Exploration of Ideological and Political Education in Computer Courses in the Post-Pandemic Era in Higher Education

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Abstract. Thought and political education for university students are crucial components of higher education. In the undergraduate teaching process of computer science majors, instructors are tasked with seamlessly integrating ideological and political education throughout the entire educational journey. The goal is to assist students in forming correct worldviews, life perspectives, and value systems. This article first elaborates on the importance of ideological and political education in computer science courses. Subsequently, it explores the implementation methods and provides specific teaching examples, addressing material exploration, ideological excavation, and instructional design for ideological and political education within computer science courses. The article concludes with a summary, highlighting the organic integration of content and ideological education in computer science, contributing to a holistic and comprehensive approach to student development.

Keywords: Ideological and political education; Computer science education; Online teaching; Pandemic reflection

1 Introduction

With the development of technology and social progress, the significance of data is self-evident as the objective world is stored, represented, and simulated through computers. From personal data information to the potential loss of confidential information and even national assets, all are closely related to computers. Besides the security of the data itself, human subjective awareness is also crucial. For educators in the field of computer science, integrating ideological and political education into computer courses is essential.

When faced with the overwhelming influx of internet data and information, as educators, it is not only necessary to impart knowledge in computer-related courses but also to guide students in discerning and understanding data information. Ideological and political work should be integrated throughout the entire process of education and teaching. This involves exploring ideological and political education resources inherent in the teaching process of computer courses, collecting typical ideological and political cases within the curriculum, and helping students establish a correct worldview, outlook on life, and values. This is crucial for nurturing

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qualified successors to contribute to the socialist construction endeavor.

In December 2016, General Secretary Xi emphasized at the national ideological and political work conference of colleges and universities that "we should adhere to the central link of moral cultivation, run ideological and political work through the whole process of education and teaching, achieve the goal of educating people in the whole process and in all directions, and strive to create a new situation for the development of China's higher education" [1].

At the 2019 National Education Conference, General Secretary Xi proposed that college teachers must clarify several questions, "what kind of people to cultivate, what kind of people to cultivate, and for whom" is to cultivate morality, intellect, body and beauty And full-time development of professionals[2].

In June 2020, the Ministry of Education issued the Guidelines for Ideological and Political Construction of Courses in Colleges and Universities. The document points out that to build a high-level talent training system, it is necessary to integrate the ideological and political work system into it and do a good job in the curriculum ideological and political construction. At the same time, we need to solve the "two skins" problem of professional education and ideological and political education [3].

Ideological and political education should not only be emphasized in dedicated ideological and political courses but also integrated into professional courses [4]. The cultivation of university students extends beyond the transmission of specialized knowledge, placing a greater emphasis on instilling correct ideological concepts. In the era of overwhelming internet data and information, educators, particularly those teaching computer science-related courses, are tasked with not only imparting technical knowledge but also guiding students in discerning and understanding data information. It is imperative for educators to infuse ideological and political work throughout the entire educational process, uncovering the ideological and political education resources inherent in the teaching process of computer science courses. This involves gathering typical ideological and political cases within the curriculum, aiding students in forming accurate worldviews, life perspectives, and value systems. As educators, our mission is to contribute to the development of qualified successors for the socialist construction endeavor.

The concept of ideological and political education within the curriculum has not been around for long, but many scholars have developed profound insights into it. Wei [5] believes that through the construction of objectives, content, mode and evaluation of teaching the construction of ideological and political teaching system under the theory of Outcome based Education can be achieved. It can lay a solid foundation for the ideological and political teaching and construction of the curriculum. Bi [6] uses the measures such as carrying out ideal and belief education when imparting mathematics knowledge, establishing the mathematics contest platform to create a mathematical cultural atmosphere, and using mathematical concepts and mathematical allusions to guide students to form correct outlook and sense of value and further form excellent humanistic qualities. According to Yue [7], by constructing ideological and political case construction ideas, ideological and political elements such as philosophy, ethics and regulations, and a sense of social responsibility are integrated into the teaching process of compilation technology. Yu [8] constructs the basic process of carrying out the course ideology and politics in the mixed teaching of Japanese courses online and offline, and proposes the implementation path. The specific paths include:

clarifying the ideological and political teaching objectives of Japanese courses, solidifying the unification of explicit education and implicit education, compiling ideological and political teaching materials for Japanese courses, and clarifying the integration points of Japanese teaching content and course ideological and political teaching.

