Research and Practice on Fully English-Taught Programming Courses under the Sino-Foreign Cooperative Education Model

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Abstract. The ever-growing Sino-foreign cooperative education model has played an active role in cultivating multi-skilled international talents in China. Through the integration of domestic and foreign high-quality teaching philosophies and teaching resources, a large number of outstanding talents with an international perspective have been trained. Taking the Sino-foreign cooperative education project in software engineering as the research object, this paper comprehensively studies and practices teaching reform in the process of fully English-taught programming courses, addressing issues such as teaching philosophies, methods, content, evaluation methods, and language barriers faced by students. Taking Computer Science 1 as an example, this paper proposes reform plans such as joint course development and teaching, integrating multiple teaching methods, and optimizing course evaluation. Teaching practice has shown that this method has achieved good results and expected goals in teaching, providing a reference for the course construction of Sino-foreign cooperative education in computer science majors.

Keywords: Cooperative Education; Course Construction; Fully English-taught Courses

1 Introduction

With the rapid development of technology and the increasing frequency of international exchanges, cultivating talents with an international perspective and cross-cultural communication skills has become a common goal of education sectors around the world. Against this backdrop, Sino-foreign cooperative education has emerged as an important model to promote the internationalization of higher education in China [1]. This model provides students with high-quality educational resources from both Chinese and foreign partner universities, making it an important means for Chinese higher education to go global and an essential pathway for Chinese students to reach the world stage [2]. Currently, there are an increasing number of Sino-foreign cooperative education projects and institutions, and the number of students participating in these programs is also growing rapidly. Consequently, the talent

M. F. b. Sedon et al. (eds.), *Proceedings of the 2024 3rd International Conference on Social Sciences and Humanities and Arts (SSHA 2024)*, Advances in Social Science, Education and Humanities Research 851,
https://doi.org/10.2991/978-2-38476-259-0_83

cultivation in Sino-foreign cooperative education has received increasing attention. Domestic universities typically choose their traditional advantaged majors to collaborate with foreign universities, introducing their excellent educational resources, advanced teaching philosophies, and methods. Through educational and academic exchanges, teacher training connections, and joint efforts, they aim to cultivate high-quality international talents [3].

This article takes the Sino-foreign cooperative education project of software engineering in our university as the research and practice object, exploring the teaching mode and methods of fully English-taught programming courses under the Sino-foreign cooperative education model.

2 Characteristics of Programming Courses

Programming courses are the core of software engineering majors. There are currently many types of programming languages, including C, C++, Java, C#, Python, and more. Although these programming languages differ in specific syntax, their basic teaching content and knowledge structure are similar, and teaching methods and techniques can be mutually borrowed [4]. The characteristics of programming courses are as follows:

Emphasis on Practical Skills: Programming courses are not just theoretical studies, but also require practical operations [5]. Students need to convert theoretical knowledge into practical applications by writing code, debugging programs, and other methods.

Strong Logical Thinking: Programming involves rigorous logical thinking. When writing programs, students need to clearly understand the logical structure of the problem and design appropriate algorithms to solve it.

High Requirement for Teamwork: In actual software development projects, teamwork is crucial. Programming courses usually require students to work in groups and complete a project or task together [6]. This helps cultivate students' teamwork and communication skills.

Close Integration with Practical Problems: Many cases and projects in programming courses are based on practical problems. Students need to solve these practical problems through programming, such as data analysis, image processing, game development, etc. This helps cultivate students' problem-solving and innovative abilities [7].

