

Exploration on Teaching Reform of Engineering Geology and Soil Mechanics in Applied Universities

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Abstract: In order to explore and solve the problems existing in the teaching of engineering geology and soil mechanics in Application-oriented Universities and improve the teaching quality as a whole. Based on the characteristics of engineering geology and soil mechanics, which aims to train students, including road engineering and civil engineering, to solve common engineering problems in railway, water conservancy and hydropower construction projects, improve the construction of mixed teaching resources and implement diversified classroom teaching modes in combination with teaching feedback, national policies, social and industrial development, scientific and technological needs, etc, It is important for colleges and universities to integrate teaching and learning, and to form a "closed-loop" teaching and learning, which plays a certain role in teaching and learning.

1. Introduction

Engineering geology and soil mechanics is an important professional compulsory course for many engineering majors in our college, such as construction and hydropower engineering. With the development of the times and the emergence of problems such as industry transformation, the reform of curriculum teaching has always been the focus and difficulty of the teaching reform of our application-oriented colleges and Universities. The development of China's engineering industry in the future is bound to be the guidance of our teaching reform, Taking the code of ethics as the benchmark, establishing talents with outstanding professional ability and application-oriented ability is the core of our education. Under the background of the national integration of "curriculum thinking and politics" into various disciplines, combined with the social nature of innovation and development, this paper explores the teaching reform of engineering geology and soil mechanics in Application-oriented Colleges and universities.

2. Research Background

2.1. Nature and Current Situation of Engineering Geology and Soil Mechanics

Engineering geology and soil mechanics is a required technical basic course for engineering technology and other majors in our university. It mainly includes two parts: Engineering Geology and soil mechanics. Engineering geology mainly focuses on theory, while soil mechanics mainly focuses on practical application. This course is based on the basic principles and methods of soil mechanics and Engineering geological technology, Train students to survey the geological environment, analyze the seepage and settlement of dam, low-grade, Dangtu and other structures, and solve the geological and geotechnical problems existing in the project. The traditional course contents and teaching methods of engineering geology and soil mechanics are shown in Table 1 [1-2].

Table 1: traditional course contents and teaching methods of engineering geology and soil mechanics

Traditional course content of engineering geology and soil mechanics	Traditional teaching methods
Minerals and rocks: Cognition of engineering geology	Model teaching, multimedia, interaction, action oriented, task driven
Geological structure: geological structure and landform	Interaction, action oriented, task driven, model teaching, multimedia
Adverse geological phenomena:	
1. Collapse and landslide analysis	
2. Debris flow, karst and geological analysis	Action oriented, task driven, case teaching, multimedia
Basic properties of soil	
1. Three components of soil	
2. Engineering properties of soil	

2.2. Teaching Objectives of Engineering Geology and Soil Mechanics

The training of professionals in relevant industries needs this course as the basic support. Its main goal is to enable professional students to understand the engineering properties of soil and rock, the basic structure of geological soil, the causes of Poor Geology and existing problems, and skillfully solve engineering, geology, physical mechanics and other applied calculations in various engineering problems, And lead relevant project activities through tasks, laying a solid and solid foundation for the study of more core professional courses and further work and scientific research in the future.

2.3. Exploration and Application Background of Teaching Reform of Engineering Geology and Soil Mechanics in Applied Universities

In recent years, many experts have conducted research on the teaching reform and exploration of engineering geology and soil mechanics, mainly focusing on the "six in one" teaching concept, the integration of Ideological and political concept, the concept based on innovation and entrepreneurship, and the hybrid teaching and research concept based on constructivism. Zhu Jianqun [3] and Cao Xiaoqun [4] respectively took the post epidemic era as the background. Based on the thinking and exploration of the current situation of mixed teaching of engineering geology

and soil mechanics, through the learning situation and teaching practice, combined with the current situation of students' feedback, they analyzed the actual objectives of teaching, and provided new development ideas for the concept of mixed teaching; Liu Rongyuan [5] and Liu Yuli [6] analyzed the teaching reform of engineering geology and soil mechanics from the national policy background of Ideological and political course construction. Gao Xihe [7] expounded the reform and practice of the "six in one" teaching mode, emphasized the effective connection of the six core elements of "demand, goal, project, material, combination and assessment" in the curriculum teaching organization, and formed the organization and formative evaluation system of the integrated classroom activity of "teaching, learning and doing"; Yang Erjing [8] combined with the practical characteristics of professional construction and according to relevant standards and curriculum theory, carried out the reform of teaching implementation and curriculum assessment from the aspects of curriculum positioning and project design. Yin Feng [9] put forward the concept of task driven teaching. Wen aicun [9] analyzed the overall curriculum design from the perspective of mass entrepreneurship and innovation, and expounded it from the aspects of advanced concept and integration of industry and education. Wang Qiong [10] started from the interactive and research-based educational concept and explored the theory of teaching reform of engineering geology and soil mechanics in application-oriented universities. Its teaching method can further improve students' learning interest and learning effect[11].

