BIM Teaching Application based on Architectural Design and Education Integration Project of Nanquan Cultural Park

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Abstract

The impressive dissertation has subtly revealed a thought-provoking social phenomenon which is prevalent all over the world, which is hard to learn architecture in higher vocational school. There are a number of reasons for the significant problem. Above all, the author maintains that as a matter of fact, throughout history people of different cultures have regarded complexity of architecture as the most vital cause. Moreover, it is the writer's view that there are good reasons to advocate combination of architectural design practice and education in the long run. Other factor includes the pillaring and propelling role BIM. With due consideration of the analysis above, we may draw a conclusion that 3D trenching really counts in higher vocational education.

Keywords

combination of architectural design practice and education; BIM; higher vocational education.

1. Introduction

"Architectural Design Principles", "Building Structure", "Engineering Drawing" and other courses are the main teaching contents of architectural design that accounting for more than half of the credits of the lower grades of architectural design in our school. Through these practical teaching links, students will be further trained to comprehensively apply their knowledge, independently analyze and solve practical design problems, and cultivate high-quality, applied design talents.

However, students who do not know what to do when it comes to the choice of construction, data and equipment related to the design specification need to design according to the design reference case or the case in the textbook in practice from the current point of view. Some teachers can not combine the current development of the architectural profession with the actual engineering design case to teach students with good design and guidance.

2. Combination of Architectural Design Practice and Education

2.1 Tripartite Win-win

In addition, most of the students who are lacking of good study habits and boring with learning in higher vocational education have poor foundations and learning motivation. A large part of the reason is that students think that what the teacher teaches is not useful for future work. Work is not connected. In this way, practical and more practical teaching methods are urgently needed to stimulate their interest, enhance their learning motivation, and expand the cognitive network of students.

The traditional teaching methods are basically adopted from the content of teaching materials to the teaching mode at present. The teaching of building structure lacks certain teaching conditions, and the students' spatial thinking ability is relatively poor. It is difficult to carry out spatial imagination and

analysis of the structure and function of a building, which leads most students to be unable to master the architectural construction drawings after completing the course. The teaching effect is not ideal, and the most important knowledge-writing skills in the professional position of students are not fully trained and upgraded, which makes it difficult to learn the knowledge of subsequent public building design and architectural construction drawing design. Therefore, it is necessary to break through the traditional teaching methods and try to introduce BIM technology into the traditional curriculum, integrate BIM animation demonstration and building construction model training into the teaching process for forming a diversified classroom of theoretical teaching that model disassembly and assembly paper reading.

It is advisable to use the students' enthusiasm and urgency for the work to introduce the design institute project and employees into the teaching to make up for the lack of school education through the association between the school and the design institute and to turn the indoctrination learning into active work. For the design institute, the technical application talents brought out by them are more appropriate; for the school, the advancement of the times, the teaching objectives are clearer, the teaching medium is more project-oriented; for students, the knowledge and skills are more efficient. The relationship between schools, design institutes and students after the integration of architecture and education is shown in Figure 1.