3 Issues Faced by Programming Courses in the Mode of Sino-Foreign Cooperative Education Projects

3.1 Significant Differences in Chinese and Western Teaching Designs

In terms of teaching philosophy, Chinese classroom instruction typically emphasizes the systematicness and integrity of knowledge, stressing students' mastery and memorization of key points. In contrast, foreign classroom instruction places greater importance on cultivating students' practical abilities and innovative thinking. Regarding

teaching methods, Chinese classroom instruction commonly adopts a "lecture + demonstration" approach, where teachers explain theoretical knowledge and programming techniques in detail and then demonstrate example codes to help students understand. On the other hand, foreign classroom instruction focuses more on students' independent learning and collaborative learning. As for evaluation methods, Chinese classroom instruction often prioritizes students' exam scores and homework completion. However, foreign classroom instruction pays closer attention to students' practical achievements and project performance, using these as significant criteria for assessing their learning effectiveness [8]. In terms of evaluation methods, Chinese classroom teaching typically focuses on students' test scores and homework completion, using these as the main criteria for evaluating learning outcomes. Foreign classroom teaching, however, places greater emphasis on students' practical achievements and project performance, considering these as important factors for evaluating learning effects.

3.2 Challenges of Full-English Instruction

There is a large amount of technical terminology and abbreviations in the field of programming, which may not be easy for non-native English speakers to understand. When teachers explain complex concepts, algorithms, or programming techniques in English, students may feel confused or unable to comprehend. Especially when it comes to technical details or complex logic, language barriers can cause students to miss important information or have misunderstandings. In a fully English-taught classroom, students may need to actively participate in interactions and discussions to deepen their understanding of the course content. However, due to lack of confidence in their language ability or fear of making mistakes, they may hesitate or avoid participation. This hesitation and avoidance may affect students' learning outcomes [9].

4 Full-English Instructional Design and Practice for Programming Courses

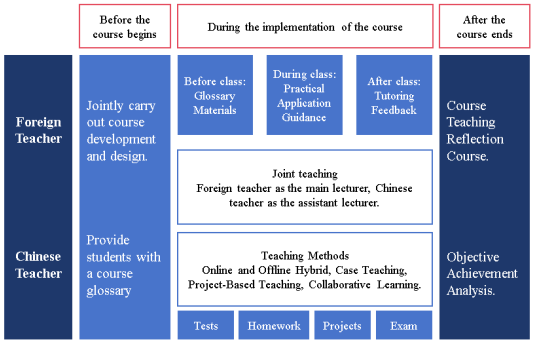

Fig. 1. Overall Course Design and Implementation Plan

Taking "Computer Science I" as an example, we will provide a detailed introduction to the instructional design and practice of programming courses. Figure 1 illustrates the overall instructional design and implementation plan for the "Computer Science I" course.

4.1 Joint Course Development and Implementation by Teachers from Both China and Foreign Countries

To achieve the course objectives and teaching effects, teachers from both sides form a teaching team to collaborate on course development and implementation. They jointly determine the course objectives and content based on the ability requirements for students from both schools. During the course, foreign teachers serve as the main instructors, while Chinese teachers act as assistants, following the course throughout and promptly addressing student issues encountered in class. For the design and implementation of each specific module, teachers from both sides also engage in extensive communication and collaboration. By combining their respective teaching experiences, they aim to achieve a truly synergistic effect of the cooperative educational partnership, exceeding the sum of its parts. After the course concludes, the teaching team holds a workshop to reflect on the entire teaching process, evaluate the achievement of course objectives, and formulate improvement plans.

4.2 Instructional Method Design

In terms of teaching format, a mixed online and offline teaching approach is adopted. Through online learning, students can repeatedly watch videos or read materials, fully overcoming language barriers and laying a solid foundation for the smooth progress of offline classes. Offline classes will adopt different teaching methods according to different course modules. This course combines the case-based teaching commonly used by Chinese teachers with project-driven teaching and collaborative learning commonly used by foreign teachers. For example, in the module of loop structures, the "explanation and demonstration" method is used when explaining the basic concepts and usage of the three types of loop structures, making it easier for students to accept and understand. In the subsequent comprehensive application section, through project-driven learning combined with collaborative learning among student teams, students' understanding and application abilities of programming thinking patterns can be effectively improved, while also exercising their team collaboration skills.