3. Theoretical Exploration on the Teaching Reform of Engineering Geology and Soil Mechanics in Applied Universities

3.1. Necessity of Teaching Reform Exploration of Engineering Geology and Soil Mechanics

As an application-oriented university, the purpose of cultivating students in our university is to cultivate high-tech talents and innovative talents in the industry. Engineering geology and soil mechanics is a basic course for many majors. The firmness of the basic course learning largely determines whether students can better accept professional knowledge in their future study. Only when the foundation is laid can they build high-rise buildings, This course belongs to the basic course of engineering course, which is relatively abstract and boring. In the traditional teaching methods, there are also the problems of single teaching methods and complex knowledge points. The lack of integration of theory and practice has also become one of the dilemmas faced by students in the learning process, It has greatly hindered the improvement of the overall teaching quality, greatly reduced the teaching effect, and can not better adapt to the requirements of the post when students enter the society in the future. Therefore, it is necessary for the teaching reform of engineering geology and soil mechanics to change the original teaching mode, optimize the overall teaching content, form curriculum teaching as the core, practical test as the auxiliary means, improve teachers' teaching level and reduce the overall teaching difficulty.

3.2. The Concept of "Curriculum Thought and Politics" Integrated Into the Teaching Reform of Engineering Geology and Soil Mechanics

The integration of "curriculum ideological and political" into professional courses is not a simple copy of the content of Ideological and political courses, but to explore the scattered and unsystematic ideological and political elements in professional curriculum knowledge, make them interrelated, moisten things silently, and run through the whole professional knowledge talent training system. Engineering geology and soil mechanics, as a compulsory course for architecture,

hydraulic engineering and other majors, not only carries the professional theoretical knowledge and practical experience of engineering geology and soil mechanics, but also many ideological and political elements need to be explored; As future project builders, students need to uphold and adhere to the correct professional initiative and principles while having strong professional skills, as shown in Table 2.

Table 2: Curriculum design and integration points of engineering geology and soil mechanics into "curriculum thought and politics"

curriculum design	Integration point of Ideological and political elements
Problem case analysis	Whether the design and selection of foundation and foundation of buildings are reasonable and whether the construction quality meets the standard determines the safety and overall value of buildings. Therefore, when explaining the three major building foundation problems [6], such as leakage, settlement stability and strength, we can analyze the causes of these accidents in combination with the cases of such problems in engineering construction, such as the levee burst of weiant dam in Italy and the dam break of Zhumadian reservoir in 1975, so as to enable students to face the warning of disasters, strengthen their professional and technical level and enhance their sense of responsibility, Establish correct career goals and values.
Case study of "positive energy"	In the course design, we can also analyze the topography, geology, construction conditions and technical means of the site selection of these super projects through some positive cases, such as the Three Gorges Dam, Qinghai Tibet railway, Hong Kong Zhuhai Macao Bridge and underwater tunnel, so as to increase students' professional self-confidence, national pride and patriotism. When designing the teaching content of adverse geological processes, students can be guided to establish the awareness of helping others and gratitude through the mutual help of people in Wenchuan earthquake and Yushu earthquake. [6]
Interpretation of relevant policies	In order to strengthen the quality management of water conservancy projects, strengthen the lifelong responsibility of quality, improve the awareness of quality responsibility and ensure the construction quality of water conservancy projects, in November 2021, the Ministry of water resources issued the notice on the management measures for lifelong responsibility investigation of responsible persons of responsible units of water conservancy projects (for Trial Implementation). Taking this as the starting point, the policy interpretation in the classroom can warn students in the future water conservancy project design In the process of investigation, relevant laws and regulations shall be strictly observed without slackening or dereliction of duty.

