Integrating Ideological and Political Education into Engineering Geology Internship Teaching

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Abstract. "Curriculum Ideological and Political Education" (CIPE) is an effective way for universities to promote the reform of specialized course teaching and improve the quality of education. This paper explores the methods of integrating ideological and political education into engineering geology internships. The discussion is centered on three main aspects: clarifying the ideological and political education goals in the internship syllabus, enhancing the ideological and political education level of internship instructors, and designing refined integration points of ideological and political elements based on the internship content.

Keywords: Engineering Geology; Internship Teaching; Ideological and Political Education; Teaching Methods.

1 Introduction

In December 2016, Chinese President Xi Jinping emphasized at the National Conference on Ideological and Political Work in Universities that "universities must adhere to the central task of cultivating virtue, integrate ideological and political work throughout the entire education process, achieve comprehensive education, and strive to open a new chapter in the development of higher education in China." [1-2] This speech set clear goals for talent cultivation in universities and pointed out the direction for updating and reforming university teaching concepts. It advocated for integrating ideological and political education into various courses, implementing "curriculum ideological and political education" (CIPE), and fulfilling the educational task of cultivating virtue.[3-6]

Engineering geology internships are a crucial practical component of the "Engineering Geology" course in civil engineering programs. These internships help students consolidate and assimilate basic theoretical knowledge of engineering geology, enrich their practical engineering experience, and cultivate their engineering practice abilities and innovative spirit. Currently, teachers at domestic universities have proposed various methods for teaching engineering geology internships. For example, Liu Ju[7] and

L. Chang et al. (eds.), *Proceedings of the 2024 8th International Seminar on Education, Management and Social Sciences (ISEMSS 2024)*, Advances in Social Science, Education and Humanities Research 867,
https://doi.org/10.2991/978-2-38476-297-2_20

others explored incorporating electronic teaching methods into practical teaching to improve efficiency; Yang Qing[8] analyzed the teaching status and deficiencies of "Marine Engineering Geology" at Dalian University of Technology and explored a five-in-one teaching plan and practical teaching model of "research- experiment- simulation-teaching-engineering"; during the special period of the COVID-19 pandemic in early 2020, Lan Jingyan[9] and others proposed and practiced a new model of online practical course teaching, providing an excellent teaching model for universities to conduct practical courses during special periods.

Overall, domestic universities have made significant achievements in teaching engineering geology internships, particularly in imparting professional knowledge and enhancing practical abilities. However, most universities have not effectively integrated ideological and political elements into internship teaching, failing to fully utilize the ideological and political education functions of engineering geology internships. In the context of higher education institutions strengthening "Three-All Education" (holistic education), it is imperative to reform ideological and political education in practical courses for civil engineering programs. This paper uses the ideological and political education reform in engineering geology internships at Shenzhen University as an example to explore CIPE activities in internship courses, aiming to promote the reform of CIPE in engineering geology internships.

2 Ideological and Political Education Reform in the Internship Syllabus

Based on engineering accreditation standards, the Civil Engineering Department at Shenzhen University, guided by the associate dean of teaching, the program director, and the teaching evaluation team, organized core faculty members to revise the teaching syllabus of professional courses and internships. The new syllabus is centered on the concepts of "student-centered and outcome-oriented," ensuring the implementation of "knowledge-cultivation, ability-cultivation, and quality-cultivation." According to the "National Higher Education Civil Engineering Professional Evaluation (Accreditation) Document," and analyzing the support index points of the graduation requirements for engineering geology internships, the teaching goals of engineering geology internships were determined as follows:

- Course Goal 1 (Knowledge Cultivation): In-depth study of knowledge such as rocks, minerals, paleontological fossils, folds, faults, joints, marine erosion landforms, geological processes, ancient life evolution, measurement of occurrence elements, site exploration methods, and on-site in-situ testing methods in geotechnical engineering investigations.
- Course Goal 2 (Ability Cultivation): Cultivating students' ability to identify basic geological phenomena and adverse geological phenomena (mainly including landslides, collapses, and karst); requiring students to propose reasonable suggestions for foundation schemes, foundation pit support schemes, and groundwater control based on the geotechnical engineering investigation results of the internship site and the

surrounding environment, thus cultivating students' comprehensive engineering practice ability to solve practical engineering problems.

- Course Goal 3 (Quality Cultivation): Guiding students to transform the acquired knowledge and skills into intrinsic political qualities, mainly through four aspects of ideological and political elements:

– Cultivating students' noble character of patriotism and love for the people, adhering to the national strategy of low-carbon and green development.
– Cultivating students' awareness and spirit of teamwork and cooperation.
– Inspiring students' scientific thinking, innovative spirit, and research spirit, cultivating their noble character of hard work and dedication.
– Strengthening students' sense of norms, cultivating their professional ethics and craftsmanship spirit of seeking truth and pragmatism.

