

Training Strategies of Practical Ability of Building Materials Professionals in Higher Vocational Colleges Under the Guidance of “Three Education Reform” Concept

Jing Sun*

Chongqing Energy College, Chongqing 402260, China

*Corresponding author: Jing Sun, 757809546@qq.com

Copyright: © 2022 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

Abstract: The main purpose of the implementation of the three-education reform concept is to improve the teaching quality and talent training level of higher vocational colleges. Through the reform, one can promote the optimization of teaching methods, provide more space for student’s self-development, and improve the quality of talent training. Building materials in higher vocational colleges are a high requirement for practical ability, which emphasizes the cultivation of students’ practical ability. Under the three-education reform concept, the traditional teaching mode should be replaced to provide more practical opportunities for students, in return give more attention to the development of students’ practical ability. This paper mainly explores the current situation and training strategies in building material professionals in higher vocational colleges under the reform of the three education systems for a reference.

Keywords: Vocational colleges; Building materials; Practical ability of talents; Cultivation strategy

Online publication: August 8, 2022

1. Introduction

With the proposal of the national vocational education reform implementation plan, China’s three educations reform concept is gradually implemented in the teaching of higher vocational colleges. Under this concept, teachers, textbooks and teaching methods should be strengthened, the students’ comprehensive ability and quality should be improved, and cultivate high professional quality and high technical level of talents. The field of building materials is an important specialty of civil engineering, which involves in the definition and testing of the properties of various materials in construction engineering. Therefore, it is essential to strengthen the exploration of the teaching reform of building materials majoring in combination with the reform of three education concepts, to improve the teaching quality, to meet the requirements of improving students’ practical ability, to gradually change the traditional teaching mode to employment and industry orientated, and to promote the comprehensive development of students.

2. Professional characteristics of building materials

Majoring in building materials is one a discipline in civil engineering, which is closely related to transportation, construction, and other. Through the study of building materials, students can cultivate good

abilities of cognition, discrimination, and detection of building materials. It also enables students to have a better understanding of the macro performance, microstructure, production technology, testing standards, and engineering applications of building materials, and further, provides an effective theoretical basis for material modification design, testing, and innovation. In addition, the quality of materials can be determined through the analysis of material performance parameters, and the corresponding construction materials should be reasonably selected based on the project development requirements, and to solve various material problems which may arise during the construction progression ^[1]. The content of this paper includes the types of building materials, material properties, such as physical properties, chemical properties, durability, and others, which may involve many interdisciplinary issues. Students are required to have sufficient knowledge to learn and apply the knowledge of building materials better. At the same time, the practicality of building materials engineering is relatively strong, which involves more content about the microstructure of building materials. The knowledge is too abstract; therefore, the theoretical knowledge is difficult to understand, thereby it is important to explore the corresponding engineering building materials, according to the requirements of building engineering in combination with practice.

3. Analysis on the current situation of practical teaching of building materials specialty

3.1. Unscientific course positioning

Judging from the current development of the social construction industry, the construction market has high requirements for talents. As an important place for social talent training, colleges and universities should shoulder the important task of talent training in the construction industry. With the economic fluctuation in the real estate industry, it causes the vibration of the whole construction industry market. In addition, economic development itself is a model of both opportunities and risks. Therefore, the technical personnel not only required to have a strong professional ability, but also have the ability to control the risks in time. Majoring of building materials is a branch of the construction industry, and a basic major in the development of the construction industry. Students have to focus on the effective combination of theory and practical in their study, strengthen practical practice on the basis of theory, master and optimize the detection methods of building materials, and clarify the application of building materials in different building environments and structures. Further, it can be seen that the building materials field has high requirements on students' experimental ability; however, from the current development of the building materials major, there are only few experimental hours in the courses, insufficient attention is given to the experimental courses, and the training efficiency of students' practical ability is relatively low. Additionally, the class hour of theoretical courses is more than twice, that experimental course. Due to the time limit of the experimental course, students can only conduct simple experiments from basic materials such as, concrete, cement, sand, and steel, while other complex experiments are difficult to carry out continuously.

3.2. Teaching experiment outline lags behind

With the development of science and technology, the field of construction materials is constantly developing. Especially under the concept of environmental protection, the forms of building materials are diversified, and new concrete and waterproof materials have gradually become the mainstream trend of current building materials. However, due to the slow updating speed of teaching materials, the practical teaching content in the teaching of architecture specialty lags behind, and experimental teaching cannot be carried out for new materials in the current construction market, which is not conducive to the students' learning to keep pace with the times ^[2]. Even if students have fully mastered the theoretical knowledge and practical operation skills of building materials in school, they could not connect with the development of market materials.

