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# Practice research on BIM teaching model in adult higher education based on "1+X" certificate system -- a case study of Lingnan Construction Construction modeling with 3D data

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**Abstract.** The "1+X" certificate system is another change in higher education, which will bring significant changes to the field of education. The purpose of this reform is to improve the level of vocational and technical talent cultivation under the current mechanism of education and talent cultivation. At the same time, BIM technology is a product of a new round of information technology transformation and the further development of the knowledge economy, and is an inevitable trend of deep integration of industrialization, urbanization, and informatization. Taking the modeling of Lingnan architecture using real-life 3D data as an example, we promote the "1+X" talent cultivation model by first building a knowledge framework, then strengthening practical abilities according to modules, organizing teaching and assessment, dividing the knowledge framework and vocational skills into modules according to courses, strengthening practical teaching, and building teaching resources, Cultivate composite technical skills talents with basic 3D data BIM building modeling ability combined with the "1+X" certificate, providing a certain reference for adult higher education.

**Keywords:** "1+X" certificate system, BIM technology, architectural modeling, course teaching.

## 1. The significance and value of the research

With the rapid development of the new generation of information technology, urban intelligent informatization has become the "fourth wave" after industrialization, electrification and informatization. BIM technology is the product of a new round of information technology reform and the further development of knowledge economy, and is an inevitable trend of the deep integration of industrialization, urbanization and informatization. The challenge brought by the educational reform of vocational education front. The "20 Articles of Vocational Education" promoted the in-depth development of vocational education reform through reform measures such as the combination of education and training, the integration of production and education, the "dual" education of schools and enterprises, and the pilot of the "1+X" certificate system. At the same time, explore the reform of professional personnel training system and teaching management mode based on credit bank, and realize the organic integration of academic education and social training. The "1+X" certificate is the product of a new round of information technology reform and the further development of the knowledge economy, and is an inevitable trend of the deep integration of industrialization, urbanization and informatization.

Collect a large number of achievements and literature materials related to "higher education quality", "1+X certificate", "BIM technology" and "Lingnan Architecture", and conduct detailed analysis and research. On the one hand, the scientific and comprehensive cognition of the research topic can be obtained, so as to grasp the overall writing direction of the results; On the other hand, materials and theoretical basis for demonstration are obtained from combing and analysis to establish a profound literature support foundation for research results. Taking "quality improvement of higher education" as the main line, this paper reviews the historical development of Chinese higher education in the process of adult higher education and academic qualification improvement, and puts the research in the context of the implementation of Chinese adult higher education, so as

to ensure the integrity, coordination, relevance and sustainability of the research. This paper uses the comparison of adult higher education models and approaches in different professional directions to reveal the characteristics and methods of adult higher education in different professional directions, as well as their influence on each other and their referability, especially in the context of lifelong learning, the comparative practice of "1+X" certificate in the teaching model and talent training approach of adult higher education under the framework of teaching.

## 2. The basis and conditions of the research

Based on the Guangdong Education and Teaching Achievement Award cultivation project - based on "BIM Engineering Center", Lingnan BIM Technology Application Collaborative Innovation Center, Guangdong BIM Technology Public Training Center, BIM off-campus practice Teaching Base of Guangdong Academy of Building Science (Guangdong Education Gao Han (2015) No. 24), Guangdong Vocational Education "Innovation Strong School Project (2014-2020) "--BIM Engineering Center and other projects of school-enterprise collaborative talent training, Construction technology BIM(Building Information Modeling direction) professional construction and talent training model reform research and practice (JG2012007), and" BIM Building Modeling "provincial quality open course, participants, We continue to develop high-quality teaching and training, "1+X" certificate training and assessment base around the provincial second-class brand professional projects of architectural animation technology.

## 3. Case analysis of Lingnan Builder building modeling with 3D real scene data

Lingnan craftsmen building modeling case, the content is divided into Lingnan craftsmen building layout, first floor creation, door and window family production, second floor creation, roof production, stair railing creation, document management and roam production, enterprise practice 8 tasks. This architectural modeling case teaching is based on the provincial high-quality open course, intelligent vocational education and other platforms, and the BIM engineering development center of the school. It carries out "four-in-one" project-based teaching project and practical project, implements the student-centered teaching concept, and adopts the online and offline mixed teaching mode. The course design is shown in the figure.

