Mining and Practicing of Ideological and Political Elements of Computer Composition Principle Based on the BOE

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Abstract. OBE (Outcomes-Based Education) is a student-centered education model that focuses on the professional abilities and ideological qualities of students. Ideological and political education is the fundamental requirement of a socialist university with Chinese characteristics. To help students establish a correct outlook on life and values in the teaching process and achieve the purpose of teaching and educating people, this paper comprehensively analyzes the content of the important professional basic course "Principles of Computer Composition" based on the teaching concept of OBE and introduces the ideological and political elements of "Principles of Computer Composition" for each chapter of knowledge points. The teaching strategy of "stimulate student potential", "tap the vitality of the classroom", and "combine online and offline" are put forward by integrating skill teaching and quality cultivation. The results of the research have played a good role in the ideological and political teaching of the "computer composition principle" in our school based on the OBE model.

Keywords: Mine of ideological and political elements, Computer composition principle, OBE (Outcomes-Based Education)

1   Introduction

In recent years, OBE education has attracted the attention and importance of colleges and universities. To comprehensively improve the quality of talent training in China's colleges and universities, many colleges and universities have proposed to implement OBE into curriculum teaching to carry out curriculum reform and practice. The implementation of the OBE teaching model of the course enables teachers and students to clearly understand the teaching requirements of the course in terms of knowledge, ability, and quality, which will promote the "teaching" of teachers and the "learning" of students. Traditional teaching content is often subject-oriented, ignoring the need for professional competence to a certain extent. Outcome-oriented education follows the principle of reverse design[1], in which the training goal is determined by the demand, the graduation requirement is determined by the training goal, and the discipline system is determined by the graduation requirements. Therefore, it is difficult for traditional education to enable students to meet the needs of employment units, while outcome-oriented education ensures the consistency of training goals and employment needs to the greatest extent[2]. Cultivating people with virtue is the fundamental task of education in the new era and the purpose of colleges and universities. To implement the important spirit of

education in the "Several Opinions on Deepening the Reform and Innovation of Ideological and Political Theory Courses in Schools in the New Era" and the "Guiding Outline for the Ideological and Political Construction of Curriculum in Colleges and Universities"[3], all schools in various places have taken active actions and have introduced implementation plans so that the majority of teachers are aware of the importance and feasibility of carrying out ideological and political construction of the curriculum[4,5]. It is generally believed that the ideological and political curriculum is aimed at ideological and political courses, but in fact, it is also of equal significance in the study of science and engineering courses. The construction of ideological and political education in science and engineering courses can integrate the formation of students' values into the daily study of professional courses, which is the significance of higher education and an important content of professional talent training.

Based on the OBE teaching model, this paper intends to conduct a comprehensive and in-depth analysis of the teaching content of the "computer composition principle ", and comprehensively excavate the ideological and political teaching content of the course "Principles of Computer Composition" to cultivate students with strong ability and high quality, and all teaching activities and teaching processes are carried out around the realization of the expected goals. The research results are intended to lay the foundation for the reform of the ideological and political teaching of the "computer composition principle ".

2   Teaching method

The "computer composition principle " is an important professional basic course of computer science, which plays an important role in the curriculum system of computer science, and is also an important professional course for graduate school entrance examination. Based on the OBE model, it is necessary to teach students not only the skills of computer composition and design but also the quality of students' thinking. The scope of ideological and political elements includes loving the country and the party, revitalizing the motherland, serving the people, being good at thinking, being brave in innovation, challenging oneself, perseverance, honesty, and trustworthiness, abiding by professional norms, solidarity, and mutual assistance, and so on.

The excavation of ideological and political elements not only requires teachers to have strong professional skills, but also requires teachers to care about current affairs, strengthen political cultivation, and improve ideological awareness. In the course of ideological and political teaching, the ideological and political elements are integrated into the professional knowledge points, so that the ideological and political elements can stimulate students' interest in mastering professional skills.

2.1   Mining of ideological and political elements of "Introduction to Computer Systems"

In this chapter, we will inevitably mention that von Neumann, known as the father of computing, not only ventured into the field of computing but also constantly changed the subject of research, with each turn being groundbreaking and achieving amazing results. VonNeumann has made so many contributions in just 54 years, and although he is talented, it is also inseparable from his diligence and hard work. As the saying goes, stupid birds fly first. There is a diligent path in the book Mountain, and there is no end to the hard work in the sea

of learning. According to this, students can be guided to cultivate students' diligent and studious spirit. If they want to succeed professionally, diligence, hard work, and perseverance are necessary ways.

