Reform and Exploration of the Teaching Content of the "Intelligent Surveying and Mapping" Course in the Intelligent Construction Major in the Context of Interdisciplinary Studies

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Abstract: With the rapid development of information technology, artificial intelligence, Internet of Things and other technologies, the intelligent construction profession came into being, which posed new challenges and opportunities to the traditional surveying and mapping discipline. In view of the problems existing in the teaching of the course "Intelligent Surveying and Mapping" of intelligent construction, this paper proposes the reform and exploration of teaching content based on the background of interdisciplinarity. Through the organic integration of multidisciplinary knowledge, innovative teaching methods, and improved practical effects, it aims to cultivate compound talents with solid basic knowledge of surveying and mapping and familiar with intelligent construction technology.

Keywords: Intelligent Construction; Intelligent Surveying and Mapping; Interdisciplinary; Reform of Teaching Content; Innovative Teaching Methods

1. Introduction

In recent years, with the rapid development of information technology, the field of surveying and mapping technology is undergoing a profound transformation from digital to intelligent. In the past 30 years, China's surveying and mapping technology has achieved a leap from analog surveying and mapping to digital surveying and mapping, which has greatly promoted the rapid development and wide application of surveying, mapping and geographic information industry. However, in the face of the current wave of information technology revolution, surveying and mapping technology is facing new application requirements such as real-time data acquisition, information processing automation, and service application knowledge [1-2].

Surveying and mapping technology plays a vital role in modern society, and its importance is reflected in many aspects, covering everything from infrastructure construction to environmental protection, from urban planning to disaster response. Surveying and mapping technology provides accurate basic data for the planning and design of infrastructure such as roads, bridges, tunnels, railways, airports, etc. With high-precision topographic maps, digital elevation models (DEMs), and more, engineers can better understand the geography of the construction site and optimize the design scheme. Surveying and mapping technology can help accurately measure land area and boundaries, support land ownership confirmation and registration, prevent illegal occupation and abuse of land resources, and ensure the healthy development of the land market. Using remote sensing technology and satellite images, long-term dynamic monitoring of forests, wetlands, oceans and other ecosystems can be carried out, and changes in the ecological environment can be grasped in a timely manner, so as to provide a basis for protection measures. Surveying and mapping technology can also analyze the probability of potential natural disasters (such as earthquakes, landslides, and debris flows) and their impact scope by establishing a three-dimensional topographic model, and formulate emergency plans in advance. Accurate geographic information is also essential for the delimitation and management of national borders, helping to strengthen security in

border areas and prevent illegal border crossings. In the military field, surveying and mapping technology provides indispensable space intelligence support for operational command, weapon deployment, and logistics support, and improves the combat effectiveness and adaptability of the military [3-5].

Driven by the needs of major national applications, as well as the continuous emergence of new technologies such as earth observation, artificial intelligence, Internet+, and intelligent surveying and mapping equipment, it has become an inevitable trend in the development of surveying and mapping technology to promote the development of intelligent surveying and mapping technology and realize the transformation and upgrading from digital surveying and mapping to intelligent surveying and mapping [6]. In this context, surveying and mapping engineering is facing unprecedented challenges in terms of the basic theoretical system, talent training mode, and practical teaching content and mode, and there is an urgent need for reform research and practical exploration [7-8].

In view of the rapid development of new technologies of intelligent surveying and mapping, wide application fields, and high quality requirements for talent training, the current practical teaching of surveying and mapping has some problems, such as outdated content, unreasonable teaching system, and single teaching mode, which can no longer meet the new requirements for the training of surveying and mapping professionals in the context of intelligent surveying and mapping [9].

In view of this, this paper takes the course "Intelligent Surveying and Mapping" of intelligent construction major of Hangzhou City University as an example, and discusses how to reform and explore the teaching content and practical teaching mode of this course in the context of interdisciplinarity, in order to provide useful reference and reference for the modernization and transformation of surveying and mapping professional education.

2. Analysis of the Current State of the Curriculum

The intelligent construction major aims to cultivate senior engineering and technical talents who master the comprehensive skills of modern surveying and mapping technology, information technology, and intelligent control technology. However, with the rapid development of science and technology and continuous innovation in the field of intelligent construction, some problems have gradually emerged in the teaching content and teaching mode of the existing Intelligent Surveying and Mapping course [10-11].