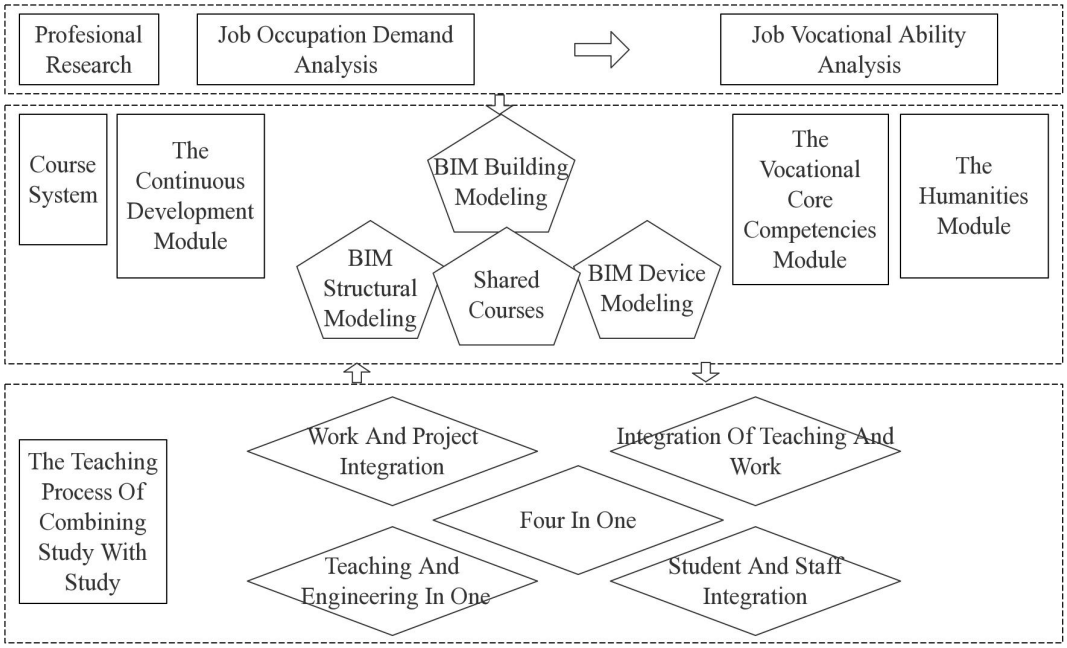



Fig. 1Curriculum architecture and teaching model diagram

### 3.1 Basic teaching strategies of Lingnan Builders

3.1.1 Teaching philosophy

Student-centered, guided by real and productive practical training projects, project teaching, case teaching, scenario teaching and work process-oriented teaching are adopted, and various teaching methods such as heuristic, inquiry, discussion and participation are widely used to realize the integration of classroom and work scenes, and the integration of works and projects. The "four-in-one" teaching mode, which integrates teachers and engineers and students and employees, breaks through the important and difficult points of teaching. Create a typical working situation of BIM modelers -- modeling service, introduce knowledge by integrating Chinese infrastructure and Luban craftsman spirit, strengthen students' national confidence and cultural confidence, and inspire students' pride in Chinese power.

Based on the work tasks of BIM modelers, integrate the course content and the "1+X" certificate BIM skill level examination center, help students participate in the competition and the "1+X" certificate BIM skill level certificate examination, and implement the "Post Course Competition Certificate" accommodation. Adopt multi-dimensional evaluation method to realize the fairness of evaluation; The evaluation uses AI intelligent scoring system to improve the evaluation efficiency.

3.1.2 Teaching methods

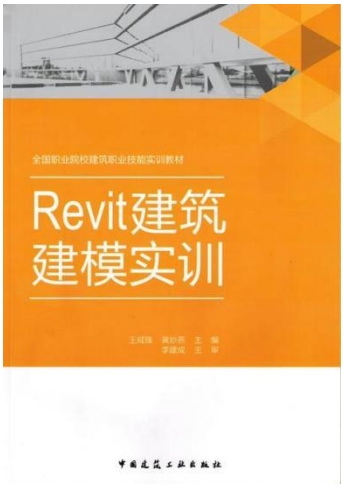
(1) Task-driven approach. The teacher sets the layout task of the model according to the teaching content, and the students complete the task in small groups according to the knowledge they have learned, so as to break through the teaching difficulties.