4.3 Evaluation Method Design

The evaluation should consider multiple aspects such as students' knowledge mastery, skill application, problem-solving ability, and innovation. Both Chinese and foreign teachers in this course adopt both process evaluation and summative evaluation [10]. However, Chinese teachers tend to prioritize summative evaluation while process evaluation plays a supporting role, while foreign teachers place greater emphasis on process evaluation. After joint discussion between teachers from both sides, consid-

ering the characteristics of Chinese students, the evaluation method for this course is shown in Table1.

Table 1. Design of Evaluation Methods for Computer Science I Course

Assignment	Points/Percentage
Attendance and Class Participation	5%
Homework	25%
Projects	30%
Tests	10%
Exam	30%
Total	**100%**

Classroom participation is an important component of students' learning process, accounting for 5% of the evaluation. It mainly assesses students' attendance and participation in class, encouraging them to actively participate in class discussions and interactions, ask questions, and share experiences. This helps evaluate their learning attitude and spirit of cooperation. Homework involve programming exercises closely related to the course content, assessing students' mastery and application of basic knowledge. Projects require students to complete a programming project related to the course content, which can be an independent individual project or a group project. Evaluation is based on four dimensions: project completion, code quality, function implementation, and innovation points. This assesses students' abilities in project planning, time management, and team cooperation. Tests are conducted at 1/3 and 2/3 of the semester, consisting of various question types such as multiple-choice, fill-in-the-blank, and programming questions, comprehensively examining students' progress at different stages. The exam focuses on closed-book programming questions, comprehensively assessing students' programming skills and knowledge application.

5 Teaching Effectiveness and Reflection

To verify the teaching effectiveness, the teaching team randomly selected 40 students from each of the two groups: 123 students in the regular software engineering project and 112 students in the Sino-foreign cooperative education project, for a total of 80 students as samples for comparison. Although the evaluation methods of the two projects differed in proportion, the design and difficulty of the final exam questions were consistent. Therefore, the comparison was conducted based on both the final exam scores and the comprehensive scores. The results are shown in Table 2.

Table 2. Comparison of Student Performance between Regular Projects and Sino-Foreign Cooperative Education Projects

Sample	Number of Students	Mean Score of Final Exam	Mean Score of Comprehensive Evaluation
Regular Project	40	73.3	77.6
Sino-foreign Cooperative Education Project	40	72.9	83.4

From the perspective of the course grades of the two groups of students, the final exam scores were basically the same, indicating that through effective course design, the all-English teaching did not affect the students' learning effectiveness. However, from the comprehensive scores, it is evident that the students in the Sino-foreign cooperative education project performed significantly better. Analysis revealed that this was due to the higher process-based assessment scores of these students.

In terms of students' learning attitude, it is evident from the process-based assessment that students demonstrated a positive learning attitude throughout the learning process, exhibiting proactiveness, responsibility, and self-discipline. They were willing to take the initiative in learning, were good at thinking, and were able to complete various learning tasks on time. Through analysis and observation of the teaching process, it was also found that effective guidance and timely feedback from teachers were important reasons for the higher process-based assessment scores of students. During the joint teaching process of the two teachers, the guidance of teachers can help students clarify their learning goals, master learning methods, and solve learning problems. Timely feedback can enable students to understand their learning status in a timely manner, adjust their learning strategies, and thus achieve better results.

6 Conclusion

This article aims to explore the full-English teaching design of programming courses in software engineering majors, taking "Computer Science I" as an example. It combines the current situation of Sino-foreign cooperative education models in Chinese universities, the characteristics of programming courses, the practice of Sino-foreign cooperative education in our university, the development trend of new-generation information technology, and the author's teaching experience. The practice has shown good results and met expectations. This study not only provides some references for improving the teaching level of Sino-foreign cooperative education and the teaching reform of other majors, but also actively promotes and facilitates the cultivation of computer industry talents with an international perspective.

ACKNOWLEGEMENTS

This paper was supported by the Digital Twin and Acoustic Perception Research Team (2021XJTD06) and New Engineering Research Project of Xi'an Eurasia University (2022GKYB003).

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