2.1 The Teaching Content is Lagging Behind

Although the intelligent construction major of Hangzhou City University keeps up with the pace of the times, the content of the "Intelligent Surveying and Mapping" course still mainly focuses on the use of traditional measurement methods and tools, such as theodolite, level, etc. The introduction of cutting-edge technologies such as GPS positioning, unmanned aerial vehicle (UAV) mapping, 3D laser scanning, geographic information system (GIS) and artificial intelligence in surveying and mapping is limited. As a result, there is a gap between the course content and the current development in the field of intelligent surveying and mapping, and it is difficult for students to master the most cutting-edge professional knowledge and better apply the knowledge they have learned to their future work.

2.2 Single Teaching Mode

At present, the teaching mode of "Intelligent Surveying and Mapping" course is still mainly based on traditional classroom teaching, which lacks sufficient interactivity and practicality. This single teaching mode is difficult to stimulate students' interest and enthusiasm in learning, and at the same time, it also limits the cultivation of students' independent learning and innovation ability. In today's highly developed information technology, it is difficult for a single classroom to meet students' needs for diversified learning methods.

2.3 Poor Practical Effect

Due to the limitation of resources such as experimental equipment and venues, it is difficult for students to get sufficient practical opportunities in the course of "Intelligent Surveying and Mapping". Most of the existing

experimental projects focus on the verification of traditional surveying methods, and there are few practical operations on modern surveying and mapping techniques. This leads to the lack of practical ability training of students, the disconnection between theory and practice, and the difficulty of applying the knowledge they have learned to practical engineering.

2.4 Lack of Education on Professional Ethics and Social Responsibility

The education of professional ethics and social responsibility may be neglected in the curriculum, and students lack the necessary guidance and support when facing complex ethical issues.

2.5 Single Evaluation System

The existing evaluation system mainly relies on the final examination and homework results, which is difficult to fully reflect the comprehensive ability and practical operation level of students.

2.6 Lack of International Vision

The course content and teaching resources may be limited to the domestic situation, lack of international vision, and students have limited understanding of the development trend and technical dynamics of global intelligent surveying and mapping.

3. Reform of Teaching Content

3.1 Reconstruct the Teaching Content to Ensure that It Is Cutting-Edge and Advanced

In view of the problem of lagging course content, this paper sorts out and analyzes the new requirements for intelligent surveying and mapping teaching content in the context of interdisdislinarity, as shown in Figure 1, and then proposes to reconstruct the teaching content through all-round organic integration to ensure the cutting-edge and advanced nature of the teaching content. Specific measures include:

3.1.1 Introduce modern surveying and mapping technology

Incorporate modern surveying and mapping technologies such as GPS positioning, unmanned aerial vehicle (UAV) surveying and mapping, and 3D laser scanning into the teaching content, so that students can master the latest surveying and mapping technologies and tools.

3.1.2 Combined with the needs of intelligent construction

According to the characteristics and needs of intelligent construction, adjust the course content, and increase the surveying and mapping knowledge and technology related to intelligent construction, such as the application of BIM technology in surveying and mapping, the application of intelligent sensors in deformation monitoring, etc.

3.1.3 Integrate interdisciplinary knowledge

Strengthen the cross-integration of surveying and mapping disciplines with civil engineering, computer science and technology, automation and other disciplines, integrate the knowledge and technology of related disciplines into the teaching content of surveying and mapping, and improve students' comprehensive quality and innovation ability.

3.1.4 Improve technical support and guarantee

Ensure that the school has sufficient hardware facilities such as computers, servers, and network bandwidth to support the normal operation of various intelligent teaching tools. Strengthen information technology training for teachers to improve their ability to use intelligent technology in teaching. At the same time, teachers are encouraged to actively participate in the research and innovation of educational technology to promote the continuous transformation of teaching models.

3.1.5 Promote the integration of the curriculum with international standards

Integrate international surveying and mapping standards and norms into the curriculum design, such as ISO international standards, relevant regulations of the United Nations Educational, Scientific and Cultural Organization (UNESCO), etc., so that students can understand and master the global technical requirements. Representative international project cases are selected for detailed explanation and discussion, such as Global Positioning System (GPS), European Earth Observation Program (Copernicus), American Landsat, etc., to help students understand the practical experience and challenges in the field of surveying and mapping in different countries and regions.