3.3. Weak innovation of building materials experiment content

With the improvement of social requirements for training of comprehensive talents in recent years, the major of building materials continues to strengthen the social reform in practical teaching design, by emphasizing the training of comprehensive talents, and include the comprehensive training plan into the teaching plan. Through a large number of experimental teaching work, it is conducive to stimulate students' innovative spirit to complete the experimental objectives in a good way. However, from the actual experimental teaching situation, teachers required students to complete a basic experimental task as long as they can complete the experimental teaching objectives, even it is lacking in the students' experimental innovation. Moreover, the school is imperfect in the construction of experimental equipment for building materials. In addition, due to funding constraints, many new equipment could not be purchased, which affects the effect of experimental teaching.

3.4. The teaching evaluation system of experimental courses is unperfect

The evaluation method of higher vocational colleges in the experimental teaching of building materials is relatively simple, which mainly gives a corresponding score in combination with students' experimental reports and students' attendance for the experimental class. Among them, the score proportion of the experimental report is relatively high about 60%, and the measurement standards of students' innovative ability and practical ability are different, which could not be fully reflected by students' grades, resulting in the restriction of students' curriculum reform work, and the evaluation method is not conducive to stimulating students' enthusiasm for learning. At the same time, after the students submitted the experimental report, the teacher did not provide a timely evaluation of the experimental report, pointing out the students' experimental problems, which may lead to the continuous accumulation of problems in the students' experiment, which subsequently may influence the students' experimental enthusiasm and experimental effect.

4. Training strategies of practical ability of building materials professionals in higher vocational colleges under the guidance of “three education reform” concept

4.1. The reform of teaching staff will improve the practical ability of talents

Under the concept of three education reform, teacher reform is one of the most important reform contents. Teachers are the organizers and participants of teaching reform. Teachers' teaching ideas, teaching methods, and teaching ability directly influences the classroom teaching effectiveness and quality, and also has a direct relationship with the cultivation of students' practical ability. Therefore, it is necessary to strengthen and optimize the teaching team, who are involved in the training of building materials professionals in higher vocational colleges. The current teaching team of building materials, have lack of practical experience and disconnection between theory and practice in their teaching task, which can affect the cultivation of practical talents. Therefore, schools need teachers to provide more practical learning time. In addition, experts from construction material industry or backbone technical personnel in construction material management from construction companies can be hired to train teachers in schools, or to enrich the practice teacher team to ensure a high practical teaching level of teachers^[3]. At the same time, teachers majoring in building materials can also be sent to various construction enterprises to take temporary posts, strengthen their practical training, improve their practical ability, and create double qualified teaching team for higher vocational colleges.

The specific reform methods of teachers can be divided into three steps as described below.

Firstly, it is important to adopt the “going out” strategy, and encourage teachers to participate in the learning from enterprises workshop, at the same time provide teachers with more practical opportunities. In recent years, the educational level of teachers in higher vocational colleges has been continuously

improved, and the proportion of students with master and doctoral is bigger, indicating that higher vocational colleges give more attention to the improvement of the quality of teachers. Although these teachers have a high level of education and rich knowledge reserves, most of them enter schools directly after graduation, thereby they are lacking in the social and professional practice ^[4]. The major of building materials gives more attention to teachers' practical ability, and on-site teaching ability. The lack of teachers' practical ability will indirectly affect the development of building materials teaching mode. In order to improve teachers' practical ability, an effective platform for teachers should be provided. The school-enterprise cooperation can be adopted, by encouraging the new teacher's participation in the temporary study in the enterprise, and the internship time at least 3 months. Through post learning, the new teachers can understand the practical workflow, and operation methods such as, material property analysis, acceptance, and testing. After three months of internship, teachers should take an advantage of winter and summer vacations for further in-depth learning and temporary training. In addition, teachers who have not yet obtained the testing qualification certificate are required to obtain the corresponding testing qualification certificate through two years of practical learning. Through continuous learning, teachers can always maintain their sensitivity to the industrial development, strengthen the improvement of their own knowledge system, timely grasp the latest knowledge consultation of the building materials industry, provide richer teaching content for classroom teaching, and ensure the connection between the teaching content of building materials and the actual situation ^[5].

