

## Teaching Reform of Programming Course under the Background of School-Enterprise Cooperation

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**Abstract.** There has always been a disconnection between teaching and practical application in the teaching of program design courses. With the opportunity of school-enterprise cooperation, this paper forms a coherent curriculum system of program design and data structure courses, combines with the actual situation of enterprises, carries out teaching design from the perspective of application, with a view to realizing real learning and application.

### Research background

Under the major strategic background of national innovation driven development and "one belt and one road" and "Internet plus", under the guidance of national policies, according to the requirements of the Higher Education Department of the Ministry of education on the collection of the 2018 year cooperative education project and the goal of "new engineering" personnel training, the collaborative education project is used as teaching. We should deepen the integration of industry and education, the cooperation between industry and education, and the collaboration of education, pool enterprise resources to support the comprehensive reform and innovative entrepreneurship education of universities and colleges, explore a new mode of joint training of talents between universities and scientific research institutes, improve students' practical ability and enhance students' innovative ability, and promote China's higher education level. It is of great significance to improve the quality of personnel training in higher education, to promote the cooperation and mutual support between universities and scientific research institutes in education and scientific research work, to realize the effective promotion of the combination of science and education, to achieve win-win cooperation, and to cultivate a large number of diversified and innovative scientific and technological talents.

With the continuous development of social economy and science and technology, society and enterprises are demanding more and more talents. The Computer Science and Technology Teaching Steering Committee of the Ministry of Education in Colleges and Universities has put forward some suggestions on the development of computer specialty with the core idea of "professional direction classification" in its Research Report on the strategy of computer specialty development. Training is summarized as three types: research-oriented personnel training, engineering-oriented personnel training and application-oriented personnel training. Among them, the application-oriented talents emphasize the application of learning, the vision of outstanding engineers and the cultivation of comprehensive quality. It has become the main training goal of computer specialty in Applied Undergraduate Colleges and universities to train computer application-oriented talents with solid basic theory and strong practical ability. School-enterprise cooperation is a mode of running applied undergraduate education. Enterprise participation can introduce advanced ideas and technologies into colleges and universities, and inject new blood into practical teaching.<sup>[8]</sup>

### Current Situation of Programming Course Teaching

Programming and data structure are the core courses of computer related majors in Applied Undergraduate Colleges and universities. They are two very important basic courses for computer majors. The study of data structure course is based on programming ability and habit. If the students can't master the programming language skillfully and develop good programming habit in the early stage, it will directly lead to the slow progress of data structure course and

gradually lose interest in this course over time<sup>[1]</sup>. Software majors usually offer program design courses in the first semester, and data structure courses in the second or third semester. The two courses are closely related. Learning program design well is a prerequisite for learning data structure. The study of data structure needs to be realized by programming. Programming can lay a good foundation for the study of data structure. At present, the teaching of the two is separated. Programming usually focuses on the contents of the previous chapters, while the following data structure courses focus on the functions, pointers and structures. The contents of such chapters. It makes it difficult for students to learn, understand and implement algorithms<sup>[7]</sup>.

In addition, the theoretical and practical nature of these two courses are very strong. In the past teaching, most teachers emphasized theory and neglected practice, or carried out practical links in accordance with the content of textbooks. Students could not live, learn and apply, nor understand the needs of the enterprise industry. The goal was not clear enough. Finally, the practical teaching links became formalized. Applied computer talents should not only be skilled in computer operation and program design, but also have the ability of system planning, design, development and innovation engineering practice oriented to practical work<sup>[3][2]</sup>.

### **Reform Assumption**

**Develop students'ability of arithmetic design and programming and improve their professional accomplishment.** Reform the traditional teaching methods, form a coherent curriculum system of program design and data structure courses, divide the knowledge content from the application point of view, highlight the key points and teaching purposes of program design and data structure courses, pay attention to the training of students'ability to analyze and solve problems, and pay attention to the training of programming logic thinking. Practice is a good preparation for the study and application of follow-up courses, and also a good foundation for the sustainable development of students. Case teaching method is adopted to cultivate students'interest in learning, strengthen students' ability of self-study, problem analysis and problem solving, and cultivate students'innovative thinking and innovative ability.

**Forming a complete curriculum system of program design and data structure.** We should break the original curriculum system, optimize and arrange the curriculum content according to the professional and technical abilities of applied talents, emphasize on optimizing the curriculum content and setting up practical projects based on the professional abilities required by industrial enterprises, and alternate theoretical curriculum learning and enterprise practice training. Emphasizing the pertinence and practicability of the curriculum system, highlighting practical teaching, the proportion of professional practice links is relatively large, attaching importance to students'practical training in industrial enterprises, and focusing on the cultivation of students' innovative and entrepreneurial abilities and practical abilities.

