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Research on the Reform of Teaching Mode of "Rock Mechanics" Course under the Background of Engineering Education Accreditation

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Abstract: With the deepening of teaching reform, the state has increasingly attached importance to undergraduate education. To meet the needs of economic and social development, the talent training models and objectives of undergraduate colleges have undergone significant changes, and new teaching concepts have emerged one after another. Engineering education accreditation is a key measure to improve educational quality and an important guarantee for comprehensively enhancing the quality of curriculum construction. "Rock Mechanics" is a basic course for the geological engineering major, serving as a crucial link to help students master core professional knowledge and develop practical abilities. However, the traditional teaching method, which focuses on knowledge indoctrination, is difficult to meet the requirements of engineering education accreditation and the actual needs of students' diversified development. Therefore, strengthening teaching reform is imperative. Under the background of engineering education accreditation, this paper explores the teaching reform path of the "Rock Mechanics" course for the geological engineering major. Starting from the current situation of course teaching, it gradually delves into specific teaching paths, aiming to optimize the teaching process, improve teaching quality, and cultivate high-quality geological professionals with good comprehensive literacy.

Keywords: Rock Mechanics; Geological engineering; Engineering education Accreditation; Teaching mode; Innovation ability

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1. Introduction

Engineering accreditation education is an emerging teaching concept in recent years. It emphasizes the dominant position of students in teaching, advocates outcome-oriented teaching methods, focuses on the cultivation of students' practical abilities, and requires colleges and universities to orient the teaching of engineering-related courses towards actual engineering needs, closely align with industry demands, optimize teaching objectives and methods, and ultimately cultivate well-rounded, high-quality engineering talents [1]. The "Rock Mechanics" course is one of the core courses for many engineering majors, acting as a key link to help students lay a foundation in engineering theory and improve engineering practice capabilities, and plays an indispensable role in building students' professional literacy. From the current teaching situation, many colleges and universities have not yet recognized the profound connotation of the engineering accreditation education concept, and the teaching mode of the "Rock Mechanics" course still has many

limitations, such as the disconnection between course objectives and actual needs, relatively weak practical links, and the need for innovation in teaching methods. The reform of the "Rock Mechanics" course teaching mode is an inevitable choice for engineering majors in colleges and universities to adapt to the needs of the times. It is of great significance in improving teaching quality and is a positive exploration to promote the in-depth integration of engineering talents' professionalism and industry needs.

2. Brief description of the current situation of the teaching mode of the "Rock Mechanics" course

2.1. The course objectives urgently need to be updated

Nowadays, the objectives of the "Rock Mechanics" course focus more on the imparting of knowledge. The training objectives for students' engineering practice ability, innovation ability, and ability to solve complex engineering problems are not clear and accurate. There is a lack of in-depth and systematic research and analysis on industry needs and career development, making it difficult to effectively connect with the identification of graduation requirements and training objectives in engineering education accreditation. For example, the course objectives do not reflect the cultivation of students' ability to carry out engineering design, optimize construction schemes, and solve sudden engineering problems using rock mechanics knowledge, which makes the rock mechanics knowledge learned by students unable to meet the needs of their actual application in engineering[2].

2.2. The teaching methods are relatively single

At present, the teaching of the "Rock Mechanics" course is mostly based on the traditional lecture-based teaching mode, with teachers unilaterally imparting knowledge, and students in a passive learning position, without the opportunity to acquire knowledge through active thinking and practical operation. The teaching content rarely uses various means and methods such as case teaching, project-based teaching, and group cooperative learning for knowledge teaching, which is difficult to arouse students' enthusiasm and initiative in learning. For instance, when explaining the theoretical knowledge of rock mechanics, some concepts are expounded abstractly through blackboard writing and courseware, making it difficult for students to combine theoretical knowledge with engineering practice. This leads to an insufficient in-depth understanding and mastery of theoretical knowledge, and students' participation in class is not strong[3]. In addition, the practical links are relatively weak. "Rock Mechanics" is a highly practical course, but the current practical teaching links of the course are weak, the content of practical teaching is outdated, there is a lack of projects combined with actual engineering construction, and the practical teaching equipment and venues are insufficient, which cannot meet the needs of students' practical operations. For example, most of the experimental courses are confirmatory experiments, where students can only carry out experiments according to the established experimental operation procedures, without in-depth thinking and independent innovative design, which makes it difficult to cultivate students' practical ability and creative ability. Moreover, there is no perfect off-campus practice base for students, and they rarely have the opportunity to apply their achievements to actual engineering[4].