Secondly, it is important to adopt the invite in strategy. The recruitment strategy, referring to higher vocational college requirements when employing building materials experts, scholars or backbone technical personnel of enterprise building materials, and others as part-time practice teachers, to ensure that the practical teaching of these professionals can solve students' puzzles about building materials learning, and to improve their practical teaching ability ^[6]. On the other hand, professional technicians can be hired to communicate with teachers, to improve the practical ability of teachers, and lay the foundation for the cultivation of double qualified teams in higher vocational colleges. In addition, in the employment of professional and technical personnel, in addition to engaging in the practical teaching of building materials, they also have to participate in the compilation of teaching materials and curriculum design of building materials, to improve the practical teaching of building materials in higher vocational colleges.

Thirdly, it is necessary to adapt the combination of schools and enterprises. The combination of school and enterprise can provide more abundant resources for training of building materials teachers in higher vocational colleges. Teachers with a doctorate and master degrees in higher vocational colleges can participate in the research and development of building materials in enterprises, and provide intellectual support for building materials research for enterprises ^[7]. In return, enterprises can provide teachers with advanced equipment, materials, and other hardware research facilities, and also provide them with practical opportunities through the implementation of engineering projects. In short, the cooperation between higher vocational colleges and enterprises can solve the problems such as, lack of research and design talents in enterprises, and the lack of practice of school teachers, and eventually achieve a win-win situation.

4.2. Reform teaching methods and improve teaching quality

Teaching method reform is the core content of the reform under the background of the three-education reform. The current teaching method in majoring building materials in higher vocational colleges, faces the following problems; (1) The combination of theory and practice is could not achieve in teaching. Generally, theoretical teaching is conducted firstly, followed by practical teaching, which is not conducive for students' to master of knowledge ^[8]; (2) The practical teaching is inconsistent with the post requirements of the building materials, and the teaching content of the school is backward, which could not meet the actual post requirements; (3) The teaching evaluation of students is too simple to effectively predict students' practical

ability, which is not conducive to the improvement of practical teaching ability. Meanwhile, the reform of teaching methods can be carried out from the following aspects as described below.

4.2.1. Reform of theoretical teaching methods

In the reform of theoretical teaching, the combination of theory and practice and the combination of online and offline teaching are mainly used to improve students' cognition of knowledge and to expand teaching knowledge [9]. However, due to the limited teaching conditions in higher vocational colleges, theoretical courses in building materials, teaching are often conducted in the classroom, and only experimental courses are taught in the laboratory. The teaching mode of separating theory and experiment, will bring difficulty for students to learn theoretical knowledge. Moreover, in the teaching of building materials, students need to observe the structure and properties of materials, to understand better the knowledge of building materials. Therefore, in order to ensure the teaching effect of building materials, it is necessary to combine the theoretical teaching content with the practical teaching content, form a project-oriented integrated teaching mode of theory and practice, and include laboratory as the main teaching place. Additionally, teachers can explain the theoretical content to students in combination with experimental materials [10], where teachers can directly show students the corresponding materials according to the needs of material explanation, or directly lead students to operate according to the explanation of the nature of the materials, and improve the efficiency of classroom teaching through the integration of theoretical and practical teaching. For example, when learning about steel testing, teachers can prepare a variety of steel material samples for students to observe and study. Compared with the empty talk of theory, this way of combining theory with practice is more conducive to students' understanding. In addition, teachers can also enhance students' understanding of the properties of steel materials through on-site demonstrations such as, cold bending, stretching, and other operations.

4.2.2. Combination of online and offline

With the development of science and technology, the current teaching in higher vocational colleges begins to emphasize the combination of online and offline teaching methods using Internet, online teaching platforms for students. Online teaching can use the teaching resources in the network to enrich the teaching content, and to optimize the teaching task by including the famous teachers and excellent teaching courses on the network [11]. For example, Muke, cloud courses, and other online teaching platforms can be used to solve practical problems which cannot be operated in reality.