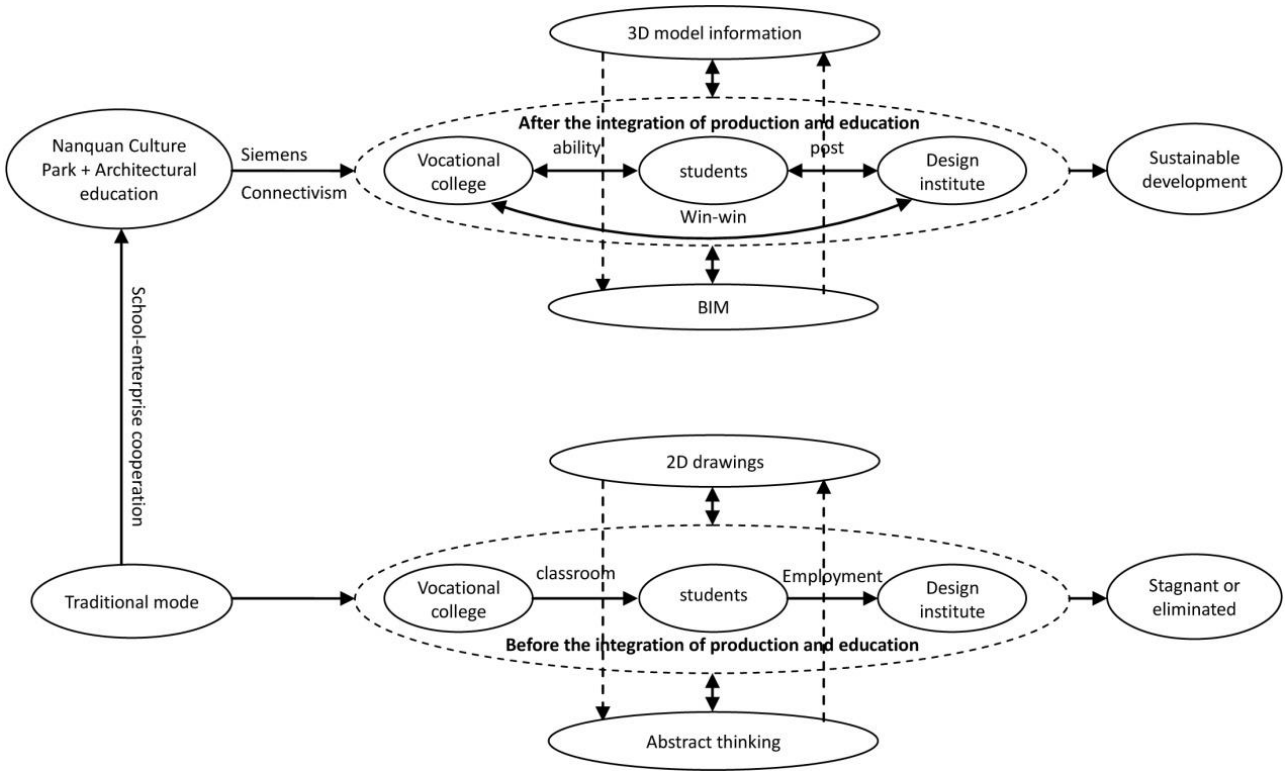


Fig. 1 Relationship between Schools, Design Institutes and Students

2.2 George Siemens-connectivism

George Siemens systematically proposed the idea of relevance in Connectivism: A Learning Theory for the Digital Age. Relevance is a learning theory through the exploration and integration of chaos, network, complexity and self-organization[1]. George Siemens believes that learning is the formation of a network that establishes effective connections between related nodes. Connectivism believes that learning exists not only in individuals but also in specialized nodes. The key to learning is to connect related nodes/information sources to form a learning network[2].

Connectivism advocates the establishment of a learning community. The learning community is required to learn on the basis of the virtual learning community to strengthen the timely connection

between the apprentice and the teacher before and after graduation so that the learner as a long-term member of the learning community instead of a participant in a learning activity that can effectively promote and maintain learning based on social interaction. Learning in corporate positions aims to strengthen the connection between learners and positions in space, enhance the social presence of learners through virtualized bodies, and enhance the realism of the connection between the masters before and after graduation. Corporate positions that promote connections between pre-graduation and real life can enhance learners' interest through role-playing and escalation systems, support a sense of interaction with the design of the school's job scene.

2.3 Production and Education Integration

2.3.1 The Point of Convergence between the Design Institute, the School and the Students

Linking the "teaching design" with some key points in the "Architectural Design of Wenzhou Nanquan Cultural Park"(shown in Figure 2): the knowledge and skills involved in the architectural design of Nanquan Cultural Park are related to the characteristics of the learners and the ability of the post; the design of Nanquan Cultural Park The choice of resources is related to the difficult and difficult objectives of the "Architectural Design Principles" course; the quality objectives required for the architectural design of Nanquan Cultural Park are related to the requirements and needs of the enterprise; the job requirements of the enterprise are related to the teaching feedback.

Fig. 2 Nanquan Cultural Park

2.3.2 Enterprise Resource Development and Application

In view of the key points in the course design, single design, and the difficulties such as Tianzheng and su drawing, the corresponding related elements are integrated, and the technical drawings such as the general plane and the single flat section are combined for practical teaching application[3]. It also expounds the specific ideas, strategies and principles of architectural design, and the implementation process of teaching organization. The student's results are fed back to the design institute[4], and the design institute conducts guidance evaluation and results adoption.Design evaluation index system from five aspects: enterprise, school, teacher, student and effect.