**Fostering Students'Practical Ability and Innovative Ability Based on Enterprise Demand.** Under the guidance of the educational thought of training applied talents, taking advantage of the advantages of school-enterprise cooperation, we can find a point of convergence between students'employment and social needs, coordinate the relationship between schools and enterprises around the purpose of training applied talents, grasp the connection between specialty setting and local industry and social needs, and the goal of talent training. Business needs docking, personnel training specifications docking with post requirements, deepening curriculum construction and practical teaching construction, highlighting students'practical and innovative ability training, so as to truly achieve "learning for application"<sup>[9][10]</sup>.

### **Co-construction of Programming Course System**

**Problem-Oriented Reform of Teaching Contents to Form a Seamless Docking Course System with Industry.** Programming and data structure are the core professional courses of computer related specialty in Applied Undergraduate Colleges and universities, and are the pre-courses of many follow-up courses. To learn these two courses

well is the basis for applied computer and related professionals to effectively use computers to solve practical problems and innovate practical thinking<sup>[4][5]</sup>.

Through cooperation with enterprises, we can better understand the needs of society and industry, assist schools in curriculum construction, improve the quality of teaching, and promote personnel training that meets the needs of industry. According to the development trend of computer software industry, we should formulate curriculum content that meets the needs of industry talents, and form a seamless curriculum system that meets the needs of industry.

**Forming a complete curriculum system of program design and data structure.** Break the original curriculum system, and form a coherent curriculum system of program design and data structure courses, so that students can learn systematically. The idea of data structure and algorithm runs through the program design. The reasonable and effective application program design in data structure courses is programmed and implemented, and the ability of program design is enhanced. Relying on the network course teaching platform of our university and based on the advanced technology provided by enterprises, we should improve the teaching syllabus based on Project-based teaching, including specific course time allocation, project, task, experiment and exercise description. We should divide the knowledge content from the application point of view, highlight the key points and teaching purposes of the course of program design and data structure, and train computer professionals according to the training of computer professionals. Requirements of cultivation, optimization of teaching contents, improvement of teaching methods, emphasis on the cultivation of students'ability to analyze and solve problems, and the training of programming logic thinking, prepare for the study and application of follow-up courses, and lay a good foundation for students' sustainable development.

**One lesson, two lessons, school-enterprise co-construction of curriculum system.** Under the guidance of the educational thought of training applied talents, taking advantage of the advantages of school-enterprise cooperation, we can find a point of convergence between students'employment and social needs, coordinate the relationship between schools and enterprises around the purpose of training applied talents, grasp the connection between specialty setting and local industry and social needs, and the goal of talent training. Business needs docking, personnel training specifications docking with post requirements, deepening curriculum construction and practical teaching construction, highlighting students'practical and innovative ability training, so as to truly achieve "learning for application"<sup>[3]</sup>.

The unified teaching plan for the course of program design and data structure enables students to change from only completing single-task programs to solving the sublimation of medium-sized and complete programs, mainly from the transfer of programming language to the course of data structure, and to complete the leap from focusing on program instruction language to focusing on abstract data type as the main framework for system design<sup>[2]</sup>.

The teaching contents are processed by different methods, and a complete curriculum system is formed according to the needs of enterprises and industries. In the school, the theory class is put in the laboratory or the enterprise, the theory class is mainly about understanding, and the practice class is mainly about application, which brings students multi-angle cognition and deeper understanding, and achieves in-depth understanding and skill growth of the theory in application, so as to achieve "understanding first, come into being as the times require"<sup>[6]</sup>.

School-enterprise co-construction of curriculum resources. According to the needs of relevant courses or experiments in schools, and with the help of teaching resources and software and hardware platforms provided by enterprises, courseware, experimental projects and real case base of enterprises are developed. Provide effective teaching resources for computer related professional program design and data structure course teaching.

**Co-construction of Practical Teaching Base between School and Enterprise.** Construct a mutually beneficial and win-win benefit-driven mechanism, accurately grasp the common interests of both sides, continue to build and improve the school-enterprise cooperation management platform and institutional mechanism, further carry out the implementation of the "project introduction + practical training" cooperation mode, establish in-school training bases, establish out-of-school training bases in the company, and achieve this goal. The construction of experimental and practical training bases inside and outside the University achieves the goal of collaborative education between universities and enterprises.

## Conclusions

Under the background of "school-enterprise cooperation, collaborative education", the traditional teaching of program design course is outdated and has little effect. As educators, we need to seize the opportunity of school-enterprise cooperation and explore practical teaching mode of program design course. Through practical exploration, the cooperative innovation training mode of integration of industry and education, resource sharing and school-enterprise co-construction is a better training mode. Of course, there are still some problems in the construction process, such as the breadth and depth of school-enterprise cooperation needs to be strengthened with the improvement of national policies.

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