4.2.3. Strengthen the reform of teaching materials to adapt to the development of the times

Teaching materials are the carrier of teaching. The content of teaching materials directly affects the learning direction of students, and plays an important role in students' knowledge and skills acquisition of building materials and professional quality training [12]. Due to the rapid development of the construction industry and building materials, building materials and testing methods are constantly developing. However, due to the lag of traditional textbooks, the contents of the textbooks that students learn have been modified by the industry, which wastes a lot of learning time and is not conducive to the connection between students and enterprises after graduation. Therefore, it is essential to compile textbooks scientifically in combination with the current needs of industry development [13]. Timely integrate new materials, new processes, and new testing specifications into the teaching materials. It needs to adopt the way of school enterprise cooperation to ensure the content of teaching materials is synchronized with the cutting-edge information on industrial development. In addition, to maintain the diversity of textbook forms such as, workbook, digital teaching resources, and loose-leaf handouts can be introduced [14]. In addition, the key and difficult contents can be converted into small videos for students to download and to learn, in order to stimulate

students' interest in learning, and to break the learning dilemma.

5. Conclusion

In summary, under the background of three education reform, the building materials major in higher vocational colleges need to explore the reform strategies of teachers, teaching methods, and teaching materials in combination with the problems and deficiencies which are existing in the current teaching. Through the implementation of the three-education reform, by optimizing the teaching team, ensuring the scientific of the teaching content, combining theory with practice, enriching the teaching content, and ensuring the training ability of building materials professionals, the building materials major can be improved.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Lei X, Zhang H, Wei J, et al., 2022, Research on Curriculum Ideological and Political Assistance to Practical Teaching and Education in the Context of New Engineering: Taking the Nanomaterials Major of Xi'an University of Architecture and Technology as an Example. *Education and Teaching Forum*, 2022(2): 98–101.
- [2] Li Y, 2021, Exploration on the Training Mode of Innovative Talents in Materials Major under the Idea of New Engineering Construction: Taking Jilin University of Architecture as an Example. *Heilongjiang Education (Higher Education Research and Evaluation Edition)*, 2021(1): 9–11.
- [3] Zhou H, Xiao X, Liu W, 2020, Exploration and Practical Research on the “2+1” Talent Training Mode in Higher Vocational Colleges of Building Materials Engineering Technology. *Modernization of Education*, 7(74): 31–34.
- [4] Chen P, Wang H, Zhao J, 2020, Research and Practice of 1+X Skilled Talents Training in Higher Vocational Architecture under the Background of University-Enterprise Integration. *New Materials and New Decorations*, 2(8): 107.
- [5] Xue Y, Zhang Z, 2020, Practical Exploration on the Curriculum Reform of Road Building Materials Combined with Engineering and Learning. *Science and Technology Information*, 18(14): 154–155.
- [6] Jin S, Jin M, Zhu M, et al., 2017, Reform and Practice of “Curriculum Ideology and Politics” in the Teaching Process of Inorganic Building Materials. *Modern Vocational Education*, 2017(9): 240–241.
- [7] Zheng W, Wang Z, Wang J, 2020, Exploration on the Training of Wood Structure Architecture Professionals Under the New Situation. *Education and Teaching Forum*, 2020(51): 100–102.
- [8] He S, 2020, Research on the Practical Teaching of Building Technology Professional Group Based on BIM. *Sichuan Cement*, 2020(1): 128. <http://org.doi.10.3969/j.issn.1007-6344.2020.01.113>
- [9] Yang C, Zhao W, Wang Y, et al., 2020, Cultivation of Professional Practical Ability of Master of Materials Engineering Under the Concept of New Engineering. *Shandong Chemical Industry*, 2020(7): 169–170 + 172.
- [10] Fu Y, Yu Z, Kong X, et al., 2020, Exploration and Practice of Collaborative Innovation in Applied Undergraduate Colleges under the Mode of Industry University Research Cooperation: Taking the Major of Material Engineering as an Example. *Industrial Innovation Research*, 2020(14): 164–165 + 168.

- [11] Tan M, 2020, Research and Practice on the “Three Docking” Talent Training Mode of Logistics Major in Secondary Vocational Schools. *Logistics Times*, 2020(12): 73–75.
- [12] Yang B, 2020, Discussion on the Current Situation and Reform of “Building Material Testing” Course in Higher Vocational Colleges. *Sichuan Cement*, 2020(2): 339.
- [13] Xie Q, 2020, Research on Teaching Reform of Building Decoration Materials and Construction Technology in Secondary Vocational Schools. *Architecture and Decoration*, 2020(14): 1.
- [14] Zhou C, Wei Z, 2020, Research on the Cultivation Strategy of Craftsman Spirit of Higher Vocational College Students Under the Background of “Three Education Reform:” Taking Architecture as an Example. *Construction Engineering Technology and Design*, 2020(34): 4152–4153.

Publisher’s note

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.