(2) Case analysis. According to the actual developments of BIM technology development and students' interests, typical cases of BIM technology application are analyzed to help students improve their cognition, and the key points of this section are analyzed and summarized;

3.1.3 Study the Fa

(1) Organize students to conduct classroom inquiry activities through collaborative inquiry method and group discussion method, give full play to the leading role of gifted students, create conditions for members to help each other, and cultivate team cooperation ability;

(2) Independent learning method. Pre-class preview requires students to learn independently




through the provincial fine open course platform to reserve knowledge and cultivate students' self-learning ability.

### 3.2 Teaching methods and resources of Lingnan Builders

Construction vocational skills training textbook for National vocational colleges, Revit Architectural Modeling Training, Building Industry Press.

Fig. 2

Self-compiled loose-leaf teaching materials and BIM workbooks, including typical work cases of BIM projects, BIM job responsibilities, and the basic process of creating BIM component families.

The basic software required for teaching includes CAD picture viewing software, Revit 2018, virtual simulation software and other general related software.

Fig. 3 CAD see drawing software

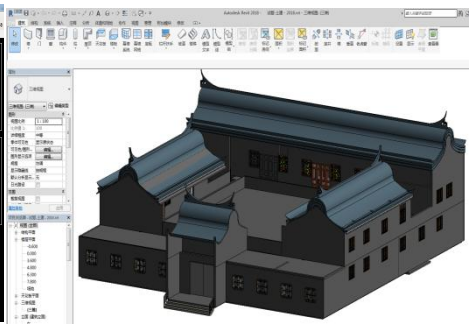


Fig. 4 Revit 2018

### 3.3 Basic flow chart of Lingnan Builders' teaching

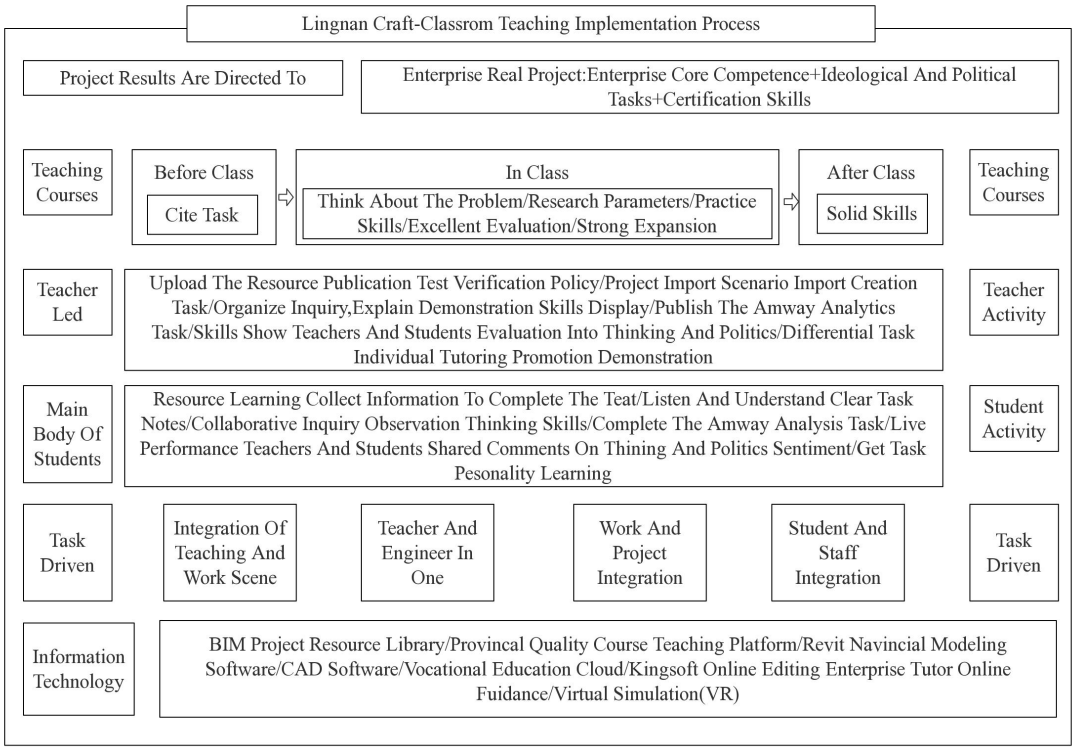



Fig. 5

### 3.4 Schedule of teaching activities of Lingnan Builders

Through the actual operation demonstration and learning of Lingnan construction project, I am familiar with the problems reflected in BIM modeling, and break through the teaching difficulties. At the same time, I completed the basic requirements of practical operation assessment in the "1+X" building information Model certificate, understood the basic knowledge of civil construction, basic operation of Revit, mastered how to create architectural models with Revit, and cultivated the students' parametric modeling ability and three-dimensional component design thinking ability. To enable students to produce various models and related information generated in the design and construction of architectural engineering into BIM and its related 2D engineering drawings, 3D

geometric models and other related graphics, models and documents that can be used for engineering design, construction and subsequent applications. Through the operation of BIM professional application software, cultivate the comprehensive application ability of BIM technology.

Table 1

| Weekly | Teaching module | content of courses | Class hours | | remarks |
|---|---|---|---|---|---|
| | | | theory | Practical operation | |
| 1 | Lingnan jiangzhu | overall arrangement | 1 | 1 | |
| 1 | | First floor creation | 1 | 1 | |
| 2 | | Doors and windows zu making | 1 | 1 | |
| 2 | | Two-layer creation | 1 | 1 | |
| 3 | | Roof making | 1 | 1 | |
| 3 | | Stair railing creation | 1 | 1 | |
| 4 | | File management, roaming production | 1 | 1 | |
