

Research on Open Teaching of Engineering Survey Laboratory Course of New Engineering Course

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ABSTRACT

This paper expounds the reform methods and ideas of open teaching of engineering surveying experimental course, the specific measures of building open surveying laboratory, and the teaching effects obtained in cultivating students' innovative spirit and ability and realizing resource sharing.

Keywords: *Engineering survey, Laboratory course, Open teaching*

1. PREFACE

» Engineering Surveying «has always been a professional basic course for civil engineering, engineering management, engineering cost and other majors. This course plays an important role in training students to master the basic theory and skills of surveying, construction surveying methods, to be familiar with the operation of instruments, and to cultivate professional interest. At the same time, it is also the follow-up courses including » Bridge Engineering», «Road survey and Design», « » Civil Engineering Construction, « » Bridge and Road Construction « and other important leading course. The teaching effect of this course directly affects the teaching implementation of subsequent courses and the quality of talent cultivation.[1]

In recent years, combining with the application of new technology, new method and new technology in construction, we have overcome the shortcomings of the traditional teaching materials, such as the vacancy and poor pertinence, and have made a great adjustment to the course content of» Engineering Surveying «, increasing the research of experimental courses and the proportion of class hours, so as to meet the needs of construction enterprises for engineering surveying talents. At present, the teaching hours of this course are 48 hours, including 32 hours of theory teaching and 16 hours of in-class experiment. In addition to the course teaching, this course also has a week of comprehensive practical training.

2. METHODS AND IDEAS OF TEACHING REFORM

Teaching ideas and methods should match the innovative characteristics of teaching ideological system. (1) Taking the "orientation" of surveying and mapping as the core to carry out the basic content and properly grasp the teaching orientation. (2) Taking modern surveying and mapping technology as the leading role, establish the innovative thinking of surveying and mapping technology step by step. (3) Pay attention to the integrity of modern engineering surveying technology, and correctly deal with the relationship between conventional technology and high and new technology. (4) From the systematic point of view of the course, improve the overall knowledge structure, refine and optimize, and expand the technical vision of engineering surveying. (5) Rational organization of new scientific and technological achievements.[2]

The combination of theory and practice is emphasized in the teaching process. Measurement technology has the modern characteristics of intensive innovation and modern application. The teaching process must emphasize the combination of theory and practice, and emphasize the realistic position of surveying and mapping technology in the overall technical composition of engineering construction, so as to effectively improve students' learning interest and sense of urgency in mastering modern surveying technology.[3]

Vigorously applying new teaching technology to promote the modernization of teaching. (1) Make multimedia software for the whole teaching process according to the main line of » Civil Engineering Surveying 《, the national planning textbook of the 14th Five-Year Plan. (2) Text teaching materials + multimedia integration teaching, teaching materials, video, the organic combination of lecturers. (3) Data processing exercises are programmed and visualized to enhance students' ability to measure the application of new technologies.

Adopt the practice way of simulating production, strengthen the practical training consciousness. The design idea of practical teaching is to carry out the reform of civil surveying practice in simulating production mode and insist on the training of basic surveying techniques for civil engineers.[4] Simulation production, in fact, is to bring students from the focus on the book environment into the group of simulation production practice, the implementation of the collective behavior of everyone interrelated. Effect: Through the simulated production practice, the technical quality of civil engineering survey has been rapidly improved. Students said that the simulated production practice is no less than military training, can learn technology, exercise life, lifetime unforgettable.

By holding measurement competitions, students are encouraged to actively participate in scientific and technological innovation and practical education activities in their spare time, so that students can apply the theoretical knowledge learned from books to practical operation. By strengthening the practical teaching links and combining the course teaching with the skill competition, the practical ability of college students can be enhanced, the team spirit and rigorous scientific attitude can be cultivated, the measurement skill level can be improved, and the platform for students to show their talents can be provided. [5]Through the competition, students can test their ability to analyze and solve problems on the spot, their ability to organize, manage and write as a team, their ability to adapt to practical needs, improve their ability of lifelong learning, and show their learning style and teaching achievements.

3. THE CONSTRUCTION OF OPEN LABORATORY

3.1. The necessity of laboratory opening

The important goal of college education in the 21st century is to promote quality-oriented education in an all-round way and to cultivate high-quality applied talents with practical ability and innovative spirit. Laboratory teaching is an indispensable link in the whole teaching activities and plays an extremely

important role. The construction and management of laboratory is the key to ensure the smooth implementation of practice teaching. Opening the laboratory to students is an important practical link of vocational skills training and innovation ability training, an important content of experimental teaching reform, and an important measure to stimulate the majority of teachers, researchers and experimental technicians to actively conduct scientific research.[6]

Traditional experimental teaching is difficult to teach students in accordance with their aptitude, students are in a passive position, lack of enthusiasm, practice teaching is difficult to achieve ideal results. Surveying is a very practical course. With the rapid development of surveying science and technology, the basic theory, technical principle, practical operation means, instruments and equipment of surveying have undergone revolutionary changes. In order to fully mobilize the enthusiasm of students and stimulate their enthusiasm for innovation, it is necessary to adopt a new form of experimental teaching to extricate measurement experiments from the closed teaching and closed experiments. Open laboratory should realize the opening of experimental practice instrument, practice time, experiment item, practice teaching method, experiment teaching content and experiment teaching idea. The opening of the measurement laboratory cannot be restricted by students' specialty, discipline and grade, so as to carry out multi-level and multi-direction practical training. Students can enter the laboratory according to their own situation, design experiments independently, and complete experiments.