2.3. The assessment and evaluation system is imperfect

At present, the assessment and evaluation system of the "Rock Mechanics" course mainly relies on one-sided score evaluation such as final exam results and usual grades. The assessment methods are relatively single, lacking comprehensive assessment of the learning process and comprehensive abilities. The assessment content mainly focuses on the memory of theoretical knowledge, and the assessment of students' practical ability, innovation ability, team cooperation ability, etc., is insufficient. For example, the content of the final exam mainly consists of theoretical multiple-choice questions, fill-in-the-blank questions, and short-answer questions, which are difficult to assess students' ability to solve actual engineering problems using knowledge related to rock mechanics[5]. The evaluation subject is

single, mainly assessed by teachers, lacking multi-angle comprehensive evaluation from evaluation subjects such as students' self-evaluation, mutual evaluation, and enterprise experts, which makes the evaluation results lack objectivity and comprehensiveness.

3. Teaching reform paths of the "Rock Mechanics" course under the background of engineering education accreditation

3.1. Aligning with practical needs and optimizing curriculum objectives

From the perspective of engineering education accreditation, teaching objectives should also be appropriately adjusted to quickly adapt to the actual needs of current market development for engineering talents, achieve accurate alignment between university education and market demands, and enhance students' employability. The objectives of the "Rock Mechanics" course should be re-examined based on the graduation requirements and training goals of engineering education accreditation, with emphasis on setting three aspects of objectives: knowledge, ability, and quality. The knowledge objective is to enable students to understand and master the basic concepts, theories, and methods of rock mechanics; the ability objective is to cultivate students' ability to conduct engineering analysis, design, construction, and monitoring using rock mechanics knowledge, as well as to train their ability to solve complex engineering problems; the quality objective is to cultivate students' innovation and entrepreneurship capabilities, team spirit, engineering ethics and morality, and social awareness [6]. For example, the curriculum objectives specify that students should be able to use rock mechanics theories to analyze the stability of surrounding rock in underground engineering and propose reasonable support scheme designs, and in project research, students should develop teamwork and communication skills.

3.2. Innovating teaching methods to enhance students' interest

Innovating teaching models can bring students a novel learning experience, improve their learning enthusiasm, and enhance learning effectiveness. Firstly, the case teaching method is introduced. Teachers can use online teaching resources to collect typical domestic and foreign rock mechanics engineering cases. In the process of interpreting the case contents for students, they can integrate rock mechanics knowledge and guide students to think in depth, thereby cultivating their ability to discover, analyze, and solve problems. Secondly, the online-offline blended teaching method is adopted. Teachers can introduce online teaching platforms, combining the advantages of online and offline teaching to bring students an efficient and flexible learning method, enhance teacher-student interaction, and improve teaching effects. In online teaching sessions, teachers can release teaching resources through online platforms, such as quality courses, exercises, and case resource libraries. Students can flexibly choose according to their actual needs to achieve personalized learning; they can also interact with teachers in real-time through online platforms to solve doubts in learning, and teachers can better understand students' situations, adjust teaching strategies, and improve teaching effectiveness [7]. The offline teaching part can integrate project-based teaching methods and group cooperative learning to stimulate students' enthusiasm for active exploration. Teachers can decompose the course content into different small projects, divide students into groups to undertake different project tasks, and realize knowledge internalization and ability improvement in practice.

