The Software Curriculum Group Construction Practice with the Curriculum Design as the Main Line

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Abstract. It constructs the software design curriculum group based on the connotation of curriculum group and proposed the software series of curriculum design teaching method as the main line of the course group of software, analysis of the training mode based on software curriculum group, according to the data structure of the curriculum design as an example, proposed teaching implementation process, assessment methods and teaching practice process of the software series curriculum design. Practice shows that the perfect course group construction is an effective way to reform the traditional teaching mode, optimize the teaching system and improve the quality of teaching.

Introduction

As a core objective of computer science, the software design capability plays an important role in cultivating application-oriented talents. It requires several correlative computer science curriculums to cultivate the software design capability of students. Generally speaking, software development capabilities determine the employability for graduates.

For student majoring in computing science, they are required to adapt the rapid development and change of disciplines so that they can benefit from it. Learning power is more important than getting knowledge in the college. After mastering basic theoretical knowledge, students need to understand and digest the essence of knowledge, strengthen the ability to analyze and settle problems.

Construction of the software curriculum group for computer science major has been proven to be an efficient way to foster the software development and design capability in recent years. We need to analyse its connotation and extension, reform curriculum establishment, teaching contents and methods, fully understand the relations between the software curriculum teaching and the demand of the software industry talent market, improve the teaching quality in software design. It is not only the trends of computer professional teaching reform, but also has the profound significance in improving teaching quality [1-2].

The Contents of Software Curriculum Group

1) Taking existing personnel training program as a base, we proceed to study how to set the curriculums and subjects scientifically in curriculum group. The existing series of curriculums mainly includes: an introduction to computer science and technology, advanced language programming of computer, object-oriented programming, software design and development practice, data structure, data structure curriculum design, algorithm design and analysis, database system theory, database system curriculum design, software engineering, software engineering curriculum design and the graduation design. Following the above process, analyze the relationships among these curriculums, modify the program of cultivating talents, we can design more scientific subjects of curriculum group.

According to the software main line, a teaching mode is adopted as the following order: an introduction to computer science and technology, advanced language programming of computer, data structure, algorithm design and analysis, object-oriented programming and software engineering. Through this teaching and practice method called software main line, we can study the transformation and cohesion between the design of structured program based on C language and the design of
object-oriented based on VC++ language, deeply understand the essence of data structure, and apply the algorithm to the practical software development.

2) Taking curriculum design as main line, constructing the software talented personnel training system, which is set a series curriculum including application design, VC++/Java curriculum design, data struct curriculum design, database curriculum design, fundamentals of compiling curriculum design, software engineering curriculum design, finished with graduation design. It can be generalized as point-line-face-body frame which is knowledge point-major curricula-curricula group-curricula group system. meet the requirements of cultivating application-oriented qualified personnel.

Graduation project is an import process to improve students’ practical ability. Developing the practical project can provide a new perspective for production practice.

3) The curriculum setting of software technology is one of the characteristics of teaching. We can classify the software technique series into two parts: program design and algorithm training, system software technology. The objective of program design and algorithm training aims at the strengthening students’ capacities of algorithm design and program development. It consists of four basic components: an introduction to computer science and technology, advanced language programming of computer, object-oriented programming (VC++/Java), design and analysis of algorithms and data structures. Meanwhile, on foundation of the designment and development of software (such as VC++ curriculum design or Java curriculum design), students can deeply understand the impact of data structure and algorithm to the software performance. The system software technology sub-series could be arranged after or at the second half of the program design and algorithm training sub-series.

Teachers should cultivate students' ability of software design step by step, guide them stand in the customer's point of view to understand software requirement rather than stand in the developer's point of view, and gradually cultivate students' capabilities of system design and software development.

4) Set examination contents and ways for each curriculum of software design curriculum group according its features by accumulation test.

5) Take the teaching method that combines interest-driven teaching mode and project-driven teaching mode, adopt the multi-viewpoint research strategy, can effectively stimulate students' interest in their study, train students' manipulative and develop applications abilities, improve their autonomous learning, cooperative learning, analyzing and solving problems abilities.

