The Journal of Education Insights Vol 2 Issue 1 2024

Original Research Article

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The Cultivation of Undergraduate Students' Drafting and Recognition Abilities in the Field of Civil Engineering

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This study was supported by Education Research and Teaching Reform Project of Institute of Disaster Prevention; **Project Number:** JY2024B11.

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Abstract: In civil engineering education, the cultivation of drafting and recognition abilities is crucial. For undergraduate students, mastering solid drafting and recognition skills is not only a basic requirement for completing their studies but also an indispensable core competitiveness in their future careers. This article explores strategies for cultivating undergraduate students' drafting and recognition abilities in civil engineering majors, including optimizing curriculum design and teaching methods, designing and expanding practical components, and promoting discipline competitions and extracurricular activities. Through scientifically structured courses, diverse teaching methods, abundant practical opportunities, and competition activities, students' drafting and recognition abilities have significantly improved, laying a solid foundation for their professional development.

Keywords: undergraduate students; civil engineering; drafting and recognition abilities; cultivation

1. Overview of Drafting and Recognition Abilities in Civil Engineering Major

For undergraduate students majoring in civil engineering, drafting and recognition abilities are indispensable core skills. This ability not only determines whether students can accurately understand engineering drawings but also directly impacts their performance in future practical engineering projects. Students in civil engineering majors need to start cultivating this ability from the beginning of their studies, gradually mastering the basic rules and methods of drafting through continuous learning and practice, and becoming familiar with the expression methods of various civil engineering drawings.In terms of drafting, students need to master the use of various drawing software, such as AutoCAD, SketchUp, etc., to proficiently draw civil engineering drawings, including architectural plans, structural construction drawings, equipment layout drawings, etc. They also need to understand national

standards and specifications for engineering drafting to ensure that the drawings they produce meet industry requirements. Students should also possess spatial imagination and innovation ability, being able to flexibly adjust drawing designs according to actual situations to improve engineering efficiency and quality.In terms of recognition, students need to have keen insight and analytical ability for drawings. This includes the ability to quickly identify key information in drawings, such as dimensions, materials, structures, etc., as well as understanding the engineering intent and design concepts expressed in the drawings. Students also need to identify potential problems and hazards by comparing the differences and connections between different drawings, and propose reasonable improvement suggestions.

2. The Importance of Drafting and Recognition Abilities in Civil Engineering Major

Drafting and recognition abilities play a pivotal role in the learning process of undergraduate students majoring in civil engineering. Firstly, drafting is a crucial means for civil engineering students to express design concepts and present engineering ideas. By creating precise and standardized drawings, students can transform their ideas and creativity into visual forms, facilitating communication with others and advancing project progress together. Drafting also serves as an important way to assess students' mastery of theoretical knowledge. Through practical operations, students can deepen their understanding and application of professional knowledge.Secondly, recognition ability is essential for civil engineering students to understand and analyze engineering drawings. In actual engineering projects, drawings are vital references for guiding construction and ensuring engineering quality. Students need to quickly and accurately identify key information in drawings, understand design intentions, and identify potential problems and hazards. Only in this way can students play their proper roles in actual engineering projects and contribute to the smooth progress of projects.Thirdly, with the continuous development of technology, the requirements for drafting and recognition abilities in the field of civil engineering are constantly increasing. Modern civil engineering involves more complex structures, new materials, and advanced technologies, all of which need to be expressed and realized through precise drawings. Students with excellent drafting and recognition abilities will be more competitive and more likely to stand out in their future careers.

3. Current Status Analysis of Drafting and Recognition Teaching

3.1 Current Status Analysis of Drafting and Recognition Teaching in University Civil Engineering Major

The current status of drafting and recognition teaching in university civil engineering majors exhibits some significant characteristics and trends. With the rapid development of information technology, drafting and recognition teaching in university civil engineering majors has gradually become modernized and digitized. Traditional hand-drawn drawings are gradually being replaced by computer-aided drafting software, with advanced tools such as AutoCAD and Revit becoming essential components of the curriculum. This transformation not only improves drafting efficiency but also enhances the precision and richness of drawing expression. The widespread use of multimedia teaching and online resources makes teaching content more vivid and intuitive, which helps stimulate students' interest and motivation to learn.Currently, drafting and recognition teaching in university civil engineering majors emphasizes the integration of theory and practice. In addition to imparting basic drafting knowledge and skills, teachers also focus on cultivating students' practical operational abilities. Through extensive case studies, practical training, and project practices, students deepen their understanding and application of drafting and recognition in practice, enhancing their ability to solve practical problems. Although there has been some progress in drafting and recognition teaching in university civil engineering majors, there are still some problems and challenges. On the one hand, some universities have insufficient course offerings and inadequate scheduling for drafting and recognition courses, making it difficult for students to comprehensively master relevant knowledge and skills. On the other hand, some teachers rely on relatively monotonous teaching methods and lack innovation and flexibility, making it difficult to meet the diverse learning needs and interests of different students.

