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Teaching Design and Practice of Curriculum Ideology and Politics of Data Structure and Algorithm

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Abstract. Analyze the teaching status of data structure and algorithm majors by mining the ideological and political education elements in this course and its ideological and political education functions. The ideological and political elements are better integrated into this course. Actively promote the reform of classroom teaching with the goal of "course ideology and politics," establish curriculum moral education goals, and scientifically and rationally design ideological and political education content. In knowledge imparting, we should pay attention to value guidance and realize the organic unity of ideological and political education and knowledge system education. Guide students to establish a correct world outlook, outlook on life, and values, and promote the overall development of students.

Keywords. Data structure and algorithm; Curriculum ideology and politics; Teaching reform; Moral education material

1. Introduction

Conscientiously implement the spirit of documents issued by the Ministry of Education of the People's Republic of China, such as the "Implementation Outline of the Quality Improvement Project of Ideological and Political Work in Colleges and Universities" in 2017, the "Opinions on Accelerating the Construction of High-level Undergraduate Education and Comprehensively Improving the Ability of Talent Training" in 2018, and the "Outline of Construction Guidance Ideological and Political Courses in Colleges and Universities" in 2020 [1-3] The curriculum of ideological politics is not a simple "course plus ideological politics." It emphasizes that the ideological and political elements are naturally integrated into the professional curriculum, which turns the wind into the rain and moistens things silently. Adhere to "student-centered, quality education in the classroom, and education serves for learning." Provide personalized, diversified, and high-quality teaching services for students of different levels and types and promote their active learning and overall development. Data structure and algorithm is a core basic professional course in computer science and software engineering curriculum. While teachers teach the professional knowledge of this course in the classroom, it is worth exploring how to promote the ideological and political construction of the course and integrate morality education into all aspects of teaching.

2. Present Education Situation of Curriculum Ideology and Politics

Curriculum ideology and politics is a kind of comprehensive education idea, which means

that all kinds of courses and ideological and political theory courses are carried out in the same direction to form a synergistic effect in the form of constructing the pattern of an entire staff, whole course and whole course education, and "moral cultivation" is regarded as the fundamental task of education [4]. However, for a long time, especially in science and engineering courses, the focus has been on how to let students master more professional knowledge while ignoring ideological and political education. Then ideological politics education and professional education have been isolated from each other. Moreover, the original intention of training new talents with both ability and political integrity has been violated.

3. Teaching Objectives of Curriculum Ideology and Politics

College students are the backbone of the youth group, shouldering the important task of realizing the country's prosperity, the rejuvenation of the nation, and the happiness of the people. They are the future and hope of the country. "Foster virtue through education" is the fundamental higher education task [5]. This course is offered in the first semester of the sophomore year, which is a critical period for them to establish a correct world outlook, outlook on life, and values. The ideological and political courses will be constructed, and curriculum ideology and politics will be unified with the ideological and political courses. Ideological and political education should not only play the role of ideological and political education in course teaching but also carry out ideological and political teaching with professional education to make ideological and political teaching a professional color. Ideological and political courses do not simply teach knowledge nor teach a skill. However, through the ideological and political content of the course, they imperceptively establish the correct three views for students and lay a solid foundation for their life growth [6].

"Data Structure and Algorithm" is a core introductory professional course between mathematics, computer hardware, and computer software. Its research involves computer hardware and has a close relationship with computer software. Data structures are used in all fields of computer science and related application software, and they play a linking role. It is one of the compulsory courses for most computer majors, so computer majors have always valued this course. Moreover, it is a basic professional course with strong practicality and theory. It requires good mathematical knowledge and computational thinking ability. Therefore, this course is critical in constructing a curriculum and ideological and political. In this course's ideological and political construction, to further refine the moral education goals, we should observe the following points. Excavate the moral education materials contained in the course content. Formulate suitable teaching methods and means, and integrate the elements of educating people into the course content. Integrate moral education into all aspects of education and gradually promote the full coverage of curriculum education. Moreover, adopt heuristic, case-based, inquiry-based, discussion-based, and participatory methods suitable for this course to organize the entire teaching process—the curriculum construction goals center on the trinity of value shaping, ability training, and knowledge imparting. In the course content, look for moral education elements related to core values such as family and country feelings, legal awareness, social responsibility, cultural self-confidence, humanistic feelings, engineering ethics, and craftsman spirit. Through the design and application of teaching materials such as typical cases, "course ideological and political" elements such as the correct value pursuit, ideals and beliefs, and family and national feelings are used as the vital content of classroom teaching and the critical knowledge of students' assessment. And specific to the teaching chapters, sections or knowledge modules, knowledge points and academic evaluation, and other education and teaching processes and links[7-8].

4. Implementation of the Curriculum Ideology and Politics

Although this course belongs to the professional computer course, there are many ideological and political elements related to the knowledge of the professional course that can be

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organically integrated into the teaching. Instead of forcibly grafting some ideological and political education content into the teaching of professional courses, it is not far-fetched. This will quickly lead to "two skins" between ideological and political elements and subject knowledge, which will be counterproductive. Using ideological and political elements adequately and appropriately in teaching and making the finishing touches at critical points can achieve the desired effect. This course is our school's first batch of approved ideological and political course demonstration courses. In the construction of ideological and political courses, the research group members deeply explored the ideological and political elements in the content of professional courses and silently integrated ideological and political education into the teaching of the course. For example, introduce a series of achievements made by famous people who give algorithms in this course, such as Huffman, Kruskal, Dijkstra, Floyd, and other famous scientists. Moreover, there are successful domestic enterprises such as Huawei and Alibaba, computer experts such as Xia Peisu and Yao Qizhi, and representative teachers and students of our college. In ordinary times, some news hot spots related to professional technology can also be used as examples, such as telecom fraud, education students beware of campus loans, and must not use the professional knowledge of computers to engage in illegal and criminal activities. Moreover, more practical and exciting examples of course knowledge can lead to students' listening efficiency and learning enthusiasm. The supporting example animations and courseware are used to make the teaching content-specific, vivid and intuitive, reducing the degree of abstraction and facilitating understanding and memory. It enables students to master the professional knowledge of this course and, at the same time, subtly enhance their ideological realm.