Computer science courses are compulsory for undergraduate students majoring in computer science, software engineering, and related fields. Effectively incorporating ideological and political education into computer science classrooms can assist undergraduate students in establishing correct life perspectives and values. This, in turn, enables them to base their actions on the core socialist values when entering the workforce, consistently arming themselves with correct political ideologies, enriching their knowledge, and realizing their social and life values. This integration is also in line with the requirements of the "New Engineering" talent development goals in the new era [9, 10].

University computer science instructors need to delve into the ideological and political materials within computer science teaching, effectively integrating the educational goal of nurturing moral and intellectual individuals into the computer science classroom. This approach aims to cultivate students' sense of social responsibility and patriotism, urging them to rigorously demand of themselves in future societal practices, and become the backbone of modernization construction.

2 The importance of ideological and political education in computer courses

2.1 The ideological and political education in computer courses aligns with the educational goals of higher education institutions

The teaching objective of applied undergraduate colleges is to cultivate applied talents for socialist construction, and students' ideological and political level influences the effectiveness of socialist construction, particularly in the context of information technology development. Guided by the educational policy of nurturing moral and intellectual individuals, in the teaching of computer science courses at undergraduate colleges, it is crucial to clearly define the core objectives of undergraduate talent cultivation, strengthen the development of students' ideological and political qualities, and achieve a seamless integration of professional course education and ideological and political education.

Undergraduate students are at a critical stage in the formation of their values, making them susceptible to the negative influences of external thoughts. Integrating ideological and political education into computer science courses plays a crucial role in guiding students, correcting erroneous life perspectives and values, and assisting them in developing positive, correct, and progressive life values. This approach aims to shape students' thoughts and behaviors to align with the core socialist values, providing guidance and support during a period where they may be vulnerable to incorrect ideologies.

Simultaneously, in the teaching process of computer science courses, it is essential to fully integrate the characteristics of the professional discipline and the course. By identifying points of intersection between the specialized content of the course and ideological and political

education, students can consciously develop resistance against the negative influences of the internet. This collaborative effort aims to construct a civilized and healthy online cultural environment.

2.2 Ideological and political education in computer courses enhances students' personal code of conduct

Education for computer science students is a crucial component of the undergraduate education system, with the goal of cultivating comprehensive qualities in computer professionals. Conducting ideological and political education for students aligns closely with the undergraduate training objectives of computer science in higher education institutions. In the socialist new era, computer professionals are expected to possess an equal level of importance in both personal moral qualities and professional competence.

If students majoring in computer science possess only high-level professional knowledge without a noble level of ethical and moral values, it is not beneficial for society; instead, it can be disastrous. For instance, malicious activities like hacking networks or unlawfully obtaining others' private information are typical examples of individuals possessing technical skills but lacking ethical and moral values. Throughout the various stages of cultivating computer science professionals, attention must be given to students' ideological and political development, preventing instances where computer technology is used solely for personal gain, potentially harming the overall interests of society.

2.3 Ideological and political education in computer courses can reflect the social service nature of talent

In the teaching process of computer science, the design and development of software systems are focal points of the curriculum. The worldview of software design and development professionals determines the conceptual orientation of the software system itself. In the economic construction process of the socialist new era, the degree of use and reliance on computer software systems is increasing. Therefore, the ethical and moral standards of software system developers have a significant impact on the software system itself and even on the situation of socialist economic construction.

Through ideological and political education for undergraduate students majoring in computer science, the aim is to encourage students (future software developers) to approach the design and implementation of software systems from the fundamental interests of societal development and the people. This involves utilizing their professional skills to better serve society in the process of engaging in computer software design and development work.

3 Design of ideological and political education in computer science courses teaching

3.1 Online related ideological and political education

At the beginning of 2020, the novel coronavirus (COVID-19) pandemic struck suddenly, sweeping across the entire country. In the subsequent years, many universities, during various academic semesters, implemented varying degrees of fully online teaching.

Fully online teaching refers to a mode of education in which all teaching activities are conducted online through the internet for a certain period during the course. Despite the shift from traditional classroom instruction to fully online teaching, it is essential to integrate elements of ideological and political education into the process of explaining computer science course content. Throughout the fully online teaching process, instructors inevitably need to make full use of the vast online resources related to course content, encouraging students to engage in self-directed learning. Among these abundant resources, there are also materials related to ideological and political education. Therefore, in the context of fully online teaching, the integration of subject-specific content and ideological and political education becomes more convenient and effective.