3.2. The construction of open laboratory

3.2.1. Formulate and improve the management system of the laboratory

The management of the laboratory is one of the key factors to ensure the normal operation of the laboratory. Develop and improve the laboratory management system, such as » Methods for the management and use of laboratory instruments and equipment《、《 Liability for laboratory accidents and compensation system for damage and loss、《 》 Rules for laboratory safety and health management、《 》 Measures for the management of laboratory low-value durable goods and consumable goods 《 and other rules and regulations. For those who do not obey the discipline and do not care for the equipment and cause serious loss and waste, the instructor should terminate the experiment in time, and give disciplinary action and economic compensation according to the seriousness of the case.

3.2.2. Improve experimental teaching methods

In order to give full play to the function of open measurement laboratory, the teaching method, teaching content and experimental means should be reformed accordingly. With the rapid development of computer technology, space technology and information technology, surveying and mapping instruments are constantly updated, and surveying and mapping methods and means have undergone great changes. Must, therefore, to determine the three elements of "difference, Angle and distance" as the foundation, to map, graph and layout as the main line, in the teaching of basic knowledge, basic theories and methods of traditional measuring teaching content at the same time, another increase in digital mapping, GPS, digital photography, emerging, and practical knowledge of basic surveying and mapping technology and GIS. In order to improve the efficiency and quality of classroom teaching, electronic textbooks, network and multimedia technology should be actively used to make the teaching content more rich, full, no longer boring. At the same time, we will increase the information content of the course, supplement the hot issues at the forefront of current research in the surveying and mapping industry, constantly update and broaden the scope of knowledge, and improve the professional knowledge structure of students.[7]

Combining theoretical teaching with classroom experiments, we carry out a series of open experimental projects: level routine survey, theodolite routine survey, control survey, total station survey, construction lofting, digital mapping, etc. After the opening of the laboratory, students can freely choose experimental projects according to the syllabus, and independently design and carry out experiments under the guidance of experimental teachers and experimental textbooks. In terms of time arrangement, students can freely choose their own experiment time, and on the premise of doing a good preparation, they can not only carry out a variety of measurement experiment items, but also can watch the multimedia experiment principle and operation guide through the network system of the laboratory. In this way, under the traditional closed management mode, some students are in a waiting state due to the lack of experimental equipment, thus wasting time.

3.2.3. Establish a laboratory management system to improve the efficiency of laboratory management

A laboratory management system should be established for the open measurement laboratory. Before entering the open laboratory to do experiments, students should follow the procedures of topic selection → appointment → preview of the experimental instruction book → submission of application report or

experimental feasibility demonstration report. After approval, students can enter the laboratory. By applying for the experiment, students can preview the instruments and equipment used and their instructions, experiment procedures, and matters needing attention in the experiment in advance. If they are not clear, they can consult the experiment teacher. [8]During the internship, each experimental project should establish the corresponding project situation table, register the instructor and the main participants of the experiment, and fill in the corresponding experimental progress table for the instructor to check the progress of the project regularly, so as to know the experimental situation of students at any time. At the end of the experimental project, students will make a timely summary and submit the internship summary or paper, and then the instructor will finally evaluate the students' performance.

3.2.4. Create an open platform for intelligent "Internet+" laboratories

In recent years, "Internet+" technology has accelerated the informatization and intelligent transformation of teaching places such as laboratories and libraries, and actively explored and promoted the construction of intelligent learning space based on the new generation of information technologies such as mobile terminals, Internet of Things, cloud computing, big data and artificial intelligence. At present, the two-dimensional code technology is relatively mature, and its application is universal and convenient. Students scan the two-dimensional code on an open experimental platform. They register through an account number, make an appointment for a laboratory, select an experimental instructor, and at the same time, the experimental student's instructor receives the student's experimental information, using mobile tools such as smart phones, tablets and the Internet, instructors and students can receive video, pictures, text and other information of students' experimental operations anytime and anywhere. In order to avoid the blindness of the experiment and improve the efficiency of the experiment, the students should communicate with the instructor in time.

3.3. The construction effect of open laboratory

All the practical teaching links from the curriculum setting, content, teaching methods, and practice teaching management are highlighted to encourage students to take the initiative to train and explore. All experimental projects are open to students. Students can choose not only the time, but also the teaching content according to their own interests and professional characteristics. This meets the needs of personalized education, but also stimulates the enthusiasm of students

to take the initiative to learn, improve the quality of students' scientific experiments.

4. CONCLUSION

The comprehensive opening and utilization of laboratory is an effective way and method to cultivate students' innovative spirit and ability and realize resource sharing. Our college has made some attempts and studies on the opening of the laboratory, and has achieved good teaching results, there are still many problems to be explored and solved in the process of opening the measurement laboratory. At present, there is no fixed pattern for the construction and management of the open laboratory. Each university chooses the way suitable for its own development according to its own school-running orientation, and promotes the integration and sharing of high-quality resources, the establishment of an efficient open laboratory management mechanism for college students to provide a good learning platform, innovative platform. We believe that only by further improving students' practical ability and innovative spirit can we cultivate more high-quality application-oriented technical personnel.

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