| 4 | | Enterprise practice | 1 | 1 | |
| 5 | Component family | Cognizant family | 1 | 1 | |
| 5 | | Set the family environment | 1 | 1 | |
| 6 | | Create a column family | 1 | 1 | |
| 6 | | Create a door and window family | 1 | 1 | |
| 7 | | Create a General Component | 1 | 1 | |
| 7 | | Create a mass model | 1 | 1 | |
| 8 | | Create parametric families | 1 | 1 | |
| 8 | | Enterprise practice | 1 | 1 | |
| 9 | file management | Create BIM schedule and construction drawings. | 1 | 1 | |
| 9 | | Room marking and area analysis, rendering the drawing. | 1 | 1 | |
| 10 | "1+X" certificate BIM skill level training comprehensive training" | Study the "1+ X" certificate BIM vocational skill level examination outline and explain the theoretical | 1 | 1 | |
| 11 | | Creation of "1+X" Certificate BIM Skill Level Component | 2 | 2 | |
| 12 | | Creation of Parameterized Family of BIM Skill Level of "1 +X" | 2 | 2 | |

| | | | | | |
|---|---|---|---|---|---|
| 13 | | “1+X”Certificate BIM skill level building model comprehensive problem explanation and | 2 | 2 | |
| 14 | | "1+X" certificate BIM skill level building model comprehensive problem explanation and | 2 | 2 | |
| 15 | | Enterprise practice | 2 | 2 | |

## 4.the application value and thinking of teaching mode practice research

Higher education is a special form of education, which is mainly to update, supplement, expand and improve the knowledge and skills of professional and technical personnel, further improve the knowledge structure, improve the creativity and professional and technical level. According to this feature, the talent training mode of "1+X" is promoted by building knowledge framework first, and then strengthening practical ability according to modules. In order to facilitate teaching organization and assessment, knowledge framework and vocational skills are divided into many modules according to the course. As long as learners can successfully complete knowledge and skill training of each module and complete credit bank, the knowledge framework and vocational skills are divided into many modules. Can successfully complete adult higher education.

It is possible to further improve the lifelong learning credit bank and promote the construction of a learning society. Based on the research of this project, the effect evaluation is carried out to improve the lifelong learning system, build a credit bank and build a learning society. The "1+X" certificate system will focus on serving the needs of the country and market demand, so the "X" certificate will represent the national strategic development direction of technology or the development of new industries in new areas, only in accordance with this direction, in order to train the national strategic shortage of talents or social demand for new technical talents. Only in order to realize the original intention of adult higher education to update, supplement, expand and improve the knowledge of professional and technical personnel, can we achieve the purpose of developing the potential ability of talents and improving the overall quality of the team.

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