Before the start of the curriculum design, first determine the teaching objectives, and then consider the teaching evaluation, making the expected results of the study, learning performance, teaching and learning behavior on the establishment of an organic association [3].

Change the traditional structure of teaching and learning, fully reflect the principal part of students and the leading part of teachers, mainly include the combination of theory and practice, combination of horizontal and vertical, combination of inheritance and reform, and the combination of teachers and students. Through the further research on the aspect of improving students’ comprehensive quality and training software industry talents with strong team work spirit, we study the teaching reform on software design course group architecture from the perspective of theory and practice.

The Design Philosophy of Software Series Curriculum Design

The software series curriculum adopt a new innovation model by simulating the actual project. During the course design, teachers stand in the perspective of customers to make demands on students, point out problem in software development phase especially in design phase. Make students aware of how to communicate with customers in software development, and also cultivate students’ teamwork spirit. Require students to select the topic carefully, carry on the research work before the selection of subjects, this is also part of the innovative design.

For students participating in project development, they can use the idea of big project [4] to develop software. Teachers detail the overall process of curriculum design and the specific requirement, teach them how to find the valuable topics, how to conduct research and so on before the theme choosing of
curricular design. During the software acceptance stage, the relationship between teachers and students turns into investor and software development unit relation. Teachers propose the demand to develop a project and make a comprehensive evaluation to the software and each student according to their own performance. Make students realize how to carry on the software design in the user's perspective and recognize the importance of communication.

At the beginning of the curriculum design, we illustrate a rule that if the project acceptance is unqualified, then all members in this group can not pass the examination. Group members should treat the curriculum design as the first project of their start-up company and everyone should be work at full stretch. Through the analysis of the respective software, guide them find the function that no realization or not perform well, lead them be curious to study the database and have great expectations for database curriculum design. Lay the foundation for the follow-up professional course and the graduation design and future work.

**The Organization of Curriculum Design and Teaching Methods**

Take the case of data structure curriculum design, we start the structure curriculum when the data structure course goes on the chapter about tree. The theory of blended learning is adopted in teaching process, we should pay attention to the combination of practice and theory [5]-[6]. Teachers need to evaluate the perspective of choosing subject and students shall start to work following teachers satisfactory. Although the stipulated time of curriculum design is two weeks, it is almost five weeks actually.

Curriculum design is carried out in group that members cooperates each other to complete the object under the organization of group leader. Each one need to develop a module by themselves after the group have assigned tasks and delineated their functional modules. Phase-by-phase examinations are conducted throughout the design process. The essentials of choosing subject, requirement analysis, intermediate inspection, project acceptance are in charge of teachers, while the detailed programming is completed by students independently or in collaboration. Students need to complete final integration by cooperation. They could get sense of team-work by solving problems together. The curriculum design is an important practicality link in teaching plan, which proceeded in the three stages for the sake of better effects, as shown in Figure 1.

![Figure 1. Three stages curriculum design.](image)

**The Selection Process of Software Series Curriculum Design**

Software series curriculum design is a comprehensive application-oriented experimental curriculum, it is difficult for it covers many knowledge points among different chapters. Students are required to propose the research background, meaning and requirement through investigation and study.

Before the curriculum design, teachers specify the requirements and ask students to team up (each group consist of two to four person) and choose a subject based on actual needs from daily life. Students should discuss by group in spare time and submit curriculum design task book in two weeks and develop a project with actual value, which is including topic choosing, research significance, requirement analysis, division of labour, base module and so on. Every group must submit the specification before the curriculum design, teachers assign the level to each group according to evaluation as a part of grade. Topic selection is an important procedure that if a group get C in the topic selection stage, and the final grade can’t be A.
Intermediate Inspection of Curriculum Design

Teachers are in charge of intermediate inspection and check whether students are in accordance with the requirements. When they meet problems in designing data structures or algorithm, teachers evaluate each project and put forward further requirement. Finally, teachers grade each group for intermediate inspection.