3.2 Innovate Teaching Methods in a Multi-Faceted and Multi-Faceted Manner

In order to solve the problem of single teaching mode and poor practice effect, this paper proposes a multi-stage and mixed teaching method, which includes:

3.2.1 Pre-class stage

Use the online teaching platform to push teaching materials and videos, guide students to preview the course content, ask questions and give feedback.

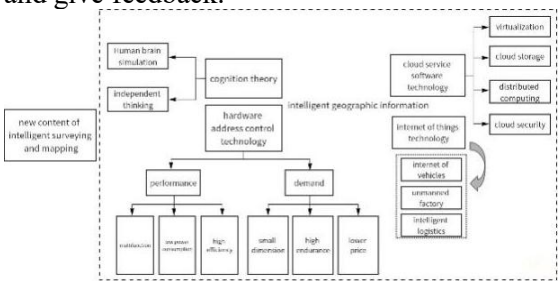

Figure 1. New Requirements for the Teaching Content of Intelligent Surveying and Mapping in the Context of Interdisciplinarity

3.2.2 In-class stage

Lectures, discussions, case studies and other teaching methods are adopted, combined with cases of major national engineering projects, to stimulate students' interest and enthusiasm for learning. Through a variety of interactive forms such as "teacher-student interaction", "student-student interaction", and "group discussion", the classroom is lively and students are moving

3.2.3 After-class stage

Assign self-directed learning tasks to guide students to carry out discussions and research after class, and improve their ability to comprehensively analyze and solve complex engineering problems.

3.2.4 Practical stage

Combined with experimental equipment and site conditions, design a variety of practical tasks, such as UAV surveying and mapping experiments, 3D laser scanning experiments, etc., to improve students' practical ability and innovation ability.

3.3 Based on the Assessment System of "Competency-Oriented Integration"

In order to solve the problem of weak educational effect, this paper proposes an assessment system based on "ability-oriented integration", which organically combines process assessment and final assessment. It aims to accurately assess the development of students' abilities in terms of knowledge, skills, attitudes and other aspects through comprehensive, systematic and scientific evaluation methods, so as to promote the all-round development of students. Specific measures include:

3.3.1 Classroom performance assessment

Through class discussions, group assignments and other forms, students' classroom participation and cooperation ability are assessed.

3.3.2 Essay assessment

Combined with the course content and students' interests, assign special essay tasks to assess students' research ability and innovation ability.

3.3.3 Final examination assessment

Through closed-book or open-book examinations, students' mastery of the course content and application ability are assessed.

3.3.4 Practical assessment

Through the completion of practical tasks, the writing of experimental reports, etc., the students' practical ability and problem-solving ability are assessed.

3.3.5 Professional quality assessment

Incorporate professional ethics and social responsibility into the assessment system, and guide students to establish correct values and professional ethics through case analysis and discussion. Provide career planning and career guidance services to help students clarify their career goals and development paths, and enhance their employability competitiveness.

4. Innovative Teaching Methods

4.1 Construct a Student-Centered Inspiring-Inquiry-Practice Teaching Model

First of all, in the enlightenment session, it can fully stimulate students' curiosity and desire for knowledge, prompt them to think actively, no longer passively accept knowledge, so as to cultivate their independent thinking ability. For example, teachers set up inspiring questions to guide students to think deeply about subject concepts, so that students can gradually develop the habit of thinking about independent exploration of knowledge. Secondly, the inquiry process gives students the space to explore knowledge independently, and they can dig deeper into the subject content according to their own interests and strengths, so as to improve their innovative thinking and problem-solving skills. For

example, students independently design practical solutions to explore scientific phenomena, and in the process, they are constantly trying new methods and ideas. Finally, the practical session allows students to apply the theoretical knowledge they have learned to practice, enhance their hands-on ability and depth of understanding of knowledge, so that students can better adapt to the needs of the future society, and quickly integrate into the job after graduation and show strong competitiveness, laying a solid foundation for their long-term development.

To this end, two-dimensional teaching and five-element mixed teaching can be implemented, and the two-dimensional teaching (online and offline combination) mode can be adopted to make full use of online resources to expand the learning space; At the same time, the five-yuan blended teaching (lectures, practice, discussions, research, and online) is implemented to build a diversified learning environment. Through a combination of online and offline methods, it provides a wealth of learning resources and interactive platforms to meet the learning needs of different students.

