and practices.

### 2.1 Designing a teaching model for Program Design course based on collaborative work

- (1) Set up a cross-professional course group information sharing platform

If you can create a horizontal curriculum-centric platform for the "first computer language for students" course group, and collaborate on the resources of the common modules in the course group and upload them to the information platform. Accumulated over the years, forming three advantages: First, students can choose the micro-course video that suits their style. Second, the rich resources on the information platform are convenient for students to access anytime and anywhere, and promote the development of students' self-learning habits and the construction of independent learning mode. Third, it is convenient for students to prepare before class, review after class, and make up for themselves at any time. For the individuality modules in the course group, the course teachers will

build the course resources separately and publish them on the course platform. As long as the class teacher agrees, they can open the permissions and share them with others.

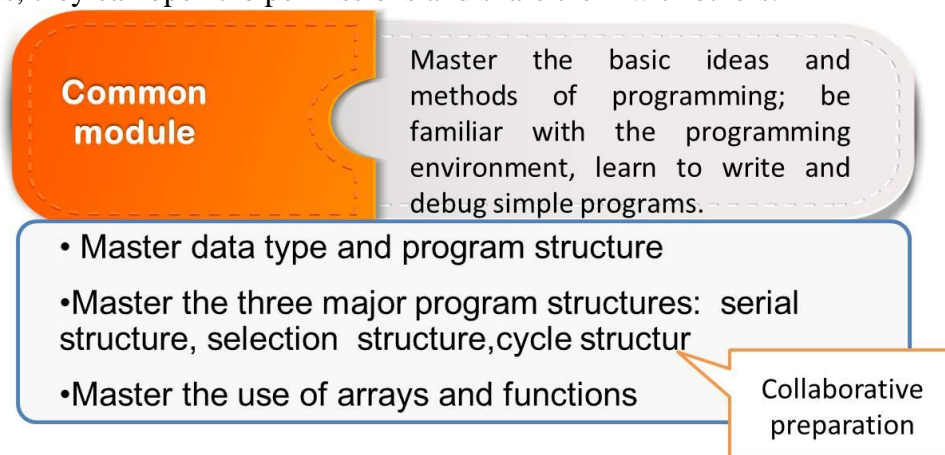


Fig.1 Processing of Common Module of Program Design Course Group

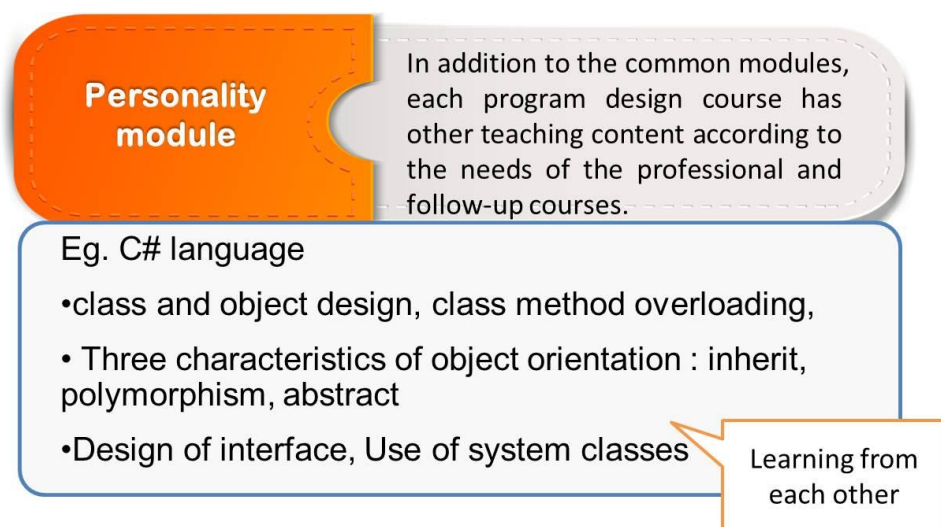


Fig.2 Processing of Personality Module of Program Design Course Group

The common modules and processing methods of the program design course are shown in Fig. 1. The Fig. lists the common knowledge points and skill points of the program design language. For these common modules, teachers can jointly build resources and students can share resources. The personality module and processing method of the program design course are shown in Fig. 2. The C# language is used as an example to list other knowledge points and skill points of the course outside the common module. These knowledge points and skill points are the characteristics of a program design language, but learners of different languages can learn from each other. Although different languages have different grammatical details, there are many commonalities for knowledge transfer.