3 Enhancing Ideological and Political Education Levels of Internship Instructors

The professional ethics of internship instructors significantly influence the quality of internship teaching. Ideological and political education is a form of implicit education. If internship instructors forcibly integrate ideological and political content into the practical knowledge system during field internships just to complete CIPE tasks, it can disrupt the completeness and systematization of internship teaching content. This overly formalistic and explicit approach to ideological and political education can result in poor student reception and negatively impact their enthusiasm for internships. To enhance the ideological and political education abilities of internship instructors, the Civil Engineering Department at Shenzhen University has taken two approaches:

3.1 Enhancing Instructors' Political Literacy

Organizing teachers to study the "Code of Professional Ethics for Teachers," strengthening their moral and ethical qualities; organizing online study sessions, distributing study materials, and recommending reading materials to help teachers thoroughly understand the party's theories and central documents, adhere to the correct political direction, and enhance their political literacy.

3.2 Improving Instructors' Ideological and Political Education Levels

Encouraging teachers to participate in national teaching seminars to learn CIPE methods from other university instructors; having teachers actively research CIPE methods in practical courses, carefully integrating professional knowledge with ideological and political elements, and subtly incorporating ideological and political elements into internship and practical teaching.

4 Conducting Refined Ideological and Political Education Based on Internship Content

The engineering geology internship content at the Civil Engineering Department of Shenzhen University primarily includes three modules: basic geological knowledge internship, on-site geotechnical engineering investigation internship in common Shenzhen strata, and virtual simulation experiments based on outstanding engineering geology cases.

4.1 Basic Geological Knowledge Internship Module

This module mainly involves investigating geological phenomena at field outcrops. Field observations of rocks, geological structures, and landscapes resulting from geological processes are often covered by soil and vegetation, making them difficult to identify. Moreover, outcrops containing different geological phenomena are often far apart, sometimes requiring a whole day's travel to observe a single geological phenomenon. During these trips, instructors incorporate ideological and political elements ① and ②. For example, while leading students to investigate geological knowledge of rocks, folds, faults, stratification, and coastal landforms along the Yangmeikeng line in Nanao, Dapeng New District, Shenzhen, the unique natural landscape sculpted by billions of years of time deeply captivates the students. When seeing the sea erosion cliffs and caves where Stephen Chow filmed "The Mermaid," students are exceptionally excited and genuinely marvel at the beautiful landscapes of the motherland. Immersed in the mountains and seas of the motherland, without words, the love for the country, its landscapes, and its people quietly imprints on every student's heart. While leading students to the second peak of the Deer and Goose Line, Da Yan Ding, the instructor guides students to observe the road surface. Upon the instructor's reminder, many students notice the gravel road surface, with steps made of crushed stones and logs, with grass seeds embedded between the stones. At the mid-mountain viewing platform in Lu Zui, the instructor tells students that this place was originally a dangerous slope, and the designer cleverly utilized the original terrain, eliminating safety hazards while providing a viewing function. These clever designs not only save significant construction funds but also create a good ecological environment, making students realize that the civil engineering profession can contribute to the national strategy of low-carbon and green development. During the identification of fault fracture zones and measurement of joint occurrence along the Lu Yan Line, the long journey and low temperatures in the mountains may present risks such as encountering snakes. Many students voluntarily walk on the outer side, holding umbrellas to protect the instructor and female classmates. During the measurement of occurrences, each group member actively participates in measuring, reading, recording, and completing the internship tasks together. There are multiple such group internship tasks during the trip, cultivating students' awareness and spirit of teamwork and cooperation.

4.2 On-site Geotechnical Engineering Investigation Internship Module

This module mainly involves conducting internships at construction sites within Shenzhen undergoing investigations. The Civil Engineering Department at Shenzhen University has established off-campus practice bases with several construction engineering enterprises, such as Shenzhen Hengtaiji Construction Engineering Co., Ltd., Shenzhen Jianan (Group) Co., Ltd., Shenzhen University Architectural Design and Research Institute Co., Ltd., and Shenzhen Metro Group Co., Ltd., effectively ensuring the conduct of professional practical teaching. In this module, instructors incorporate ideological and political element ③. For example, during the karst investigation internship for Shenzhen Metro Line 16, which starts from Dayun Station in Longgang District and ends at Tianxin Station in Pingshan District, with a total length of 29.2km, entirely underground, the segment from Dayun Station to Tongle Village Station, spanning 15.3km, includes 13.3km passing through limestone strata. The high degree of karst development presents significant challenges for subway construction. Through on-site internships and discussions with subway experts, students learn the differences between karst investigation methods and conventional investigation methods. The instructor, together with students, analyzes the engineering geological problems caused by karst at different locations relative to the tunnel (top, within the body, bottom), and student groups propose countermeasures, which the instructor evaluates, affirming reasonable measures and pointing out deficiencies in unreasonable measures. Students experience the joy and sense of accomplishment from applying their knowledge to promote national subway construction, inspiring scientific thinking and innovation. When frontline engineers recount the arduous stories of subway construction under complex geological conditions in Shenzhen, students deeply appreciate the hard work and dedication of many civil engineers contributing to Shenzhen's rapid development and glory.

