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Abstract. According to the requirement of Professional certification and the Cultivation of quality and ability, this paper proposes the “combining platform + ability module” practice teaching system based on the cultivation of engineering practice ability, constructs the multi-level ability cultivation module, discusses the teaching organization and teaching methods, and points out three reasonable combination should be obtained.

Introduction

To promote engineering management industry development, meet the demand of employing units, and achieve the virtuous circle of high education serving society, Ministry of Housing and Urban-Rural Development proposes the professional certification requirement to engineering management specialty. There exist three levels as knowledge, ability and quality needed for the graduates of engineering management specialty, which includes basic knowledge of humanities and social sciences, natural science, instrumentality, professional knowledge(engineering management, building, Transportation, landscape, etc.), basic ability of literal expression, document retrieval, computer and foreign language, professional ability of engineering management, and quality of humanity, science and profession[1].

From quality education theory, quality is the basis of ability, ability is the manifestations of quality, and the magnitude of ability is determined by the quality[2]. For engineering applied talents, there exists important characteristics different from other kind of talents, which includes systematic engineering consciousness and the comprehensive professional ability to realize, analyze, study, and solve the actual problems in engineering management.

Based on the profession certification requirement, the course system of engineering management specialty includes mathematics and natural science, basic courses, professional basic courses, professional courses, practice link(experiment, practice, course design and innovation training), and graduation design[3].

For the process of knowledge connotation, the knowledge of mathematics and natural science is obtained by impartation; the engineering basic courses include engineering mechanics, engineering drawing, engineering measurement, building structure, principle of management, operational research, and computer technology, the knowledge of these courses is obtained by impartation; the professional courses include project management, engineering cost management, engineering contract management, engineering economics, civil engineering construction and organization, building structure, and application of BIM, etc. These courses are more comprehensive, and the knowledge of these courses is obtained by impartation and practice application. That means there not only needs the impartation of theoretical knowledge, but also needs the practice in practice link, and the two methods must be combined effectively[4].

The traditional personnel training mode emphasizes the impartation of theoretical knowledge and neglects the effective combination with practice link, which causes the deficiency of the cultivate training on ability about comprehensive application, design application and innovation[5]. In this
mode, the practical teaching is attached to theory teaching, and its content is limited to the verification of theoretical knowledge. Thus, building the practical teaching culture system of engineering management specialty adapted to professional certification is of significant importance.

**Construction of “Integrated Platform—Ability Module” Practice Teaching System**

According to quality and ability training objectives, the practice link includes three levels of confirmatory, comprehensiveness, and innovation, which respectively corresponded to basic practical ability, comprehensive application ability, and innovation ability.

Based on the demand characters of the applied talents in engineering management specialty, the practical teaching culture system should pay more attention to the comprehensive application ability and comprehensive quality in application-oriented institutes. Thus, this paper integrates the original practical teaching system, and proposes integrated platform - ability module practice teaching system, its structure is shown in Table 1.

Table 1. Integrated platform—ability module practice teaching system.

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<td>The subject foundation practice platform</td>
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<td>The professional practice teaching platform</td>
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**Construction of Integrated Platform—Ability Module**

The core of the system is ability module, ability modules in different levels compose platform. During the construction, the ability demand is the guidance, and the engineering application ability training is the main line. Firstly, the ability points of original practical teaching system must be extracted, decomposed and classified based on the professional theoretical knowledge system and classification of different levels of ability. Secondly, the ability points of single course or multi-courses must be combined with the principle of carefully chosen and broaden. And for the last, the practice link(experiment, practice, course design and innovation training) must be designed based on the principle above-mentioned to compose different levels ability training module. The combining practice platform includes subject foundation practice platform, engineering practice teaching platform and innovation practice platform.

**The Subject Foundation Practice Platform and Ability Module.** This practice platform includes practice teaching of all professional basic courses and a few professional courses with low comprehensiveness, which trains the basic practical ability, basic comprehensive application ability and design ability. The ability module includes confirmatory practice module and single course comprehensive ability module, which is less than 30% of class hour and credit in the whole system, and the confirmatory practice module is less than 15%.

The confirmatory practice module is the confirmatory practice link which is necessary and difficult to integrate for related course theoretical knowledge, such as the mechanical properties experiment of concrete in civil engineering construction.

The single course comprehensive ability module is constructed with courses, mainly includes the comprehensive practice ability module which combines the knowledge and ability of the course, such as the setting out practice in engineering measurement.