Regarding the development of computers, the development of computers in China began in the 50s of the 20th century. So far, China is the third largest producer of supercomputers after the United States and Japan. In June 2016, Sunway Taihu Light, which was manufactured using its chips, topped the list. However, China's computer industry still has serious shortcomings in key technologies (such as CPU design, chip manufacturing, system software, basic software, industrial software, etc.). In the field of CPU design, with the unremitting persistence and efforts of Loongson CPU in domestic independent and controllable decades, Huawei Kirin processors have sprung up. Due to the interruption of the supply of the latest chip manufacturing technology in the United States, there is still a long way to go for China's information industry to be independent and controllable. According to this, we can guide students to cultivate students' patriotic feelings, As college students in the new era, they should study hard, dare to take responsibility, and contribute to the rejuvenation of China and the power of science and technology.

2.2 Mining of ideological and political elements of data representation

Since the word length of the data is always limited, when the word length is $n+1$, the range of fixed-point decimal is $-1 \backsim (1-2^{-m})$, the range of fixed-point integer is $-2^{n} \backsim (2^{n}-1)$, and the standard range of single-precision IEEE754 floating-point number is $2^{-23} \times 2^{-126} = 2^{-149}$ to $2^{-126} \times (1-2^{-23})$, even if the floating-point number of a double precision IEEE754 is expressed in the range of $1.0 \times 2^{1-1023} = 2^{-1022}$ to $2^{1023} \times (2-2^{-52})$, so the representation range of data in a computer is limited. Binary floating-point numbers do not accurately represent decimal floating-point numbers, IEEE754 the standard of decimal floating-point numbers such as 0.1 is only an approximate number, and there is a slight error with the actual value, but the slightest mistake will cause huge losses. For example, In the Gulf War, because of a floating error, the Aigo missile directly led to the failure of missile interceptors and the deaths of many people in the U.S. military. Small floating point error problems bring fatal disasters and major losses, which can cultivate the responsibility of the student's scientific craftsmanship spirit and engineer's sense of responsibility.

In the early 80s of the 20th century, the floating-point representations of various machines were incompatible with each other, and it was troublesome to transfer data between machines. In the late 1970s, the IEEE began to develop the floating-point standard, and in 1985, the floating-point standard IEEE754 was formulated and is still in use today. Therefore, teachers can cultivate students' professional ethics and guide students to strictly fulfill their responsibilities in the project. There are also rules in real life, which lead students to obey the law and obey the rules and regulations of the school.

2.3 Mining of ideological and political elements of "operation methods".

Since the range of representation of various data is limited, the sum of two positive numbers may exceed the positive range, while the sum of two negative numbers may be less than the negative range. By studying the content of this chapter, students will understand that in programming, operations can produce overflow problems. As a programmer, you must

consider the overflow problem when dealing with it, and there are some important areas where failure to consider the operation overflow can lead to serious accidents and disasters. For example, on June 4, 1996, the Ariane 5 launch vehicle of the United States overflowed due to the conversion of long data to short data, which directly led to the collapse of the system and the explosion of the rocket, causing huge losses. Therefore, teachers can cultivate students' scientific spirit and guide students to treat professional problems with a scientific attitude. The students must be meticulous in the actual work and must not be perfunctory.

2.4 Mining of ideological and political elements of the "memory system"

In the computer system, the larger the memory capacity required, the faster the better, and the lower the cost the better, so the modern memory system generally adopts a multi-level memory structure, as shown in Figure 1.
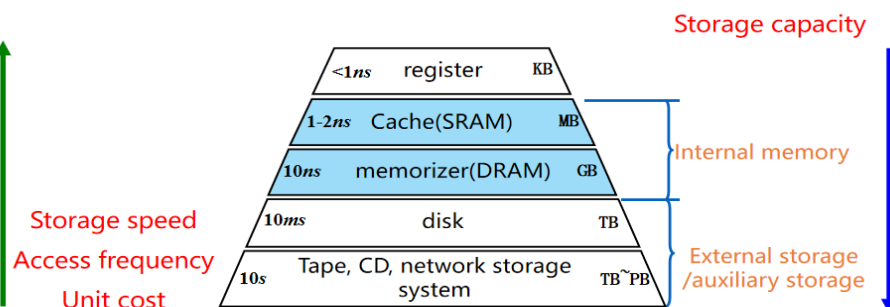

Figure 1. The multi-level memory structure

How to improve the speed of the memory system? SRAM is faster than DRAM, but its capacity is limited, cost is higher, and power consumption is larger. To further improve the performance of CPU access to main memory, a small capacity of fast SRAM, called Cache, is usually added between the CPU and main memory. The data frequently accessed or will be accessed in the main memory is scheduled into the small-capacity SRAM, and the program execution by the CPU has a strong program locality feature so that most of the data accessed can be carried out in the fast SRAM, thus improving the system performance.

