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# Talent Training Optimization for Surveying and Mapping Majors in Higher Vocational Colleges Under the Background of Production-Education Integration

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**Abstract:** In recent years, the surveying and mapping geographic information industry has experienced rapid expansion. The application scenarios for "pan-surveying and mapping" have diversified, and advancements in aerial surveying equipment technology have raised the requirements for data application and expression skills among staff. This has created an urgent need for a team of highly skilled and practically capable surveying and mapping professionals. Higher vocational colleges, as the primary institutions for training surveying and mapping professionals, must align with industry development trends and proactively collaborate with enterprises. Building a training model that integrates production and education is essential to enhancing the quality of surveying and mapping professional training. This paper explores how to optimize the training mode for surveying and mapping professionals in higher vocational colleges within the context of this production and education integration.

**Keywords:** Integration of production and education; Surveying and mapping major in higher vocational colleges; Personnel training mode; Optimization

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## 1. Significance of talent training optimization for surveying and mapping majors in higher vocational colleges under the background of production-education integration

### 1.1. Conducive to improving the quality of talent training

At present, vocational schools rely on the integration of production and education platforms to optimize the talent training mode of surveying and mapping majors, which can not only maximize the overall education level of the school but also enhance the comprehensive competitiveness of students in the industry, thus helping vocational schools to further improve the level of education. To implement the integration of production and education in the training mode of surveying and mapping professional talents, higher vocational schools should take the initiative to carry out in-depth communication and cooperation with enterprises, provide students with

a better learning and growth platform, and comprehensively enhance their comprehensive quality to meet the requirements of the industry for surveying and mapping talents. In addition, to ensure the deep integration of "production" and "teaching," higher vocational schools need to integrate their own experience and resources in school-enterprise cooperation, which plays a more positive role in optimizing the training mode of surveying and mapping professionals [1].

### 1.2. Promotes the sustainable development of teachers

Integrating production and education in the training of surveying and mapping professionals in higher vocational schools benefits both student growth and sustainable teacher development. This approach fosters active cooperation between vocational schools and enterprises. Through this collaboration, teachers gain a deeper understanding and mastery of cutting-edge industry knowledge and technologies, significantly improving their practical skills and experience. They also benefit from active communication and exchanges with key industry talents and participate in the development of new technologies, enhancing their professional levels [2]. Additionally, teachers are motivated to optimize and improve the training modes for surveying and mapping professionals based on real-world enterprise needs, which enhances their educational and teaching abilities. This integration creates a dynamic learning environment that aligns educational outcomes with industry demands, ultimately benefiting both students and teachers [3].

### 1.3. Conducive to promoting the sustainable development of enterprises

Under the integration of production and education, enterprises and higher vocational schools collaborate to build educational platforms through school-enterprise cooperation. These platforms allow students to gain practical experience and improve their professional skills, ensuring they can quickly adapt to their jobs upon graduation. This approach helps enterprises reduce the investment needed for subsequent human resources training. Furthermore, these educational platforms enable both teachers and students to actively participate in the development of enterprises. This participation optimizes the working atmosphere within enterprises and leverages the resources of vocational colleges for new rounds of research and development of products and technologies. This collaboration minimizes resource waste and enhances the overall level of technological research and development, providing continuous momentum for the sustainable growth of enterprises [4].

## 2. Shortcomings of the talent training mode for surveying and mapping majors in higher vocational colleges under the background of the integration of production and education