In the post-pandemic era, universities are more inclined to adopt a blended teaching approach that combines online and offline methods. Employing this approach involves designing teaching cases for pre-class, in-class, and post-class sessions, making full use of resources such as cloud classrooms, massive open online courses (MOOCs), online teaching platforms, etc. This approach seamlessly integrates ideological and political education with the content of professional courses, as illustrated in Figure 1.

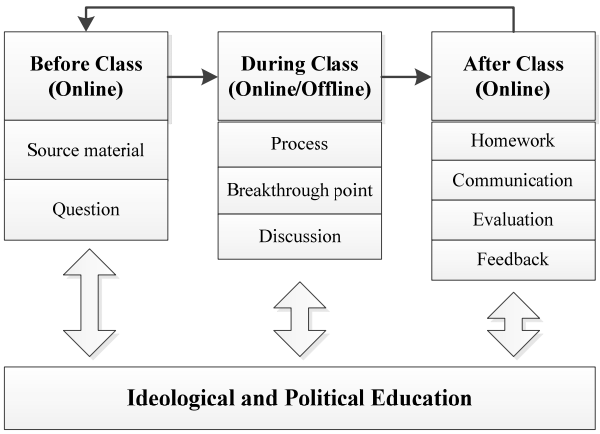

Figure 1. Ideological and political teaching system based on online and offline hybrid teaching mode

1) Pre-class Preparation

① Resource Integration: Teachers need to integrate ideological and political elements related to the course content in advance and prepare corresponding materials and resources. This may include classical literature, current affairs, historical events, etc., ensuring that these contents are closely related to the course theme.

② Design Guiding Questions: To stimulate students' thinking, teachers can design ideological and political questions related to the course content, allowing students to contemplate and preview before the class.

2) During-class Teaching

① Introducing Ideological and Political Content: During the explanation of professional

knowledge, teachers can timely introduce ideological and political elements, using examples, cases, etc., to allow students to implicitly receive ideological and political education while learning professional knowledge.

② Interactive Discussions: Regarding the pre-designed ideological and political questions, teachers can organize group discussions or class discussions, encouraging students to express their own opinions and guiding them to think deeply.

③ Utilizing Online Resources: Teachers can leverage the advantages of online teaching platforms, such as real-time Q&A, online tests, etc., to interact with students in real-time and enhance their learning engagement.

3) Post-class Consolidation

① Assigning Ideological and Political Homework: Teachers can assign homework related to course content and ideological themes, allowing students to summarize and reflect on what they have learned through writing essays, creating PPTs, etc.

② Online Communication and Q&A: Utilizing the discussion area or real-time communication tools on online teaching platforms, teachers can communicate with students after class, answer their questions, and provide feedback on their opinions and assignments.

③ Teaching Evaluation and Feedback: Teachers can collect students' learning data, such as test scores, participation rates, etc., through online platforms to assess teaching effectiveness. Simultaneously, adjustments to teaching strategies can be made based on student feedback to further optimize blended teaching both online and offline.

Through this blended teaching approach, not only can students ensure their learning of professional knowledge, but it can also subtly cultivate their socialist core values, helping them establish the correct worldview, outlook on life, and values. Simultaneously, this teaching method fully embodies the leading role of teachers and the active role of students in the teaching process, contributing to the improvement of teaching effectiveness and students' overall quality.

3.2 Chinese traditional culture based ideological and political education

Chinese traditional culture is vast and profound, possessing rich historical roots and cultural significance. Drawing positive and uplifting nourishment from the excellent traditional culture that has endured for millennia is of great importance for the ideological and moral development and patriotism education of students. Extracting elements of ideological and political education from Chinese traditional culture can be transformed into a powerful spiritual force for students, creating a positive teaching atmosphere. Below is an attempt to design a case of ideological and political education with a focus on traditional culture for computer science courses.

1) "Digital Circuit Logic" and "Computer Organization Principles" Courses

In the above courses, it is necessary to teach students the concepts of binary (as well as other numeral systems) and related knowledge such as conversion between binary and the traditional decimal system. In the instruction of this course content, connections can be made with relevant knowledge from the ancient Chinese traditional culture, particularly the "I

Ching" or "Yijing." After Leibniz introduced binary thinking, he found a coincidental correlation with the binary concept in the philosophy of the "I Ching." Additionally, octal (base-8) can be associated with the eight trigrams of the "I Ching." During the course teaching process, an attempt can be made to introduce the basic ideas of "I Ching" and the eight trigrams, requiring students to express yin and yang, hexagrams in a computer-based numeral system. This approach deepens students' understanding of numeral systems and enhances their proficiency in numeral system conversions. Simultaneously, it fosters a certain level of understanding of ancient Chinese traditional culture, cultivating a spirit of love for the country and respect for tradition among students.