The project team built a MOODLE platform for teaching and learning. The MOODLE platform is an open source course management system (CMS), also known as the Learning Management System (LMS) or Virtual Learning Environment (VLE). With Moodle, today's major media files are available for delivery, which makes the resources available on the platform very rich. It can better assist teachers in teaching and facilitate students to learn. Teachers can build courses, add co-constructors and learners, students can register their own accounts, enter the course, review or download materials, turn in homework, view grades, and communicate with other users of the platform to publish their own Comments and suggestions. Teachers can upload course materials, arrange and correct assignments, complete online tests, communicate online with students, and fully understand student situations through this online platform. The fundamental difference between the MOODLE platform and the traditional boutique course website is the existence of its interactive features. The MOODLE

platform is a socialized interactive learning platform. On this platform, teachers can publish various learning resources of the course centered on the curriculum. The learners use the socialized teaching platform to establish their own learning network and learning community. You can choose the learning materials and micro-course videos provided by the teacher who you like or are suitable for on the platform. The main feature of the MOODLE platform is to emphasize the socialization of learning, and the collective wisdom can be shared and created on the platform.

Three years of teaching practice shows that there are three advantages to doing so. First, it broke the situation that “the existing teaching arrangement makes it impossible for students to choose the teacher who is suitable for themselves and can only adapt to the teacher’s style”. Second, the resource sharing of the common modules of the course provides a platform for the teachers to communicate and share. The teachers can work together, share resources, and greatly improve resource utilization. Third, it is conducive to accumulating teaching resources over the years, so that the new teachers of the program design course “stand on the shoulders of giants”, avoiding the detours that the predecessors have gone through, and starting teaching work at a high starting point.

(2) Student-oriented, Reforming the teaching mode of the program design course group

We insist that teaching is based on student learning. We design classroom teaching based on the concept of “student-oriented, comprehensive technology (skills) training as the core”. According to the learning characteristics of vocational students, teaching students in accordance with their aptitude. Under the guidance of constructivism and humanistic teaching theory, the implementation of work-oriented projects leads the task-driven teaching model. Under the guidance of constructivism and humanistic teaching theory, the project team implements a work-oriented project to lead the task-driven teaching model. As shown in Fig. 3, the project team adopts the Butler learning model in the overall design of the teaching, and adopts the Scaffolding teaching model for the teaching of complex knowledge points.

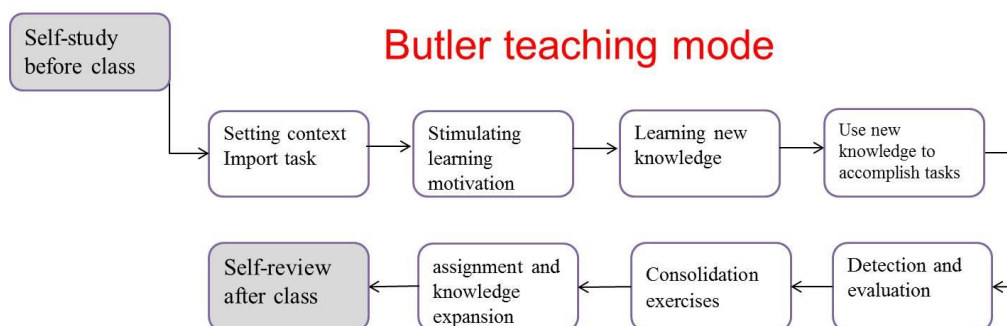


Fig. 3 Butler teaching mode applied in the teaching of programming

The results of three years of teaching implementation show that the implementation of this teaching mode can greatly alleviate the difficulty of teaching and designing courses, and can motivate students' learning initiative and reduce the difficulty of course learning. This practice fosters students' interest in programming and even makes students like programming. After the students complete the programming course in the first grade, the excellent rate of achievement and pass rate are greatly improved. The number of students who switch majors is greatly reduced because of the difficulty in learning the course.

## 2.2 Create an assessment method suitable for program design courses

The evaluation of the teaching effect of computer programming class is different from the traditional theoretical teaching. This kind of course pays more attention to the students' practical ability and the improvement of comprehensive quality. Therefore, designing a reasonable evaluation method is also an effective way to further test the students' learning effect. The project team shifts from attaching importance to the test results to paying attention to the educational process, and changing the final

assessment to process assessment, guiding students to understand the content of the course in the course of practice, so as to achieve the learning goal.

As shown in Fig. 4, the project team designed an assessment method suitable for the course group, which is an innovative measure. The project team divides the assessment of the whole course into two parts: basic knowledge assessment and comprehensive application ability assessment ,as shown in Table 1.

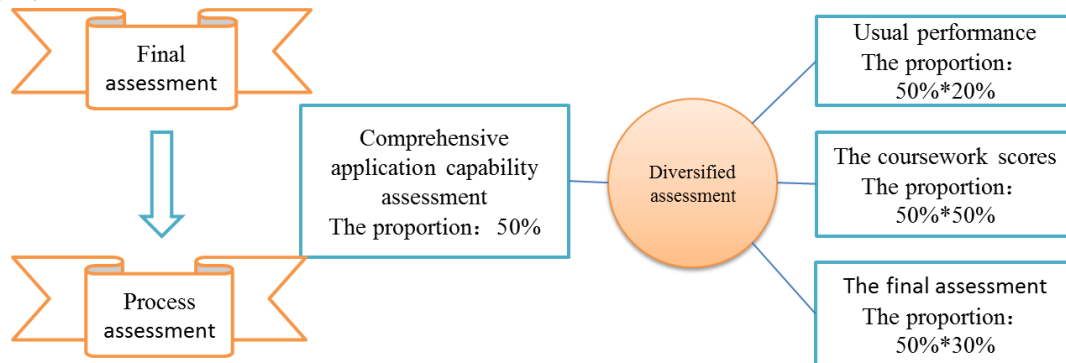


Fig. 4 Assessment Method Suitable for Program Design Courses

Table 1 Rating criteria for the entire course

Rating item	Weights
Basic knowledge assessment	50%
Comprehensive application capability assessment	50%

Final score= Basic knowledge assessment scores\*50% + Comprehensive application ability assessment scores\*50%.