### 2.1. Single personnel training mode

Under the integration of production and education, the talent training methods used by schools and enterprises have been relatively limited. While these methods have yielded good results, they struggle to meet the personalized development needs of surveying and mapping students. Historically, schools and enterprises have primarily utilized methods like order classes and modern apprenticeships for talent cultivation. Modern apprenticeships involve enterprises sending engineers to schools, where talent training plans are tailored to enterprise needs, and students are required to practice under the guidance of enterprise mentors. Order classes focus on training specific skills within the production process, which may not align perfectly with enterprise talent demands. This approach has led to a narrowing scope of employment opportunities for students, particularly in small and medium-sized enterprises, which are vital for student employment [5]. However, each enterprise within a specialized field may have unique demands, making it challenging for students trained

under this model to meet the personalized employment needs of these enterprises. In higher vocational colleges, the surveying and mapping curriculum encompasses a wide range of industry segments, such as deformation monitoring and ancient building restoration, requiring students to grasp both fundamental knowledge and specialized skills. Simple school-enterprise cooperation models have proven insufficient to meet these complex teaching requirements.

### 2.2. Depth of resource integration is insufficient

Due to the influence of traditional education concepts, the educational mindset of higher vocational teachers has become entrenched, limiting the role of enterprise mentors to some extent. While vocational schools can address this by hiring or introducing technical personnel to supplement teaching staff, there is a need for a balanced approach where theoretical gaps are filled, and practical teaching is enhanced. However, the surveying and mapping industry is evolving rapidly, leaving many vocational teachers lagging behind in their understanding of industry trends and needs. This knowledge gap results in a disconnect between taught content and industry demands, leading to a mismatch between talent training and enterprise needs. Under the integration of industry and education, bringing industry experts to schools for teaching practice can bridge this gap. These experts are deeply rooted in the industry forefront, providing students with current industry insights and prospects, and instilling confidence in their ability to succeed in industrial development. However, the selection of technical experts poses challenges for enterprises due to varying selection criteria, inadequate incentives and support systems, and the absence of a comprehensive assessment mechanism. These issues limit the educational impact of bringing industry experts into vocational schools [].

## 3. Under the background of integration of production and education, vocational surveying and mapping professionals training model optimization path

### 3.1. Optimizing the teaching content based on the outcome-based education (OBE) concept

The teaching content of surveying and mapping majors should be optimized under the OBE education concept. Teachers can collect and analyze the real needs and feedback of enterprises for surveying and mapping talents through questionnaires and interviews, and adjust the teaching system and content. For example, the following four levels of teaching content can be constructed: single core course (gold course), core course group, innovation and entrepreneurship course, and practice expansion course. Level 1 (core course): The core course is designed based on a data collection module, including topics like global navigation satellite system (GNSS) and remote sensing principles and applications. This course is designed for students to better understand the basic theoretical knowledge of the major. Level 2 (core course group): this level is mainly based on the data processing module, the curriculum topics include measurement program and design, Geographic Information System (GIS) principle and application, and digital image processing, aiming at cultivating students' comprehensive ability to solve practical problems [7]. Level 3 (innovation and entrepreneurship courses): this level is mainly based on the surveying and mapping product generation module, and the curriculum topics include remote sensing principles and application, photogrammetry, etc. These courses aim to realize the exposure and integration of various disciplines and improve students' comprehensive analytical skills. Level 4 (practical extension course), this level is mainly based on the application of surveying and mapping results, the curriculum topics include engineering surveying, deformation monitoring and data processing, and road survey and design, aiming to organically combine the knowledge and methods to ensure that students can flexibly deal with the complex engineering problems in surveying and mapping work.