2)"Computer Organization Principles" and "Operating Systems" Courses

In the aforementioned courses, students need to be taught relevant knowledge about computer hardware architecture, principles, and mechanisms of computer system software. In the instruction of this course content, connections can be made with the ancient Chinese traditional calculating tool – the abacus. The earliest recorded mention of "bead arithmetic" or the abacus can be found in the writings of the Eastern Han Dynasty mathematician Xu Yue in his work "Shu Shu Ji Yi." China began using the abacus as a calculating tool, making it the first tool to fully utilize decimal-based calculations.

Using the abacus for rapid calculations was mainly achieved through memorizing and executing the basic rules of the abacus. From a computer perspective, the abacus rules represent the instruction sequence for computer operations. In reality, the abacus rules, like instructions, still require human operation, and the abacus lacks actual data storage functionality, which is its greatest distinction from modern computers. During the course teaching process, students can be asked to contemplate the fundamental differences between the abacus and modern computers. Encouraging students to discuss divergent issues such as "What automated mechanisms or devices could be added to the abacus to meet the basic requirements of a modern Turing machine" can stimulate critical thinking. Presenting knowledge about the abacus alongside modern computer concepts and conducting a comparative analysis enables students to profoundly understand the fundamental concepts and essential characteristics of modern computers. Simultaneously, it introduces students to Chinese traditional culture and fosters a sense of patriotism.

3)"Data Structures and Algorithms" and "Numerical Analysis" Courses

In the aforementioned courses, students need to be taught computer-related algorithmic content. In the instruction of this course content, connections can be made with the contents recorded in ancient Chinese mathematical works such as "Nine Chapters on the Mathematical Art" and "Zhou Bi Suan Jing." During the course teaching process, students can be introduced to the mathematical problems in "Nine Chapters on the Mathematical Art," such as square root extraction, circle division, and horse racing, and be required to implement them through computer programs.

Compared to the deductive approach represented by Western works like "Elements of Geometry," the philosophy of ancient Chinese mathematicians is more akin to the inductive method, making it more accessible for understanding and mastery. Additionally, it is more amenable to description through computer algorithms and easier to implement through functional programming languages. In the era of information technology, with the widespread

use of internet technology and the flourishing development of artificial intelligence, encouraging students to diligently study computer-related knowledge and technology is essential. They can contribute meaningfully in the third wave of the technological revolution, striving for the country's advancement.

3.3 Modern daily life education

The college life of students on campus is closely related to computers. Students have a wide range of information sources, and various social ideologies can have a significant impact on them. Teachers in computer science departments need to promptly transform the teaching models in computer science courses and provide ideological guidance and innovative political education for students.

For example, in the explanation of knowledge related to computer network security, in addition to explaining the basic principles and mechanisms of computer viruses, students are encouraged to analyze and crack computer viruses, gaining a preliminary understanding of how to prevent and eliminate computer viruses reasonably and legally. At the same time, students should be introduced to basic knowledge of relevant laws and regulations such as the "Network Security Law," "Criminal Law," "Civil Law," "Consumer Rights Protection Law," and "Password Law." Students are required to comply with national legal systems and professional ethics in the computer industry. Moreover, students should be educated to resist and oppose inappropriate behaviors such as online violence, spreading rumors, online fraud, and illegal lending. The online environment is not a lawless space. In summary, teachers should cultivate students to apply professional knowledge and skills along with ideological and political theories to address practical issues during the professional teaching process, fostering a disciplined, law-abiding, and positively oriented work ethic.

3.4Current affairs education

Current hot topics are closely related to university life, widely discussed among college students, easily accessible through various channels, and especially prominent through the internet, attracting students' attention more easily [11]. Teachers should proactively explore such examples from society, not allowing students to merely scratch the surface of knowledge but encouraging them to gain real insights. Teachers need to enhance their sensitivity to information, discover current events, and help students interpret them, dispel preconceived notions, and take preventive measures. For example, the live streaming sales success of Li Jiaqi and the addition of the occupation "Internet Marketing Specialist" by the Ministry of Human Resources and Social Security are recent hot topics. Regarding such current affairs, teachers should assist students in analyzing them. Li Jiaqi's success is largely due to his personal efforts, dedication to work, focus on product expertise, and familiarity with professional knowledge. Teachers should use this example to encourage students to approach their studies with dedication and diligence.