3.2 Survey of Students' Mastery of Drafting and Recognition Abilities

The current status of drafting and recognition teaching in university civil engineering majors reflects certain differences and challenges in students' mastery of drafting and recognition abilities. Through a survey of students' mastery of drafting and recognition abilities, it was found that the majority of students can grasp the basic knowledge and skills of drafting, and are able to use common drawing software for drawing and editing drawings. However, in aspects such as detail processing, precision requirements, and interpretation of complex drawings, some students still show significant deficiencies. These students often encounter issues such as dimensional deviations and annotation errors when drawing drawings, and struggle to accurately understand design intentions and construction requirements when interpreting complex drawings. The reasons for this situation are multifaceted: some students lack awareness of the importance of drafting and recognition, and thus lack sufficient motivation and practical investment in learning. They often view drafting and recognition as mechanical operations, neglecting their practical application value in actual engineering. Additionally, some universities face challenges in drafting and recognition teaching, such as insufficiently systematic course content and monotonous teaching methods, making it difficult for students to comprehensively and deeply grasp relevant knowledge and skills. Currently, there are differences and challenges in students' mastery of drafting and recognition abilities in university civil engineering majors. It is necessary to improve teaching methods and strengthen practical teaching measures to help students better master this important skill and lay a solid foundation for their future careers.

3.3 Teachers' Views on the Cultivation of Undergraduate Students' Drafting and Recognition Abilities

Currently, in civil engineering education, drafting and recognition teaching plays a crucial role, and teachers hold different views on the cultivation of undergraduate students' drafting and recognition abilities. Most teachers generally believe that there is significant room for improvement in undergraduate students' drafting and recognition abilities. They emphasize that drafting is not just a technical operation but also a reflection of the comprehensive application of civil engineering knowledge. In the teaching process, teachers focus on cultivating students' spatial imagination, logical thinking ability, and problem-solving skills. However, some teachers believe that there are some problems in undergraduate students' drafting and recognition abilities. For example, some students are not proficient enough in mastering drafting standards, leading to errors or deviations from industry standards in their drawings. Additionally, some students struggle to accurately understand design intentions and construction requirements when interpreting complex drawings.

4. Strategies for Cultivating Drafting and Recognition Abilities in Civil Engineering Majors

4.1 Optimization of Curriculum Design and Teaching Methods

Optimizing curriculum design and teaching methods is crucial for improving teaching quality and promoting student skill development. Regarding curriculum design, it is essential to consider industry demands and students' practical needs, constructing a scientifically rational curriculum system. Foundational courses should focus on learning drafting basic theory, drawing tool usage, and drawing standards, laying a solid foundation for subsequent professional courses. Professional courses should be expanded in depth and breadth, incorporating more real engineering cases to deepen students' understanding and application of drafting and recognition in practice. Interdisciplinary courses, such as computer-aided drawing and structural design, should also be emphasized to cultivate students' comprehensive qualities and innovative abilities. Optimization of teaching methods is also essential for enhancing the effectiveness of drafting and recognition skill cultivation. Traditional "transmission-based" teaching methods are no longer adequate for modern education. Therefore, it is crucial to explore diverse teaching methods and approaches actively. For example, project-based learning can be introduced to enhance students' drafting and recognition abilities through completing real engineering projects. Additionally, multimedia teaching and online resources can be utilized to conduct blended learning, combining

online and offline teaching methods to stimulate students' interest and motivation. Teachers should also focus on cultivating students' independent learning and teamwork skills through group discussions, case studies, and other activities to improve learning outcomes.To ensure the effective implementation of curriculum design and teaching method optimization, universities should strengthen faculty development, improving teachers' teaching skills and professional competence. Collaboration and communication with enterprises and industries should also be enhanced to understand industry trends and employment needs, providing robust support for optimizing curriculum design and teaching methods. Through optimizing curriculum design and teaching methods, the cultivation effectiveness of drafting and recognition abilities in civil engineering majors can be effectively improved, providing strong guarantees for nurturing high-quality, innovative civil engineering talents.