In a computer system, how can a large number of large user programs run in a limited main memory space? The solution is to introduce virtual memory so that the main memory and auxiliary storage can be managed by the operating system and hardware, and provide a much larger storage space than the actual storage space. In paged virtual storage, both the virtual space and the main memory space are divided into fixed-size pages, and the virtual address looks up the physical page number according to the page table during the conversion process. The page table is stored in the main memory, and the virtual storage space is also in the hit, the page table must be checked first, and then the main memory must be accessed, and the data can be retrieved after two memory visits, so the fast table is introduced in the conversion to improve the search speed.

The construction idea of the above-mentioned Cache and virtual memory system has been gradually improved from shallow to deep. The process of teaching professional knowledge can be aimed at cultivating students' ability to analyze and solve problems, stimulating

students' enthusiasm for learning, encouraging students to think hard and ask more questions, and cultivating students' practical ability and scientific research abilities.

2.5 Mining of ideological and political elements of the "command system".

In the design of instruction systems computer system designers add more and more powerful complex instructions and more addressing methods, to meet the needs of different aspects of the computer, this kind of computer is called a complex instruction system computer (CISC).

Further analysis of CISC found that 80% of CISC programs had only used 20% of the instruction set[6], and based on this finding, the Reduced Instruction System Computer (RISC) was created which was a profound revolution in computer system architecture. At present, both CISC and RISC technologies are evolving and starting to converge with each other, and eventually, CISC and RISC will end up in the same place. Therefore, teachers can guide students to cultivate students' comprehensive vision of problems: everyone has their strengths and weaknesses, and they must learn to develop their strengths and weaknesses and learn more from others' strengths and prescriptions to overcome their shortcomings.

2.6 Mining of ideological and political elements of "Central Processing Unit".

The central processor is composed of an arithmetic unit and a controller, and its composition structure is quite complex. Figure 2 below is the composition structure of a pipeline CPU of a Reduced Instruction System Computer (RISC).
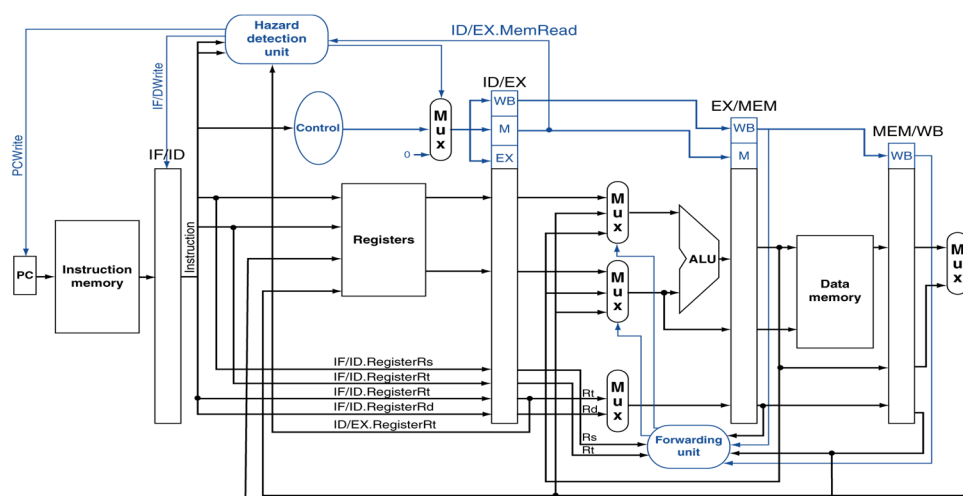

Figure 2. The composition structure of a pipeline CPU

The central processing unit is composed of combinators and controllers[6], and the ability of a computer to execute programs depends on the delicate coordination of controllers and combinators. The collaboration of the various parts of the CPU reminds us of the cooperation of a project team, which helps to improve the productivity of team members, and everyone in the team can work together and persevere when faced with difficulties to achieve a common goal. Here, the purpose of cultivating students' teamwork spirit can be to guide students: the power of one person is small, but if the individual is integrated into the collective, division of

labor, and cooperation, then the power is infinite. One chopstick can be easily broken, but ten pairs of chopsticks can be firmly held together to play a greater role.