When certain social hot topics arise, teachers should diligently analyze the phenomena, uncover the essence of events, and better guide students. For example, Western developed countries led by the United States, in order to maintain their hegemonic status, have implemented unfair and illegitimate suppression policies against the computer development of developing countries. This has led to current events like "Huawei chip supply cut-off" and

"export controls on cutting-edge products." Teachers can provide ideological and political education to students from two aspects: promoting the spirit of independent development in computer technology and fostering students' patriotic sentiments. To evolve from "Made in China" to "Created in China," the country has introduced initiatives like the "HarmonyOS" (in the operating system domain) and the "Ark Compiler" (in the compilation domain). Teachers can engage students in discussions related to professional knowledge and patriotic spirit in relevant courses.

Students can obtain current affairs information through various media platforms, and teachers can also use these platforms to stay informed about students' ideological dynamics. Through these media platforms and technologies, teachers can subtly influence students through ideological and political education efforts. Teachers can stay updated on social hot topics by following trending topics on Weibo, recommendations on Toutiao, and content from public accounts. They can select information with high relevance to students, extract current affairs news, and uncover materials for ideological and political education. Additionally, teachers can leverage party organizations within their departments to establish and maintain platforms such as public accounts, using new media technologies to have a positive impact on students. For example, in the author's college, the creation of the "Home of Information Engineering Students" public account disseminates relevant information, addresses students' inquiries, reports on current affairs, promotes exemplary deeds, and educates students on ideological and political matters, which is shown in Figure 2. Moreover, teachers can use new media technologies for classroom presentations, analyzing collected cases and using visual or video formats to spark students' interest and encourage active participation in learning and practical activities.

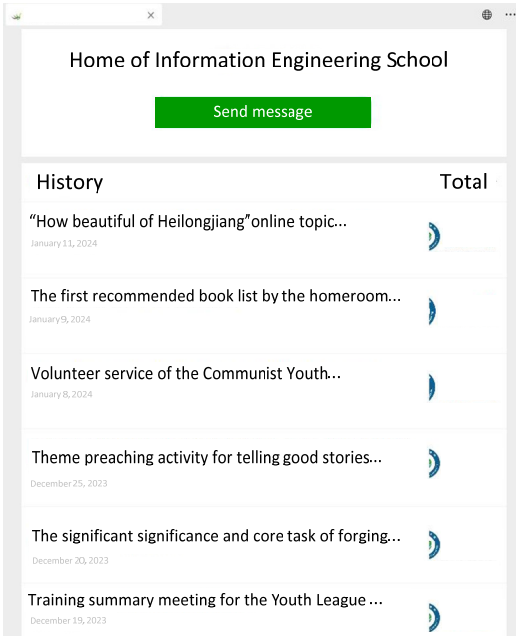

Figure 2. Expression of "Home of Information Engineering Students" public account

3.5 Pandemic ideological and political education

In early 2020, the sudden outbreak of the novel coronavirus (COVID-19) quickly spread across the country. To minimize the impact of the epidemic on regular teaching, during the postponed start of the academic year, universities utilized high-quality online course resources through the internet and implemented online teaching methods, including live-streamed lectures.

During this period, the Party and government leaders implemented a joint prevention and control effort, fully leveraging the efficiency of the national governance system and institutional strength to effectively curb the spread of the epidemic. This fully reflects the superiority of the socialist system with Chinese characteristics under the centralized and unified leadership of the Party. In teaching, educators can incorporate the superiority of the socialist system demonstrated in the collective anti-epidemic efforts into the curriculum, guiding students to have unwavering "Four Confidences." Simultaneously, during the anti-epidemic period, numerous exemplary individuals and touching stories emerged nationwide, and these can be conveyed to students to cultivate a sense of love for the Party and the people, enhance patriotic awareness, and instill a sense of social responsibility.

In the era of the Internet, whether it's pandemic-related information or stories of epidemic prevention, they can be rapidly disseminated in real-time through the network. In courses such as "Big Data Analysis" and "Artificial Intelligence," educators can guide students to conduct statistical analysis, prediction, and visualization of pandemic information and data. This approach allows students to develop a deeper understanding and appreciation of the achievements and effectiveness of the Party and government in responding to the epidemic. It subtly educates students to be more supportive of the Party and government and nurtures a sense of pride in the nation.

4 Ideological and political education teaching case

In this section, the "Compiler Principles" course is selected as an example, using a teaching case to demonstrate how ideological and political education can be integrated into computer science courses.