4.2 Design and Expansion of Practical Components

In the process of cultivating drafting and recognition abilities in civil engineering majors, the design of practical components should be closely integrated with the course content to ensure that students deepen their understanding of drafting and recognition through practical operations while mastering basic theoretical knowledge. For example, teachers can design drafting exercises and case studies related to the course content, allowing students to engage in practical operations and discussions in the classroom to reinforce their learning. To broaden students' practical perspectives, universities should actively collaborate with enterprises and establish off-campus practice bases. By organizing students to participate in drafting and recognition work in actual engineering projects, students can be exposed to real engineering scenarios and complex drawings, further honing their practical skills and problem-solving abilities. Moreover, guidance and feedback from industry mentors can help students identify their deficiencies and make targeted improvements.Universities can also organize drafting and recognition skills competitions and exhibitions to provide students with platforms to showcase their talents. These activities not only stimulate students' learning interests and motivation but also promote communication and collaboration among students from different grades and majors, collectively enhancing drafting and recognition abilities. With the continuous development of information technology, universities can utilize virtual simulation technology, online teaching platforms, and other means to construct virtual practice environments. This allows students to engage in drafting and recognition operations in virtual environments, breaking through the limitations of time and space and enhancing the flexibility and efficiency of practical teaching.By carefully designing and expanding practical components, universities can effectively enhance the cultivation effectiveness of drafting and recognition abilities in civil engineering majors, nurturing more high-quality talents with practical skills and innovative spirits.

4.3 Promoting Skills Enhancement through Discipline Competitions and Extracurricular Activities

In the cultivation of drafting and recognition abilities among university students majoring in civil engineering, discipline competitions and extracurricular activities play a crucial role alongside regular classroom teaching and practical components. These activities not only provide students with platforms to showcase themselves and develop their abilities but also serve as effective means to rapidly enhance their drafting and recognition abilities.Discipline competitions serve as important benchmarks for assessing students' drafting and recognition levels. By participating in various civil engineering drafting and recognition competitions, students can hone their adaptability and psychological resilience in intense competitions. They also have the opportunity to interact and learn from outstanding participants from different universities and backgrounds, broadening their horizons and absorbing new knowledge. In the preparation process for competitions, students need to delve into drawings, master specifications, and improve accuracy, all of which contribute to enhancing their drafting and recognition abilities.Extracurricular activities provide students with a vast field for enhancing their drafting and recognition abilities. Students can spontaneously organize or participate in various clubs, interest groups, and activities related to drafting and recognition. Through regular communication and discussion, they can learn and progress together. Students can also

utilize their spare time to participate in drafting work for actual engineering projects, thereby improving their practical skills and problem-solving abilities through practice.It is worth mentioning that discipline competitions and extracurricular activities can also stimulate students' innovative spirit and teamwork awareness. In competitions, students need to continuously explore new methods and technologies to pursue higher scores. In extracurricular activities, students need to closely collaborate with team members to accomplish tasks collectively.

Conclusion

In conclusion, the cultivation of drafting and recognition abilities among undergraduate students majoring in civil engineering is a continuous and systematic process that requires concerted efforts from universities, teachers, and students. By optimizing curriculum design, improving teaching methods, strengthening practical components, and organizing discipline competitions and extracurricular activities, students' drafting and recognition abilities can be effectively enhanced, thereby nurturing more high-quality and innovative talents in civil engineering. Looking ahead, with the continuous advancement of technology and the ongoing development of the industry, we will continue to explore more efficient and practical strategies for cultivating drafting and recognition abilities, providing students in civil engineering with broader development opportunities and prospects.

References

[1] Chen, Xuejie, & Wang, Jianxin. (2020). Research on Cultivation of Drafting and Recognition Abilities in Civil Engineering Based on BIM Technology. *University Physics Experiment*, 32(2), 97-100.

[2] Wang, Junfeng, & Zhang, Qingxuan. (2021). Discussion on Teaching Reform of Cultivating Drafting and Recognition Abilities in Civil Engineering. *Intelligent Computing and Applications*, 10(3), 26-29.

[3] Zhang, Lin, & Nan, Haimin, & Zhao, Lin. (2019). Research on Cultivation of Drafting and Recognition Abilities in Civil Engineering Based on Project-Oriented Teaching Mode. *Modern Technology Education*, 20(2), 74-77.

[4] Yang, Liu, & Liu, Jianguo. (2020). Study on Strategies for Cultivating Drafting and Recognition Abilities of Undergraduate Students Majoring in Civil Engineering. *Education Informatization*, 16(4), 13-17.