### 3.2. Meeting the needs of the development of the industry and training students in groups

After entering the school, students should conduct systematic research and study the basic theoretical knowledge of their major to establish a sound knowledge system and gain a comprehensive understanding of their field. At this stage, it is crucial for students to lay a solid foundation by systematically learning the required courses in their major. Higher vocational schools should engage in top-level planning to ensure that students' academics and lives are not disrupted by grouping them appropriately. In the process of grouping, teachers need to be aware of the development trends and current situation in the surveying and mapping profession while also considering each student's preferences and choices. Furthermore, students should improve their professional skills according to their specialties, such as enhancing their practical operation skills through temporary positions in enterprises or providing technical services. Leveraging information from networks and professional cases can also enhance the learning effect of professional knowledge, thereby improving students' insight into industry developments [8]. These measures collectively aim to improve the overall quality of students, helping them become high-quality talents truly needed by the industry. Secondly, cross-disciplinary teaching should be implemented to cultivate diverse talents. In the training of surveying and mapping professionals, teachers can broaden the scope of students' knowledge and place greater emphasis on training cross-professional talents. This can be achieved through cross-disciplinary guidance and dual mentorship on campus. For example, combining surveying and mapping majors with computer majors ensures that students not only master the professional knowledge of surveying and mapping but also acquire skills in operating computer software. This approach extends students' work scope from traditional surveying and mapping to the integration of new technologies within the industry, thereby broadening their professional vision.

### 3.3. Using VR technology to build a mixed practical training teaching model

Under the current teaching conditions, teachers can leverage VR technology to build a blended online and offline surveying and mapping practical training model, establishing a "rich media" practice classroom. By designing virtual surveying and mapping instruments, creating three-dimensional experimental scenes, and implementing internal and external industry energy interactive simulations, teachers can continuously upgrade and develop virtual simulation scenarios based on VR technology. This approach builds an integrated "teaching-learning-training" surveying and mapping professional online and offline training platform. This platform combines virtual resources with the production environment of enterprises, primarily utilizing 3D real scene technology to ensure that virtual practice environments closely resemble real work settings. This provides students majoring in surveying and mapping with an intuitive and vivid practice environment.

In this virtual environment, students can independently practice by building blocks according to their learning characteristics, helping them understand and master relevant theoretical knowledge and skills [9]. They can also access the hybrid virtual simulation practice platform through computers, mobile phones, and other devices to efficiently conduct simulation training in areas such as digital mapping, spatial analysis, and landscape planning. This high-fidelity restoration and rehearsal of surveying and mapping practical training addresses issues related to the high costs, risks, and non-repeatability of traditional practical training methods, ultimately achieving better practical teaching outcomes. Additionally, after thorough practice in the virtual environment, students can transition to offline enterprises for hands-on experience, enhancing the effectiveness of practical teaching.

## 4. Optimizing the teaching evaluation system based on OBE

Teachers should adopt the OBE concept, defining learning outcomes based on the competency needs of

surveying and mapping enterprises. A classroom teaching evaluation system oriented around student learning outcomes should be established, with refined evaluation standards and rules implemented through "project evaluation + comprehensive evaluation" methods. A multi-subject evaluation model involving teachers, enterprise instructors, and students should be created. This model uses group evaluations as a foundation, with group evaluation results reflecting individual student differences [10]. Various evaluation methods, such as teacher-student interactions, questionnaires, quick Q&A sessions, and practical operations, can help teachers assess students' learning status in real time. Identifying learning issues allows teachers to adjust teaching strategies and methods accordingly, thereby improving the quality of talent training [11]. Enterprises should also actively participate in student evaluations. By using project-based evaluations, they can assess students' technical deficiencies, helping students understand their learning shortcomings and improve their learning methods effectively [12].

## 5. Summary

Under the background of the integration of production and education, optimizing and innovating the training mode for surveying and mapping professionals in higher vocational colleges is a systematic project requiring the collaboration of schools, enterprises, governments, and other stakeholders [13]. Higher vocational schools should base their teaching content on the OBE concept, building a "platform + module" curriculum system and implementing comprehensive educational reforms. To meet industry development needs and facilitate group-based student training, schools can use VR technology to create a blended practical training model [14]. Additionally, optimizing the teaching evaluation system to be results-oriented is essential. By pooling resources from schools and enterprises and constructing resource-sharing platforms, the overall quality of education can be improved comprehensively. These efforts will help cultivate high-quality surveying and mapping professionals, equipped with the skills and knowledge required by the industry [15].

## Disclosure statement

The authors declare no conflict of interest.

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