Exploration on the Cultivation of Engineering Practical Ability of Civil Engineering Specialty in Newly Built Undergraduate Colleges Based on BIM Technology

Zhao-xia MA and Qi-bin GU

Department of Architecture and Material Engineering, Hubei University of Education, Wuhan, 430205, China

*Corresponding author

Keywords: Engineering practical ability, BIM technology, Application-oriented talents training mode, Double qualified teachers

Abstract. On the basis of consulting a great deal of information, investigating and visiting, learning from the experience of BIM technology training at home and abroad and combining with the practices in our university, the paper builds application-oriented talents training mode based on BIM technology for civil engineering specialty. The normal operation of the training mode of applied talents of civil Engineering specialty based on BIM technology is ensured by optimizing the teaching conditions of applied technical talents, maximizing the teaching of the application of BIM technology, and strengthening the construction of double qualified teachers, practice base construction, platform construction and related system construction. The paper puts forward such measures as solving thinking problems, reforming the programs of talents’ training, perfecting practical teaching links so as to broaden the horizons of higher engineering teachers, renew the train of thought in reforming and perfect the new measures of cultivating engineering practical ability.

Introduction

Engineering ability is one of the most important and basic quality of civil engineers. It is an urgent need to study to solve the practical problems for the new civil engineering applied undergraduate colleges how to cultivate civil engineering and technical personnel with both the comprehensive application of modern scientific theory and technology and modern engineering ability. There have been more than 640 local newly-promoted undergraduate universities who make up 55% of national undergraduate colleges and universities. A large number of newly established undergraduate colleges and universities are unknown location, and professional characteristics are not obvious out of touch with local economic and social development since 1999. At the same time, the undergraduates trained by university cannot completely adapt to the demand of these posts provided by market of continuous changes. On the one hand, employers lament recruitment difficulties, on the other hand, some graduates are facing employment difficulties. The main reason of this phenomenon is that the ability of engineering college graduates is out of touch with employers demand, so it has profound practical and social significance of the study of cultivating engineering skills of civil engineering professional of new applied undergraduate college[1].

BIM Technology

BIM(Building Information Modeling) is leading the construction industry unprecedented reform on the new idea and practical technology.2011-2015 development outline of construction industry informatization in May 2011 clearly showed that BIM technology should be researched and applied in the construction stage, be promoted the extension from the design stage to the construction stage, be regarded as the core technology of information development of engineering general contracting, survey and design and construction enterprises in 12th Five-Year. The Ministry of housing and urban rural development in “Notice on the issuance of the revised standards for the
engineering construction standards in 2012” was declared officially that BIM standards-setting activities were officially launched, and systematization and standardization for BIM were opened a curtain[2].

In a recent study of Arizona State University and a non-profit construction company at abroad, 70% colleges under investigation had integrated BIM into courses, and 88% colleges which had not got BIM course will provide BIM course. At home, the first BIM Engineering Master Class was opened at Huazhong University of Science and Technology in 2012, and Harbin Institute of Technology developed the course of the application of BIM technology in 2013[3].

However, domestic penetration rate of BIM technology whether in the application of industry or in college teaching is far lower than abroad. BIM technology popularization and application in the construction industry is the trend, and the lack of talent has become represent the general trend, the main bottleneck in the development of BIM technology. Students are the reserve force, the future of the application and development of BIM technology. Only teaching BIM technology in the university courses and in continuing education courses will be able to achieve large-scale education and training, implement the level of BIM talent breakthrough and enter the construction of the "BIM era"[4].

New undergraduate colleges will be integrated BIM technology into the civil engineering specialty, and cultivate a group of new engineering technology application talents of creative consciousness and grasping the innovation tools, which provides a new idea for teaching reform, but also meets the market demand and development of the industry. Developing production line of high-level technical skills applied talents, and improving the students’ engineering practical ability and comprehensive quality gradually realize the seamless connection between talent training and employment needs.

**Construction of Application-oriented Talents Training Mode Based on BIM Technology for Civil Engineering Specialty (Being Illustrated in Figure 1)**

Figure 1. Construction of application-oriented talents training mode based on BIM technology.

**The Investigation and the Reference the Talent Training Status Quo and the Problems in the Process of Talent Training of Civil Engineering Specialty in Newly Built Universities**

The construction enterprises and civil engineering students in newly built colleges and universities were carried out research and interviews. Based on the experience of BIM technology training at
Constructing an Application-oriented Talent Training Mode

Grasping the new undergraduate colleges civil engineering professional training research present situation of talent cultivation, analyzing the present situation of foreign and domestic BIM education, combining with the training scheme of new undergraduate colleges civil engineering professionals, demonstrating the feasibility of BIM teaching in the foundation of summarizing the domestic and foreign BIM teaching, BIM teaching content of new undergraduate colleges of civil engineering, the curriculum system, teaching mode and the main training method was raised through the literature method.

Combined with the data of investigation, the reform program of applied talents training for civil engineering specialty in newly built Universities was formulated through the reform of the curriculum system, teaching methods and means, and practical teaching system. BIM technology will be integrated into the civil engineering professional training, which formed the teaching mode of civil engineering specialty. Training new application talents meets the needs of the industry on the basis of the original professional courses and BIM technology platform through the training mode of work study combination.