4.2 Construct a Student-Centered Practical Teaching Link that Combines Tradition and Intelligence

In the teaching process, we pay attention to the main position of students and encourage students to actively participate in classroom discussions and practical activities. Through incentive mechanisms such as excellent homework display and learning achievement sharing, students' learning initiative and participation are stimulated. At the same time, a mutual evaluation mechanism between teachers and students is established to promote effective communication and feedback between teachers and students. After that, the hands-on teaching sessions with the highest student participation are optimized.

(1) According to the syllabus and subject characteristics, the specific objectives of each practical teaching session are clarified to ensure that these objectives are not only in line with the cognitive level of students, but also can promote the development of their professional skills. Taking the needs and development of students as the starting point, we design teaching activities that can meet different learning styles and needs, and encourage students to actively participate and explore independently.

(2) Modular reconstruction of the course content, modular reconstruction of the course content, and clarification of basic knowledge, professional skills and thinking requirements. The principles of surveying and mapping, intelligent technology, thinking education and other contents are organically combined to form a complete curriculum system.

(3) Strengthen the teaching of basic knowledge, redesign the practical teaching link, and redesign the practical teaching link on the basis of strengthening the teaching of basic knowledge. Introduce practical projects based on AI and big data, such as intelligent surveying and mapping data processing, intelligent monitoring system design, etc., so that students can master intelligent surveying and mapping technology in practice and improve their ability to solve practical problems.

(4) Promote the dual improvement of students' theoretical and practical ability, and make students not only master a solid theoretical foundation, but also have rich practical experience through the optimization of practical teaching links. By participating in practical projects, competitions and other activities, the comprehensive quality and innovation ability of students are improved.

(5) A variety of assessment methods, such as written and oral examinations, work exhibitions, peer evaluation, etc., are used to comprehensively measure students' knowledge mastery and practical ability. Special attention is paid to process assessment, which focuses on the growth and change of students throughout the learning process. Regularly collect the opinions and suggestions of teachers and students, reflect and summarize the teaching methods and curriculum settings, and make necessary adjustments and optimizations in a timely manner to ensure the continuous improvement of teaching effectiveness.

4.3 Curriculum and Each Person's Responsibility Blended Teaching

Integrate the elements of course responsibility into the teaching content and teaching methods, and guide students to establish correct values and professional ethics by

digging deep into the cases of each person's responsibility in the field of surveying and mapping and intelligent construction. Specific measures include:

4.3.1 Introduction of patriotic cases

When explaining the application of surveying and mapping technology and intelligent construction, relevant patriotic cases are introduced, such as the brilliant achievements of China's bridge construction and the professional ethics of surveying and mapping engineers, so as to cultivate students' patriotic feelings and sense of social responsibility.

4.3.2 Diversified responsibility scenarios

Combined with practical assignments and seminars and competitions, design diversified personal responsibility scenarios, such as simulated engineering project surveying and mapping, participating in social welfare surveying and mapping, etc., so that students can accept the guidance of values in practice.

4.3.3 Carry out special lectures

Invite industry experts, senior engineers or legal professionals to hold special lectures to introduce the latest developments, laws and regulations and professional ethics of the surveying and mapping industry, and enhance students' sense of responsibility and mission.

4.3.4 Strengthen extracurricular theoretical learning

Elective courses are offered for junior and senior students, such as "Engineering Ethics" and "Surveying and Mapping Law and Policy", to explain professional ethics, laws and regulations in depth, and improve students' theoretical level. It is recommended that students read classic works or papers on professional ethics at home and abroad, such as "The Social Responsibility of Engineers" and "Introduction to Professional Ethics in Surveying and Mapping", etc., to broaden their horizons and deepen their understanding.

4.3.5 Strengthen the interaction between teachers and students

Implement the tutor responsibility system, equip each student with a corresponding professional tutor, pay attention to their ideological dynamics and personal growth while providing academic guidance, answer their confusion in terms of values and professional ethics in a timely manner, and give positive guidance and support. Set up a fixed time period (such as a weekly group meeting or a monthly theme activity) for teachers and students to discuss hot topics and news events related to surveying and mapping, so as to promote the collision of ideas and the renewal of concepts.

5. Prospect

In the future, we will continue to learn from experience and continue to deepen the reform and exploration of the teaching content of the "Intelligent Surveying and Mapping" course. Strengthen exchanges and cooperation with related disciplines and industries, keep in line with international standards, constantly update teaching content and methods, cultivate more compound talents with solid basic knowledge of surveying and mapping and intelligent construction technology, and contribute to the development of intelligent construction.

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