In addition, the design of CPU cores is not a "stuck core technology" for today's China, and the production and manufacturing problem is the core foundation of the entire semiconductor industry chain, and it is also the most ruthless part of the US sanctions today. The successful promotion of domestic CPUs in the field of information innovation proves that domestic CPUs can undertake a wide range of office applications. China's Huawei leads the world in 5G technology, but there are still some problems in chip technology, which depend on the younger generation. Here, the purpose of cultivating students' courage to explore and study hard can be carried out, and students can be guided to forge ahead and strive for progress.

2.7 Mining of ideological and political elements of "system bus".

Only devices from different manufacturers that meet the bus specifications can be compatible and interoperable, and computer engineers also need to comply with engineering specifications and documentation specifications in their daily work to facilitate communication and communication. The interlocking scheme in bus control is analogous to the communication between members in a team project, which can guide students to establish a sense of teamwork, develop good habits of complying with engineering specifications and improve communication skills in project cooperation, cultivate students' teamwork spirit.

2.8 Mining of ideological and political elements of "input and output system".

The exchange of information between the CPU and the external device adopts different control methods depending on the nature of the external device. Program control mode means that the input and output are completely dependent on the CPU to execute the program, and in this control mode, the CPU and external devices can only work serially. In the program interrupt control mode, the executing program is suspended and the corresponding interrupt service program is invoked to complete a message transmission between the CPU and the external device. Both program control and interrupt control require the CPU to execute the program for actual data transmission, which has become the main bottleneck in the development of I/O transmission technology, resulting in direct memory access (DMA). In this mode, the DMA controller temporarily replaces the CPU control bus, and the direct data exchange between the control device and the memory is carried out, which greatly improves the transmission rate and CPU utilization.

The development process of I/O control is the process of continuously solving problems when encountered. It can cultivate students' spirit of active exploration and innovation. Encourage students to bravely face and be good at solving various problems in study and life, and correctly deal with various abnormal situations in daily work and life, such as physical diseases, psychological problems, failure in study, family accidents, etc., so that learning and life can return to the normal track as soon as possible.

3 Practice and results analysis

3.1 Stimulate student potential

According to the characteristics of the thinking element and the student's level of the course, the teacher should play a positive role in the teacher's leadership. Teachers should help students strengthen students' self-learning ability. In the teaching process, the use of vivid illustrations, plain language, and clear explanations makes the content easy to understand and accessible. The guided approach is adopted to develop students' ability to learn and think independently. Use ideological and political elements to stimulate students' patriotic feelings and learning motivation. Students are encouraged to pursue their goals and make feasible study plans with the excellent cases of past postgraduate exams. On the other hand, teacher love is the key to a harmonious teacher-student relationship[7]. Teacher's love is the cradle of students' success. Use teacher love to light the fire. With teacher love with students healthy growth. Truly make virtue and cultivate people. While teaching professional knowledge, the teacher flexibly integrates ideological and political elements into the course, imperceptibly and silently conveys ideological and political ideas to students, so that students can arm themselves with correct political thoughts, and enhance their independent learning ability and independent thinking ability.

3.2 Tap the vitality of the classroom

In the teaching process, students are not only required to master the theoretical knowledge points but also required to flexibly use the knowledge points[8].In the course of teaching, to improve students' comprehensive quality and learning interest, teachers can design open questions and ask questions by random roll call or quick answer score. Teachers can also set questions and suspense, be problem-oriented to cultivate students' divergent thinking ability and problem-solving abilities, fully mobilize students' classroom enthusiasm, and let students acquire knowledge in a relaxed learning atmosphere. Teachers should enable students to strengthen the grasp and application of theoretical knowledge in the process of problem-solving, to cultivate students' language expression ability, innovation ability, thinking ability, problem analysis, and problem-solving ability.