4. Practice and Exploration of the Course Mode of Engineering Geology and Soil Mechanics

4.1. Practice and Exploration in Combination with "Six in One"

In the teaching reform of engineering geology and soil mechanics, the "six in one" model takes "needs, objectives, projects, materials, combination and assessment" [7] as the core elements, covering many aspects, such as vocational ability improvement training, vocational goal establishment, vocational ability demand analysis and so on. Therefore, the practice of this model in the course of engineering geology and soil mechanics can be carried out from the following aspects:

(1) Investigate the professional ability needs of posts, formulate professional ability training objectives and optimize curriculum modules Conduct in-depth investigation on the posts of railway, highway, water conservancy and other relevant enterprises, analyze the needs of the professional technical posts for ability and technology, communicate and discuss with industry experts and enterprises, jointly responsible for the improvement of talent training process and the upgrading of teaching content modules, and formulate detailed and practical ability training objectives. For example, "it is necessary to analyze and deal with the causes of engineering geological problems

such as landslide and collapse on the site or prevent engineering geological problems in the construction process", the teaching module of case analysis, prevention and solution of common engineering geological problems can be set up; For "being able to analyze and identify common rock strata and mineral samples, and skillfully consult and draw geological maps, geological symbols and engineering geological survey reports", the teaching module of basic engineering geological knowledge and skills can be set up.

(2) Design practical training projects and use students' subjective initiative to realize the integration of "teaching, learning and doing" Talent training can not only rely on teachers to teach theoretical knowledge in the classroom. After optimizing the classroom content, it is also necessary to sort out and integrate the curriculum content and formulate a practical training project for vocational ability training. The training project should have a clear training direction and result display, For example, "use the geological compass survey to survey the rock stratum, identify the rock stratum mineral type, improve the geological map, and finally submit the engineering geological survey report of this training survey" is the training link of the whole engineering geological knowledge and skills, so that each student can organically integrate the content they have learned into the practice process through division of labor and cooperation in the training process. At the same time, we should also improve the construction of training bases inside and outside the school and the investment degree of complete instruments, so as to maximize the consistency between curriculum training and professional ability needs.(3) Build a systematic assessment system and pay attention to the cultivation of students' comprehensive ability Change the traditional assessment mode, build a systematic assessment system, and take students' completion in practical training, teamwork ability, attendance rate, final summary assessment results and professional related vocational skill certificates obtained in the course of learning as a comprehensive consideration standard, so as to stimulate students' learning enthusiasm and correct students' learning attitude.

4.2. New Ways of Curriculum Reform in the Post Epidemic Era

In the post epidemic era, the further integration of curriculum teaching and advanced information technology is an inevitable development trend. When most colleges and universities have resumed classes, online and offline parallel is still the mainstream education mode. For online education, colleges and universities should set up a special project team integrating professional teaching content and modern information technology to deeply develop scientific and effective online education resources, with the help of popular new media and online education platforms, such as Moke, supernova, etc. Pay attention to the online and offline communication of existing educational resources, improve the connection and opening of online and offline education, and improve the national public service system of educational resources [12]. At the same time, we should also strengthen the allocation of hardware facilities for information-based teaching, the training and introduction of relevant educational talents, and increase the quality and frequency of foreign online academic exchanges. In the process of offline education, on the premise of maintaining independence, we should communicate and cooperate with professional related enterprises and industry experts, grasp the needs of the vocational skills market, innovate the educational content, and establish a complete talent training system. At the same time, we should pay more attention to the cultivation of students' subjective initiative, so that classroom education is no longer just a teacher's "personal stage" [13].

4.3. Take the Three Gorges Project as an Example to Explore the Practical Links of Teaching Reform of Engineering Geology and Soil Mechanics

As the largest water conservancy project in China, the Three Gorges water conservancy project faces many difficulties in the construction process, such as shortage of funds, technical blockade, natural conditions and so on. However, with the unremitting efforts of China's project builders and independent innovation in adversity, this super project has finally been completed, whether at the professional and technical level or spiritual level, It is worth becoming an important part of the teaching reform practice of engineering geology and soil mechanics, which can arouse students' thinking and resonance. For example, through the analysis of the reasons for the site selection of the Three Gorges project, it can be concluded that the site is located in the river valley, the terrain is relatively open, and the bedrock is hard granite, which has the terrain, geological foundation and construction conditions for building a modern concrete dam. Then we can investigate and analyze the types of foundation soil, water seepage, settlement and structural stability of foundation and retaining structure of the Three Gorges Project [6]. It not only reviews the knowledge points of "engineering geology cognition, geology and structure, soil compression and foundation settlement" in the traditional course content, but also lays a good foundation for future work and study.

5. Conclusion

Facing the new development situation under the influence of the post epidemic era, the exploration of teaching reform of engineering geology and soil mechanics should firmly grasp the weather vane of the times, combine the traditional teaching content with advanced teaching concepts such as "six in one" and "curriculum thinking and politics", and analyze the ability needs of current front-line technical posts through contact with relevant enterprises and experts, Formulate vocational ability training objectives, optimize curriculum modules, implement parallel measures of online and offline education, pay attention to the design of practical training projects, realize the integration of "teaching, learning and doing", improve students' subjective initiative and comprehensive quality, and build a complete professional training system in railway, water conservancy and hydropower.

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