Project Acceptance and Assessment of Curriculum Design

When curriculum design is near the end, students are asked to write subject report conclusion, while teachers grade the software in validation phase. The rule that if a group got C in topic selection stage and the final grade can’t be A is also one of the innovative points. It requires students to make conscientious survey on topic selection. Teachers detail the whole process and specific requirement, introduce the investigation method. In validation phase, teachers act as the investors while students play a role as the software development units.

Two or three teachers are responsible for the acceptance of curriculum design. Take the data structure course design as example, the specific acceptance process is as follows:

1) The group leader make an overall introduction that mainly consists of the significance of the research, main function modules and the division of labour.

2) Team members present their own work for the project and describ how to define the data structure and solve the practical problems.

3) Teachers point out the advantage and the deficiency of project. Each student is given a grade as the acceptance result according to their workload and the quality. If the project is unqualified, every member of the group is failing the course, which is consider to train the students’ team spirit.

4) Submit the curriculum design report. Each student has to complete curriculum design summary for two weeks work based on their own experience. It can be written in this part as long as it is the student's own ideas. Teachers could have a more comprehensive understanding to students through the curriculum design summary and process of analysis.

5) Hold the curriculum design competition. Select outstanding curriculum design teams according to innovation of selecting topic and actual completion of work. The selected groups are required to improve their software in their leisure time according to the problems raised by teachers. Curriculum design competition is held two weeks after, outstanding curriculum design groups should conduct live demonstrations and defense. Give award to the outstanding curriculum design groups, and publish them on the website of the data structure for students to study.

The Examination Content and Method of Curriculum Design

Teachers can understand students about various knowledge points through the evaluation of curriculum design. Students are required to write the project report, while teachers in curriculum design group check, evaluate and give the total results of software acceptance. The grade of the curriculum design includes topic selection, intermediate inspection, project acceptance and the reports. The grade of topic selection count for 20%, intermediate inspection count for 10%, project acceptance count for 50% and report count for 20%. If the grade of topic selection is C, the total score can not be A, for student who fails software acceptance goes directly to make-up examination. The essential step to ensure the curricular design quality is intermediate inspection. Teachers put forward new requirements from the user's perspective to each student according to the progress of their own software development, it can not only ensure the quality, but also prevent students from copying. Every requirement proposed by teacher is the standard of software acceptance. A long-term practice has proved that this method is suitable for all curriculum design, especially for the examination of graduation design. It is effectively prevent students from copying or to be a bystander.

The ratings are based on a reference as the following (the criteria for different curriculum design evaluation criteria will have minor changes):

1) The significance of topic selection is the application value of software
2) The conformance between topic and software design

3) Actual workload towards requirements

4) Use the corresponding curriculums key points, such as the logical structure and storage structure design in data structure course, algorithm design, etc

5) Achievement assignment for each group

6) Meet the requirements of users

7) System interface, function and key algorithm analysis.

8) Software system development method and innovative thinking

9) The writing quality of curriculum design report

10) Team work spirit

11) Summary

The Effect of Practice Teaching

Every curriculum design goes through four stages: project selection, the mid-term examination, software inspection, and report writing. It makes students better understand the content of classroom teaching, expand the scope of knowledge, and improve the ability of abstracting, thinking, designing, analysis of algorithm and data structure, writing and expression of scientific report.

Combined with curriculum design and the research direction of teachers, it can not only enable students to have an early understanding of computer science and master methods of scientific research, but also to learn how to solve practical problems. For the contents that the textbooks not involve, students could consult a source to train the ability of literatures consultation and research.

Conclusion

The process to realize software design greatly enhance the integration of curriculum, the optimization of curriculum content and make students understand the knowledge more clear and systematic. We bring forward the innovation teaching method, which can not only improve ability of students' autonomous learning, cooperative learning, problem analysis and problem solving, but also can cultivate the ability of software development and cultivate team spirit and innovative consciousness. There is a process for the construction of innovative software curriculum group, which is based on VC curriculum design and taking data structure curriculum design, database curriculum design and software engineering curriculum design and graduation design as main line to train competitive ability. The practice has proved that the curriculum group construction is an effective method to improve the teaching quality as the new teaching model, we need continue to explore, to advance, and continuously to improve.

References