3.3. Improve the evaluation system and enhance teaching quality

The evaluation system is an important component of teaching activities, a powerful tool for testing teachers' teaching quality and students' learning effectiveness, and an important reference for teaching adjustments [8]. In the traditional teaching mode, teaching evaluation tends to focus on assessing students' periodic examination results, which to a certain extent ignores the process of students' growth, making teaching evaluation less comprehensive. Under the new educational background, teachers should focus on building a multi-level assessment and evaluation system with more comprehensive assessment content, covering both learning outcomes and students' development in the learning process,

thus forming an evaluation model that combines formative evaluation and summative evaluation. The content of assessment and evaluation mainly includes theoretical knowledge, practical ability, innovation ability, teamwork ability, etc. [9]. The assessment and evaluation methods mainly include formative evaluation and summative evaluation. Among them, the weight of formative evaluation should be increased, including classroom performance, group assignments, project practice, online learning, etc.; summative evaluation is mainly the final examination, which focuses on examining students' comprehensive ability to apply knowledge and solve practical problems [10]. The evaluation subjects include teacher evaluation, student self-evaluation, student mutual evaluation, and enterprise expert evaluation. For example, in project practice assessment, teachers, group members, and enterprise experts jointly evaluate students' project results, conducting a comprehensive and objective evaluation of students' abilities from different perspectives and dimensions.

3.4. Strengthen practical teaching and promote all-round development

Practical teaching is an important part of the "Rock Mechanics" course, and an important carrier for cultivating students' good practical ability, improving their problem-solving ability, and fostering their innovative spirit. Under the background of engineering education accreditation, professional teachers should pay attention to strengthening the practical teaching link, build a bridge between practice and theory for students, and help students deepen theoretical knowledge in practice and improve practical skills in the process of theoretical verification. First, strengthen the practical part in the teaching process, increase the number of experimental hours, optimize the experimental content, and ensure that students have sufficient practical opportunities. For example, set up comprehensive testing experiments on rock mechanics parameters, where students determine the test plan, select test equipment, conduct tests, and process data by themselves, so as to cultivate their innovative awareness and engineering practice ability [11]. In order to further improve the quality of experimental teaching, colleges and universities as well as teachers should provide necessary support for students. Specifically, colleges and universities should increase investment in laboratory construction, update experimental equipment and conduct regular maintenance to ensure the smooth progress of experimental teaching. At the same time, they should continuously optimize the experimental environment and introduce digital teaching technologies to enhance the attractiveness of experimental teaching [12]. Second, carry out school-enterprise cooperation and build off-campus internship bases. Colleges and universities should form continuous cooperation with relevant enterprises and set up more off-campus internship bases. Arrange students to practice at engineering sites, participate in engineering construction, monitoring, management and other work, so that students can have real engineering practice experience and combine the theoretical knowledge they have learned with practical engineering. For example, arrange students to practice at tunnel construction sites, participate in tunnel surrounding rock monitoring and support construction operations, so that students can be familiar with the application of rock mechanics in engineering and enhance their practical operation ability [13].

4. Conclusion

Against the backdrop of current engineering education accreditation, reforming the teaching mode of the "Rock Mechanics" course is not only an urgent need to improve the quality of course teaching, but also an inevitable choice to cultivate high-quality professionals who can meet the high standards of engineering practice. Judging from the current teaching situation, many colleges and universities still have deficiencies in terms of curriculum objectives, teaching methods, and evaluation systems. There are drawbacks such as mismatches with the development needs of the current era, difficulties in aligning talent cultivation with market standards, and it is even harder to meet the higher requirements for course teaching set by the context of engineering education accreditation [14]. Colleges and universities, as well as their relevant teachers, should adhere to the teaching principle of keeping pace with the times, update teaching concepts in a timely manner, and make continuous improvements. Through measures such as optimizing curriculum objectives, innovating teaching methods, improving the assessment and evaluation system, and strengthening practical teaching

links, they can comprehensively improve teaching quality, cultivate high-quality talents with equal emphasis on theoretical knowledge and practical skills, contribute to the development of engineering education, inject new vitality, realize the seamless connection between courses and industry needs, promote the optimization of the university's engineering education system, and assist in the development of higher education [15].

Disclosure statement

The author declares no conflict of interest.

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