It is evaluated whether the Nanquan Cultural Park is related to the operation, adaptability and fit of architectural design teaching; whether the hard environment and soft environment in the teaching implementation environment are conducive to the development of the Nanquan Cultural Park project and stimulate the desire of students to participate[5]. Whether the teacher can organize and guide well; whether the student can actively participate in the project and actively perform in the position, complete the tasks and contents in the post. Whether the final effect achieves the expected teaching goals and allows students to experience the atmosphere of work, stimulates students' desire to learn. In this way, the level of achievement of the teaching objectives is checked, and according to the feedback information, the teaching design of the integrated design of production, education and teaching is adjusted to improve the rationality of the teaching practice, see Table 1.

Table 1. Production and education integration point

Nanquan Cultural Park Project Stage	Teaching skill point	Student achievement
Task Assignment Data search	Copy site plan, draw the corresponding analysis chart;Find relevant cases, familiar with the specification	Cultural architecture design data set Nanquan culture refining materials
Technical drawing design	Drawing architectural drawings with the sky; quick tips	Site plan; plan; design description
Analysis drawing	Draw a vector or path with CAD, ID, PS	Location; traffic; fire; landscape; sunshine analysis

3. BIM Assisted Teaching

Teachers can use BIM technology to create a standardized component model resource library for enriching the curriculum visual teaching resources and effectively alleviating the current lack of teaching resources and poor student acceptance in the explanation of the knowledge points of the theoretical course. At the same time, the BIM technology is used to form a three-dimensional information model for the planar components of the past, which has a good visual effect and realizes the “what you see is what you get” in the teaching process, which leads to students' interest in learning.

Table 2. BIM technology introduction and traditional teaching mode comparing Take the "sinking toilet drainage system" as an example

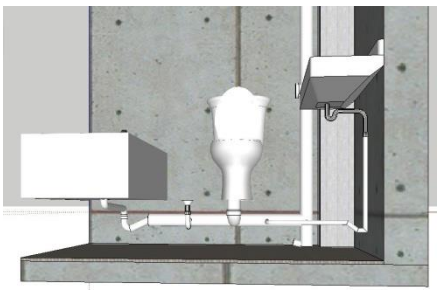
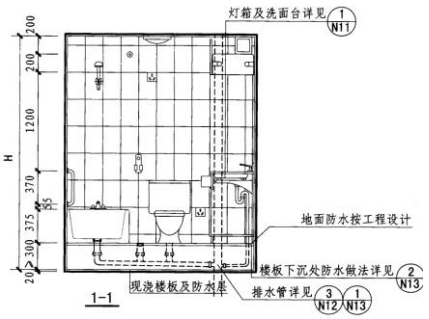
Number	Teacher task(BIM)	Student task(BIM)	Teacher task(2D)	Student task(2D)
1 Before class	Wechat QR code	 vr in cellular phone	Prepare teaching content and teaching materials	Preview textbook
2 In class	 BIM situational cognition		 Traditional drawings are difficult to understand	
3 After class	Online tutoring	Students' online communication after class	none	finish homework

Table 2 shows the three-dimensional model and two-dimensional flat and elevation maps of building components. During the teaching process, the three-dimensional solid and two-dimensional planes of the door and window members can be viewed simultaneously, and the students' impression of the construction plane is deepened[6]. The model based on BIM technology can not only realize the visual simulation of 3D geometric shape but also contain a large amount of non-geometric information, such as information of materials and information of components, so that the teaching content is more visual and intuitive.

The students' practical ability is strengthened and the students' understanding of building construction knowledge is deepened through the teaching application of the BIM-based architectural construction course for the students of Wenzhou Vocational and Technical College. The students' willingness to learn has been significantly enhanced and their professional skills have improved significantly. Through the test results on the engineering drawing software, the students' ability to map construction drawings is enhanced; the student's scores are also significantly improved compared with the past; the professional students won the third prize of the provincial competition in the "Construction Engineering and Drawing" competition of the National Vocational College Skills Competition.

4. Conclusion

It providing the conditions of integration of production and education and achieving the win-win effect of colleges, enterprises and students by introducing BIM into the practice of Nanquan Cultural Park architectural design project. At the same time, BIM technology feeds back the teaching of building structure and builds a virtual teaching system for building structure. That creates different learning environments and learning paths through digital technology which improves students' enthusiasm and initiative in class by way of using this system to assist in the construction of multi-teaching. The combination of "virtual and real" and mixed teaching methods can ultimately provide a theoretical basis for students to construct a rich and diverse knowledge system.

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