The following describes the implementation process of the course's specific ideological and political content through moral education materials.

(1) In introducing the development history of data structures, focus on scientists who have made outstanding contributions to computer science. Their remarkable contributions laid a solid foundation for developing computers and data structures. For example, the founder of the data structure, the Knuth scientist, studied hard and won the Turing Award, the highest honor in the computer science community, at 36. Tell such stories to students, guide them to love computers, learn computers well, and encourage them to study hard. While understanding the development history of data structures, students will fall in love with computers, learn computers well, and use the computer knowledge they have learned to contribute to the country in the future.

(2) In the chapter on queues, let students understand the characteristics of queues in this course through first-come, first-served examples in daily life - queues are linear tables with limited operations, to deepen students' understanding and application of the content of queues in this course. At the same time, educate students to abide by social order and respect social morals in daily life, such as cooking, shopping, traveling, and other occasions. Guide students to establish a correct social orientation and improve their quality. College students should master science and technology, cultural knowledge, and professional skills. They should also strengthen ideological and moral cultivation, adhere to the correct political direction, and establish the correct outlook on life, world outlook, and values, forming a unity of political integrity and ability.

(3) In the practice session, some students are afraid of writing algorithms and programming, especially when there is an error in the compilation of the computer program, and there are a few students who have the idea of giving up. We use the greedy algorithm, the classical method, to generate the minimum spanning tree in the figure chapter, and the final result is an example of the overall optimal solution. In this way, students are taught to "learn a little bit more greedily every day, work a little more, and will surely gain more knowledge over time." The greed here is not pejorative but positive greed. Students who have problems can help find out the problem through individual counseling on time, check for omissions, and encourage them to overcome difficulties so that they will be able to learn this course well. For students with a good foundation, specifying extra-curricular reading materials increases their

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knowledge, arranges thinking questions, and mobilizes their potential. Students with outstanding learning are encouraged to participate in the undergraduate science and technology innovation fund project. Let every student have the confidence to learn this course well.

(4) This course has always been regarded as a relatively dull and challenging subject. Especially the abstract data types are challenging to understand. We will start with the most familiar examples to students. For example, when teaching the shortest path problem, starting from the actual example of traveling from one city to another, each city is regarded as a vertex, and an edge connects two cities. The distance between two cities represents the value. Thus we can establish the abstract data type of the problem - a weighted connected undirected graph. Then Dijkstra's algorithm can find the shortest path. Cultivate students' abstract thinking ability from shallow to profound. We can take one of the courses with high practical value in graph theory as an opportunity to promote civilized tourism when visiting scenic spots and beautiful rivers and mountains of China with family or friends in their spare time. Moreover, to have a strong sense of social responsibility in tourism activities to show the style of modern and contemporary students. This style is reflected in the study of life as honest, severe, rigorous, tolerant, persistent, and friendly in life. At the same time, students should be encouraged not to be afraid of difficulties. As long as they persist, they will have a harvest.

(5) Students work together to complete joint, comprehensive experimental problems in cooperative learning. This course divides students of different levels into one group through heterogeneous grouping, "heterogeneous within the group, homogeneous among the groups," and narrows the gap between the groups. It is conducive to students' collaborative learning in the group, to the exertion of students' different intelligence advantages, and to enhancing self-confidence and stimulating achievement motivation. The "homogeneity between groups" provides objective conditions for the improvement of mutual assistance among students in the group and provides a platform for stimulating the collective honor consciousness among the groups. There are differences in students' performance in different fields of study, "everyone has his strong and weak points." They work in groups through individual learning and mutual learning and work together to complete the cooperative learning tasks assigned by the teacher. Classroom teaching techniques are recognized based on their overall group completion. In class, we start from the typical application of binary tree - the principle of constructing an optimal tree by finding two leaf nodes with the smallest weight from a set, adding the weights of these two leaf nodes as the parent node's weight value. Then this sum value is added to the set, and so on. Finally, a leaf node with the largest weight is obtained. In this way, they are encouraged to learn from each other through cooperative learning among their classmates and "learn from other's strong points to offset one's weakness." The implementation of this teaching model has effectively stimulated the interest in learning and the awareness of competition among members of the group and cultivated students' teamwork awareness and teamwork ability, which has achieved good results.

5. Conclusion

The fundamental task of higher education is to foster virtue through education. Integrate the ideological and political elements of the course into all aspects of education. Integrate the ideological and political elements related to this course into the teaching while teaching professional course knowledge. After several years of implementation of the ideological and political course teaching, the ideological and political construction of the data structure and algorithm course has initially achieved the expected goal. But curriculum ideological and political construction is a long-term and systematic project. It needs to continuously establish a sound curriculum ideological and political working mechanism in various aspects such as curriculum goal design, syllabus revision, textbook editing and selection, and the compilation of teaching plans and courseware so that the curriculum ideological and political construction can achieve higher results.

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