**The Professional Practice Teaching Platform and Ability Module.** For engineering management specialty, this practice platform includes practice teaching of professional courses with high comprehensiveness and multi-courses, which trains the engineering comprehensive application ability and comprehensive analysis quality under multi-technology, multi-procedure and multi-factor situation. This platform is in 3-4 academic year. The ability module includes multi-courses
comprehensive practice ability module and professional application software practice module, which is about 50%-55% of class hour and credit in the whole system.

For multi-courses comprehensive practice ability module, there exists two kinds of combination. The first is the combination of the comprehensive and design practice ability module which combines the knowledge and ability among the courses in one semester, such as civil engineering bidding course design in which the related knowledge and ability of the courses in one semester as budget of civil engineering, engineering economy, civil engineering construction, civil engineering bidding, etc. The second is the combination of the comprehensive and design practice ability module which combines the knowledge and ability among the courses in different semester and different academic year, such as construction practice in which the related knowledge and ability of the courses in different semester and different academic year as civil engineering construction, building architecture, civil engineering materials, engineering mechanics, etc.

For the professional application software practice module, the current professional software is used to train the practice application ability, the related module includes budget of civil engineering software practice, BIM practice, etc.

This kind of module is constructed beyond the original practical teaching system, in which the arrangement of related courses is considered adequately.

The Innovation Practice Platform and Ability Module. The innovative practice of college students is an important part of the undergraduate teaching quality and teaching reform project promoted by the state. It aims to explore and establish a teaching model with the core of practice and topics, to initiate innovative experimental reform with undergraduate students as the main body, and to mobilize the initiative, enthusiasm and creativity of the students. With innovative practice, the undergraduate’s innovative thinking and innovation consciousness can be stimulated, the way of thinking and solving problems can be grasped gradually, and their ability of innovation and practice can be improved.

The innovation practice platform includes single subject innovation ability module and multi-subject innovation ability module, which is about 15%-20% of class hour and credit in the whole system. This platform is in 3-4 academic year.

The single subject innovation ability module is constructed by teachers of civil engineering. Teachers organize the practice link to train the innovation ability combined with industry demand and their research direction, such as the application of BIM in engineering management.

The multi-subject innovation ability module is constructed by teachers interdisciplinary. Teachers organize the practice link to train the innovation ability combined with different industry demand and their research direction, such as research on pollutants in green construction involving engineering management, environmental science and chemistry.

Teaching Organization and Teaching Methods

In order to ensure the good performance and effect of the integrated platform - ability module practice teaching system, three reasonable combinations should be highlighted in the teaching organization and teaching methods.

The Reasonable Combination of Internal School Organization and Practice Teaching Outside School. The module project under the professional practice teaching platform is of strong practical application, which can be carried out in the form of the combination of the internal school organization and the outside school practice. For example, the students take the form of the work assistant of actual working post under the guidance of the technicians outside school.

The Reasonable Combination of Teacher’s Guidance and the Student’s Initiative in Module Project. The use of module project under the subject foundation practice platform is mainly the verification of the basic knowledge and the cultivation of the basic ability. In this part, teachers are the dominant and the students participate.
The module project under the professional practice teaching platform are comprehensive, some of which involve multi-courses in the subject, and many related professional teachers can be invited in collaboration with students, and the way of practical theme design is carried out with the students. The module project under the innovative practice platform can be designed by the teachers, which comes from the open practice theme in the scientific research projects related to the courses or research direction of teachers. Firstly, students do the practical theme design independently according to the subject direction. Secondly, teachers determine the feasibility and science of the practical design, and then the students design and implement the project. Finally, teachers evaluate the practical results.

**The Reasonable Combination of Virtual Technology and Practical Operation.** The actual operation of the students' participation in the project can deepen the perceptual knowledge and play a significant role in cultivating the ability. However, under the condition of insufficient education funds and limited investment in education, the reasonable combination of virtual technology and practical operation should be adopted. In view of the big investment and time consuming in the ability module project, the practice of virtual technology such as simulation and multimedia can be considered, such as the virtual construction technology in civil engineering construction.

**Conclusion**

The training of the professional ability of Engineering management specialty needs the integration of the practice teaching link training and the imporation of theoretical knowledge. This paper proposes integrated platform - ability module practice teaching system based on the professional certification. During the construction, the ability demand is the guidance, and the engineering application ability training is the main line. Besides, this paper constructs the ability training module, discusses the teaching organization and teaching methods to ensure the good operation of the integrated platform - capacity module practice teaching system, and puts forward three reasonable combinations.

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**References**