3.3 Combine online and offline

The inclusion of the content of political content may take up some of the class time. To avoid the lack of class time and improve the students' classroom teaching effect, the teacher can adopt the online and offline hybrid teaching mode according to the content of the teaching. Use the network resources and the intelligent teaching platform, and promote the depth of the information technology and classroom teaching[9]. By using the class of divided class, combining the online and offline hybrid teaching mode, designing the content of online learning carefully, and guiding students to understand the relevance of thinking and professional knowledge, makes the connotation of ideology and politics promoted in the course of professional course. The various teaching methods can constantly improve the enthusiasm of students to learn and to make the students from passive to initiative. Thinking of political teaching can inspire students to study hard, not be afraid of difficulties, insist on ideals, and brave challenges. In particular, in addition to the lecture courseware and various teaching videos as shared resources, the teaching platform is used as an online communication

answer, online homework, and self-testing platform, which allows students to leave the classroom and teachers to follow up the teaching schedule and master the learning resources.

3.4 The results analysis

The purpose of ideological and political teaching is to educate and cultivate students in political theory, ideological morality, and legal foundation, and its purpose is to cultivate students' socialist core values, enhance national and national concepts, and improve students' ideological and moral quality and legal literacy. The practical results of this ideological and political teaching are shown in Table 1.

Table 1. The ideological and political teaching resulted in "Principles of Computer Composition".

Number	Ideological and political	Student gain
1	Patriotic feelings	The development process of the computer and the self-development of the CPU chip have inspired students to love the national conditions and encourage students to take the courage and courage to make progress.
2	Craftsman spirit	Students understand that in the data a millimetre error will lead to a thousand miles of mistakes.
3	Scientific spirit	Students understand that the data computing process should be treated scientifically, and in the work, they must not be duplicated
4	Exploration spirit	Students understand that some of the problems that China has in chip technology require their young generation to explore and work hard.
5	The ability to analyze and solve problems	The construction of the memory system is deep and gradual. The development of I/O control is also the process of solving problems. In the course of professional knowledge teaching, high school students improve their ability to analyze the problem and the spirit of exploring and innovating.
6	A comprehensive look at the problem	CISC and RISC technology are constantly developing and integrating, and eventually, they will be able to do the same, so the students learn to view the problem comprehensively.
7	Team spirit	In the bus control, the interlock scheme analogy team project members communicate, the collaboration of the central processor division can also be seen as the cooperation of the project team, and the students learn the spirit of teamwork.
8	Take the courage to act	The manufacturing and development of CPU and memory chips, and development have encountered the bottleneck of self-development, and the students understand that this needs the young generation to take on and strengthen their progress.

By learning the history of the development of computers and the research process of its core chips, students can have a deeper understanding of the development process and achievements of the country, to enhance their love for the country and their awareness of contributing to

society. Ideological and political teaching helps students establish a correct world outlook, outlook on life, and values. Through practical activities, students will be able to combine theoretical knowledge with practice and improve their analytical and problem-solving skills. In the process of ideological and political teaching, students often need to cooperate with others to complete projects or discussions, which cultivates their teamwork spirit and communication skills. Ideological and political teaching focuses on cultivating students' self-directed learning ability so that they are accustomed to continuous learning and self-improvement. Ideological and political teaching not only pays attention to students' political and moral development but also pays attention to their emotional, physical, and mental growth, to promote students' all-round development. In short, through the excavation and teaching of various ideological and political elements, ideological and political teaching cultivates students to become citizens with good ideological and moral quality, awareness of the rule of law, and a sense of social responsibility which lays a solid foundation for their growth and development.

4   Conclusion

Ideological and political education is an inevitable requirement for the realization of moral education, and it is a necessary part of the teaching work of college teachers. As the main course of colleges and universities, professional courses are the best carrier of course ideology and politics. While preparing the teaching content of professional courses, teachers can only organically integrate the ideological and political content with the teaching content by digging deep into the ideological and political elements of the course, to achieve the effect of moisturizing things and silently educating people. Based on the OBE teaching model, this paper excavates the ideological and political elements of the "computer composition principle ", carries out the course ideological and political teaching around the ideological and political training goals, and intends to explore the talent training mode in the new era and make efforts for the course ideological and political education based on the OBE model. Only by being familiar with these ideological and political elements can we naturally integrate ideological and political education into the teaching of the "computer composition principle ". This teaching mode not only does not delay normal teaching, but also stimulates students' enthusiasm for learning, improves students' ideological quality and professional ability, and ultimately achieves the purpose of teaching and educating people.

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