Due to the large number of students and limited internship hours, it is challenging for students to participate in the entire on-site geotechnical engineering investigation process. Moreover, some outstanding investigation cases are usually only available for one batch of students to intern on-site due to the progress of the project. To preserve these valuable geotechnical engineering investigation cases, the Civil Engineering Department at Shenzhen University, in collaboration with enterprises, has developed virtual experimental teaching resources. For example, the 2018 geotechnical engineering investigation internship was conducted at the site of Wuyuzhang Building at Shenzhen University. The proposed Shenzhen Metro Line 15 was planned to pass through this site, and the subway group was conducting investigations along the subway line. The initial investigation failed to detect large boulders in the granite residual soil, affecting the construction of support piles and subsequently the construction of engineering piles. To ensure smooth construction of engineering piles, the design unit ultimately modified the pile foundation type. The subway group also formulated related removal plans based on the detection of large boulders along the line. Granite weathering layers are widely distributed in southeastern coastal areas, and graduates from Shenzhen University often stay in Guangdong Province to work in civil engineering-related fields. This type of stratum, in its natural state, has good mechanical prop-

erties and is often used as a foundation bearing layer. However, some granite distribution areas may encounter special situations such as local absence of weathering layers, large boulders, or uneven thickness of weathering layers, adversely affecting engineering construction. To help students intuitively understand abstract clauses of geotechnical engineering investigation specifications and learn on-site investigation techniques, while enhancing their ability to cope with complex geological conditions, a virtual simulation experiment titled "Geotechnical Engineering Investigation of Granite Weathering Layers" was developed based on this outstanding investigation case. As shown in Figure 1, it is a combination of virtual and real experiments, practical when possible, and virtual when necessary.

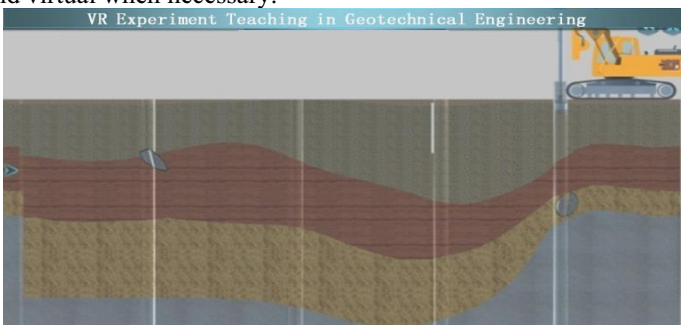

Fig. 1. Virtual Simulation Experiment Combining the Real and the Virtual

In the Virtual Simulation Experiment Module, instructors incorporate ideological and political elements. Following the scientific process of geotechnical engineering investigation, through virtual simulation technology, students are virtually assigned roles such as the head of the investigation unit, on-site drilling technician, laboratory technician, and report writer, immersing them in realistic investigation scenarios to carry out the entire investigation of an actual engineering project. Students need to fully understand relevant geotechnical engineering investigation specifications to determine the investigation level and reasonably arrange exploration holes based on the project's basic conditions. If students' investigation plans do not comply with the specifications, the virtual simulation system will issue warnings and require students to review the specifications and re-design the investigation plan. The virtual simulation experiment includes large boulders in the granite weathering layer, requiring students to dynamically adjust and intensify exploration holes based on the soil layer and core samples from exploration holes. The virtual simulation experiment reinforces students' engineering qualities, subtly integrating ideological and political elements such as a sense of norms, seeking truth, professional ethics, and craftsmanship spirit into the teaching process of engineering geology internships.

5 Conclusions

Engineering geology internships have the advantage of combining professional knowledge education with ideological and political education. The teaching syllabus

serves as a normative instructional guide[10]. Clarifying the ideological and political education goals of engineering geology internships in the teaching syllabus helps instructors recognize the importance of ideological and political education and accurately convey its goals. CIPE instructors should enhance their ideological and political teaching levels, design ideological and political elements meticulously based on the characteristics and practical conditions of engineering geology internships before the internship, and seamlessly integrate these elements into the professional practice knowledge system, subtly guiding students with positive energy without disrupting the completeness and systematization of the professional curriculum practice knowledge system. This approach aims to cultivate civil engineering professionals with a correct political direction, outstanding practical abilities, and innovative spirit for the nation.

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