Among them, the assessment of basic knowledge includes the usual performance, the usual completion of the coursework scores, and the final assessment.

Basic knowledge assessment scores= Usual performance\*20%+The coursework scores\*50%+ The final assessment\*30%,as shown in Table 2. Really break the old practice of assessment, and change the final assessment as a formative assessment.

Table 2 Rating criteria for the basic knowledge

Rating item	Weights
Usual performance	20%
The coursework scores	50%
The final assessment	30%

Comprehensive application ability assessment scores = Analytical reports(A)\*30%+ Quality of the program code(B)\*60%+ Innovation work(C)\*10%.

The analysis report (A) is used to assess whether students can communicate well with customers when they are faced with actual problems, whether they can accurately obtain the true intentions of customers, write a reasonable analysis of needs, and analyze clear system functions according to demand analysis, and design Feasible project architecture. The analysis report scoring criteria are shown in Table 3.

Table 3 Rating criteria for the analysis report (A)

Rating item	Weights
Document format and expression	10%
Integrity and rationality of the needs analysis report	30%
Rationality of system function analysis	30%
Feasibility of project architecture	30%

Code quality (B) is used to assess the project code implementation capability, whether the function of the system analysis phase is realized, whether the interface design is reasonable and friendly, the



stability of the system operation, the quality of the code is high, and the programming habits are good. The scoring criteria are shown in Table 4.

Table 4 Code Quality Rating Criteria(B)

Rating item	Weights
Whether the function is implemented	50%
System operation stability	10%
Whether the user interface is friendly	10%
Code quality	20%
design habit	10%

novative work (C) is used to assess whether students have innovative design, personalized design, and encourage students to develop and innovate.

The comprehensive project assessment pays attention to the students' normal learning attitude and the completion of the phased tasks, and scores the process.

### 2.3 Build a community that facilitates collaborative learning

When people are faced with complex problems, the role of individuals tends to be very weak. Therefore, it is necessary to work together through teamwork and mutual help to complete the entire task. Collaborative learning is a popular form of team learning. The teaching platform used by the project team constitutes a learning community. Through the teaching platform, the communication and communication between teachers and students can be realized on a platform. Teachers can upload their own curriculum resources and problems and homework that need to be considered and discussed after class. After the class, students can log in to the platform to complete homework, review and consolidate, and can ask questions for help, and also answer questions left by teachers and classmates, thus forming a mutual help and learning community. In this community, because of the common learning A group of people who love to gather together often interact to collide with the spark of thought and enhance each other's feelings. Fig. 5 is a screenshot of the teacher launching a discussion in the discussion area. Fig. 6 is a screenshot of the discussion between teachers and students on the Moodle platform.



Fig.5 A screenshot of the teacher initiates a discussion in the discussion area



Fig.6 A screenshot of the discussion on the Moodle platform

### 3. Project implementation effect

(1)The project team took the lead in proposing a cross-professional horizontal curriculum group construction model.

The project team explores the commonality and individuality of the course content in the course group, and builds a teaching information platform that shares resources and cooperates. At present, there is little research in this area. The exploration of this project has certain innovation, strong necessity and high feasibility.

(2)The learning community built by this project allows learners to collaborate and learn.

The learning community built by the project has carried out “collaborative learning” with the purpose of mutual learning and mutual learning among students. It requires learners to learn from others, help each other, make progress together, and can also learn from each other. Learn to make friends.

(3) The research results of this project can be extended to the construction of various curriculum.

Computer program design curriculum are basic compulsory curriculum for information technology majors and many engineering majors. The teaching content, teaching ideas and teaching methods of different computer languages are all interoperable. Therefore, the research results of this project can be extended to various different course groups.

### 4. Conclusion

This study is aimed at the computer program design curriculum of high vocational education, which is difficult for students to learn and difficult for teachers to teach. It sets up a platform for information sharing across professional courses for teachers to conduct flexible collaborative teaching for learners to collaborate and design for life. In this paper, the teaching model group of curriculum design was reformed, and the evaluation method suitable for program design courses was designed. The community that is conducive to collaborative learning was constructed and implemented in the program design teaching of the for students of three grades. It has been improved and the students' interest in learning has been greatly improved. These results and experiences can be used for similar research.

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