4.1 Case introduction

"Compiler Principles" is one of the core courses in computer science, aiming to cultivate students with both theoretical knowledge and practical skills in compiler principles. Students will gain an understanding of the fundamental principles, implementation processes, and technologies involved in compiling programs, fostering their logical and abstract thinking abilities.

The knowledge objective of the course is for students to master the concepts, processes, and structures of compiling programs [12]. The skills objective requires students to grasp the basic process of compiling programs. The value objective is to foster an understanding of the necessity and urgency of domesticating compilation technology and products. It aims to inspire students' patriotism and cultivate a craftsman spirit in exploring technology.

The content of this case study is to introduce the concepts and processes of compilation.

4.2 Exploration of ideological and political elements in professional knowledge

The course covers the concepts and processes of compilation, demonstrating the dialectical materialism spirit and principles of the objective existence of things.

It discusses the localization of compilers and related technologies, aiming to provide patriotic education to students and cultivate their diligent and dedicated craftsmanship spirit.

Students are required to collaboratively present a reversed explanation of the compilation process, fostering and exercising their interactive communication and teamwork skills.

4.3 Instructional design

The course adopts a blended teaching approach, consisting of three parts: pre-class online learning, in-class knowledge internalization, and post-class knowledge consolidation. Based on the analysis of the course content and student situations, the online learning resources for the course are thoroughly designed and developed. In the classroom, several teaching activities are designed to achieve knowledge internalization. After each class, additional teaching activities are employed to complete knowledge consolidation. The steps of the teaching activities are as follows.

1) Pre-class Preparation in this case

①Teachers assign online pre-class quiz questions, analyze the pre-class results, and present the course content accordingly.

②Pre-arrange the tasks for the flipped classroom, specifying the content, groups, and requirements.

2) During-class Teaching in this case

①Summarize the pre-class preparation results, compile common issues, and analyze and address them.

②Introduce why domestication of compilation technology is necessary by explaining real cases related to compilation content.

③Assign groups to present the flipped content, summarize and comment on the stages of the flipped content.

④Assign online classroom exercises, discuss the process of compilation and the basic structure of compilers, and conduct in-class exercises.

⑤Automatically form groups on-site and provide examples for group-level progress in the compilation process.

⑥After discussion, group representatives speak, summarize on-site, review classroom exercises, and conclude the course content.

3) Post-class Consolidation in this case

①Assign online post-class assignments and ideological essays, and provide a review of the content.

②Peer assessment of online assignments among students.

4.4 Integration of professional knowledge and ideological and political elements

The typical "What-Why-How" process [13] is adopted to achieve integrated problem-solving. In practical situations, the "Why" question is posed in advance to obtain a more rational approach to integration. The specific details are illustrated in Figure 3.

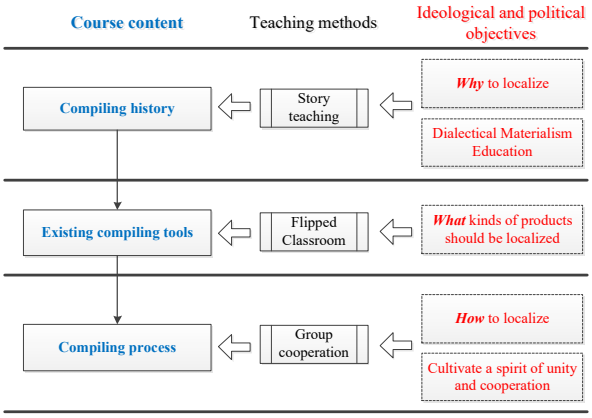

Figure 3. Integration approach of ideological and political education in the case

5 Conclusions

Cultivating high-quality professionals is the fundamental task of computer science education in universities. Integrating ideological and political education thoroughly into the teaching of computer science courses can help students enhance their knowledge and skills while fostering socialist values, thereby achieving the goal of moral and intellectual development. This approach ensures that students, upon entering the workforce, can use the socialist core values as a foundation, adhere to correct political ideologies, enhance their ideological and political capabilities, and contribute to the construction of socialism.

This paper discusses the implementation methods and specific teaching examples of ideological and political education in computer science courses. It elaborates on how to explore ideological and political education materials during the teaching of professional knowledge, uncover the core ideas of ideological and political education, and implement subtle ideological and political education. Implementing ideological and political education in fundamental computer science courses allows for a deep exploration of the educational values in various disciplines, forming a collaborative force in education to jointly promote the comprehensive growth and development of university students.

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