The Safeguard Measures of the Applied Talents Training Mode of Civil Engineering Specialty Based on BIM Technology

Maximizing the BIM Technology Teaching Based on the Current. Newly established colleges and universities develop BIM teaching such as BIM courses, BIM practice links and graduation design, application of multi course according to the hardware conditions, their students’ situation and characteristics of personnel training.

1. Setting up BIM courses
   The BIM courses are set up as a separate BIM curriculum in the teaching plan, which systematically teach knowledge and application of BIM technology to be more suitable for explaining BIM modeling software. However, the integrated use of BIM in practical engineering is not good arrangements and implementation in the main form of teaching.

2. Opening the BIM practice and graduation design based on practical training or comprehensive training
   BIM practice is set up in teaching plan in the advantages of BIM technology to develop the practice teaching, which is based on students, is flexible form and apply practical engineering case to cultivate comprehensive ability of students. According to students’ personal interests and employment direction, BIM direction is set in the process of graduation design.

   Training or comprehensive training is the most important part of teaching link in practical talent training mode based on the application of BIM technology. Practical teaching around the goal of professional training is centered on engineering ability training, training of vocational skill, engineering practice, high and new technology application and professional quality discipline, which trains advanced applying professionals to adapt to the production, construction, management, service.

3. Establishment of BIM system platform with multi course system
   A common BIM platform was established with multi curriculum system among structure, equipment, construction, estimation, project management, contract management, building materials and other different courses by use of BIM technology. The whole life cycle applications and multi collaborative applications in close combination with teaching and BIM can improve the teaching effect.

   the features of modularity, combination and progression
Applied talents training mode based on BIM technology is made up of three modules: basic skills, professional skills and comprehensive skills. Applied talents training mode has the features of modularity, combination and progression, which is not only a modular, but also combine collocation in the major categories according to the needs of different professionals. Content system are progressive, which is made up of three modules: basic skills, professional skills and comprehensive skills. Basic skills are focused on operational skills, professional skills are payed attention to technology application, and comprehensive skills are emphasized the comprehensive practice.

**Strengthening the Construction of "Double Qualified" BIM Technical Teachers to Optimize the Structure of Teachers.** BIM technology "double type" teachers depends on the cultivation of professional teachers training and hiring part-time teachers. Measures of introducing and cultivating and encouraging full-time teachers in-depth enterprise exercise accumulate practice ability of BIM technology. In addition, a relatively stable part-time teachers from enterprises with rich practical experience are built through the cooperation between colleges and enterprises and cooperation platforms, which is also necessary to protect applied undergraduate practice teaching. Multi-level and multi-channel, high starting point engineering practice experienced "double type" teachers have contributed to cultivate students’ engineering ability.

**Strengthening the Construction of Laboratories and Practice Facility.** It’s necessary to strengthen the innovation and design comprehensive new experiment content or research and development of the project based on BIM technology, update experimental projects and equipment, and strengthen and perfect the construction of the campus practice of software and hardware facilities. In addition, there are practice data, such as the specification, standard atlas, and manual, to complete the course design, graduation design and other kinds of practice teaching links in the library. The quality of the selection of teaching materials should be constantly improved, and the self-made teaching materials and fine video lessons construction for the public class and boutique sharing resources should be actively expanded.

**Strengthening the Construction of Practice Bases, Cooperation between Colleges and Enterprises and Platform Construction.** Practice bases construction, cooperation between colleges and enterprises and platform construction should be strengthened through the tightness combination of teaching, scientific research and engineering practice. The operating system of "resource integration, complementary advantages, equality and win-win and common development" should be adhered. The interaction between colleges and enterprises should be carried on to realize the resource sharing. More extensive cooperation are seek by enterprises and colleges in the job recruitment, training, scientific research and application, cultural development.

**The System Construction.** Increasing investment in project funds, serious integration of teaching resources, and building a more common case of BIM platform course system, its characteristic of the complexity and long-term determines that it can be achieved on a stable, long-term teaching management mechanism. The perfect, strict teaching management system, a feasible operation mechanism and an effective teaching management mechanism should be established in order to ensure civil engineering applied talents training mode based on BIM technology is carried out normally and guarantee the teaching quality.

**Summary**

Through using the experience of the advanced experience at home and abroad, studying of all policies of the state, extensively researching enterprise market demand, being combined with the research interview data, changing the traditional teaching method as an opportunity, this paper built applied talents training mode based on BIM technology of the newly built undergraduate colleges civil engineering at cultivating talents as the goal, curriculum system construction as the platform, "double type" teachers as the guide, practice and research combined as a support. Students' engineering ability is improved, and corporate retraining is reduced to achieve professional and
demand, curriculum and engineering professional standards, teaching and production seamless three docking.

It develops technical skills applied engineering talents to meet the needs of the country and the market, which enriches the theory of talent training in Colleges and universities and provides reference for the cultivation of talents in newly established universities in practice.

Acknowledgement

This research was financially supported by the provincial teaching research project of the higher education institutions of Hubei Province (Project number: 2015415).

References


