

Localization Development of Course Resources Based on Training Package

—Taking the Course of Engineering Cost Software Application as an Example

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Abstract—the paper constructed an open "training package" curriculum resources. This study mainly adopts discussion method, questionnaire survey method and project method. At four grades of the primary, intermediate, advanced and special, the paper constructed training package curriculum resources for the course of Engineering Cost Software Application. Ultimately, complete practice shows that training package-type curriculum resources are open, interoperable, progressive and well compatible. Both schools and enterprises all can use these resources. This has a certain role in promoting the practical operation ability of teachers and students.

Keywords—Training package, Course resources, Cost, Software

I. INTRODUCTION

The Department head of Vocational and Adult Education of the Ministry of Education clearly emphasized that the sustainable development ability of the student is not strong, and the teaching mode and textbook system cannot meet the development needs well. At present, the curriculum resources is advantageous to the position and vocational ability, but there are still some shortcomings in the combination of vocational skills and positions: Curriculum cannot combines with the positions. The division of resource grades is not obvious, and the requirement of different learners are not taken into account; curriculum resources of vocational education lacks standardization and institutionalization; the curriculum resources are not systematized and continuity, which is not conducive to the sustainable development of position.

Australian "training package" system has been relatively mature^{[1][2]}. Australian vocational education training package mainly includes national and non-national certification. The non-national certification incorporates study strategies, assessment and professional development materials [3]. By the national qualifications of the training package, the Australian Qualification Framework (AQF) has been formed. To realize all kinds of education interoperability, complementary education at different levels, and interconnection between pre-employment and post-employment education. Finally, an orderly hierarchical structure of education has been formed^[4]. The development of training package in China is relatively less [4-6]. This study adopted discussion method, questionnaire and project method. All the society, school, industry and government carried out the research. Firstly, this paper analyses the object of curriculum resources teaching, and then analyzes the corresponding professional ability based on the real project. To integrate industry norms and standards, the paper develop systematic, compatible and localized excellent resource bank and "training package" curriculum resources. For improving the quality of vocational education training in China, the paper explores a new way of curriculum construction.

II. THE PROCESS OF COURSE RESOURCE DEVELOPMENT

In order to determine tasks, the main areas of the students is analyzed. According to the tasks, the paper summarized the core vocation competence and the courses. TABLE I.

TABLE I. ANALYSIS OF CORE COURSES

| Work Field | Work assignment | Core vocation Competence | Courses |
|--|---|---|---|
| 1. Engineering construction drawing design field | 1-1 Selection and comparisons of Project Design | 1-1-1 Ability to read engineering drawings 1-1-2 Ability to calculate the design price | Mapping and Construction of Construction Engineering Building Structure |
| | 1-2 Establishment and Review of Engineering Project Design Budget | 1-2-1 Ability to read engineering drawings 1-2-2 Ability to calculate engineering quantity 1-2-3 Ability of engineering valuation 1-2-4 Ability to compile design quota 1-2-5 Ability to review design Budget | Construction engineering quantification and cost estimation Building Installation Engineering quantification and cost estimation |

Key project of vocational education and teaching reform in Shandong province in 2019, serial number: 2019051.

Key project of the 13th five-year plan -- Research on localization development of vocational skill upgrading system for construction migrant works based on training package.

| Cont. to TABLE I. | | | |
|-----------------------------------|--|---|---|
| 2. Engineering construction field | 2-1 Establishment and Review of Engineering Settlement | 2-1-1 Ability to read engineering drawings 2-1-2 Ability of construction technology 2-1-3 Ability of construction management 2-1-4 Ability to compile and apply construction quota 2-1-5 Ability to calculate engineering quantity 2-1-6 Ability to claim 2-1-7 Ability to manage construction finance 2-1-8 Ability to analyze material price difference 2-1-9 Ability to manage contracts 2-1-10 Ability to apply laws and regulations | <i>Mapping and Construction of Construction Engineering</i> <i>Building engineering CAD</i> <i>Construction Technology of Construction Engineering</i> <i>Revit modeling</i> |
| 3. Engineering completion field | 3-1 Establishment of completion Budget | 3-1-1 Ability to read engineering drawings 3-1-2 Ability to claim 3-1-3 Ability to manage contracts 3-1-4 Ability to prepare final accounts for completion | <i>Construction engineering quantification and cost estimation</i> <i>Building Installation Engineering quantification and cost estimation</i> |
| | 3-2 Economic Analysis of Engineering Cost | 3-2-1 Ability of economic analysis of engineering cost 3-2-2 Ability to deal with completion costs | <i>Application of Engineering Cost Software</i> <i>Application of Building Installation Engineering Software</i> |

The paper developed training packages for different learners including Higher Vocational colleges, spring college examinees, second-level cost engineers and first-level cost engineers in China. According to core profession competence and examination syllabus, the paper determined the assessment criteria. According to students' cognitive rules, the

training package is divided into four levels: primary, intermediate, advanced and super. According to standard requirements of the industry enterprises for completing the tasks, the paper determined the training objectives and contents. TABLE II.

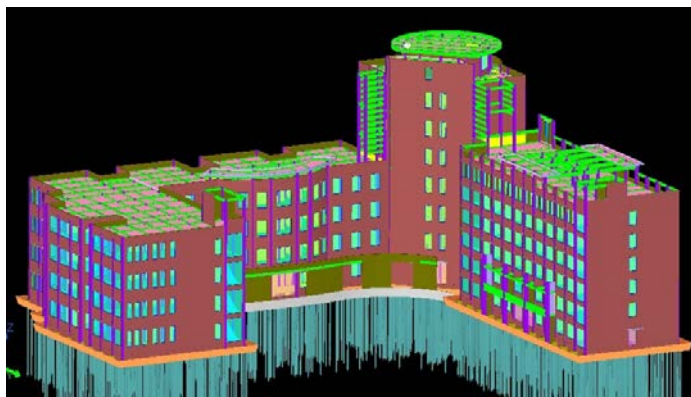
TABLE II. COURSE TRAINING OBJECTS AND "TRAINING PACKAGE" RESOURCES

| No. | Prefect object | Assessment standard | Level | Industry and Enterprise Standard Requirements | Aim | Training package content |
|-----|----------------------------|--|----------------------|---|--|--|
| 1 | Higher Vocational colleges | Ability to compile and apply construction quota Ability to calculate engineering quantity Ability to claim Ability to manage construction finance Ability to analyze material price difference Ability to manage contracts Ability to apply laws and regulations | Primary package | Including the most basic components such as the steel bar sampling, modeling, frame columns, frame beams, cast-in-situ slabs and filled walls. Including The modeling, cramping and calculation of secondary components to construct columns, ring beams, connecting beams, beams and other basic components. | The aim is to complete component modeling, complete the steel bar, civil valuation summary. | 1. frame column 2. frame beam 3. cast-in-place slab 4. infill wall 5. lintel 6. Typical Basis 7. Strip Foundation 8. Raft Foundation 9. Independent Foundation |
| | | | Intermediate package | Structural columns, girders and load-bearing walls. Brick-concrete structure is a kind of relatively detailed and trivial structure. There are many trivial and detailed structures modeling in the exterior wall of balcony, such as eaves, shape. | The aim is to complete component modeling and valuation summary. | 1. structural column 2. girth 3. bearing wall 4. Beams, doors and windows 5. pile foundation |
| | | | Advanced package | Frame-shear wall structure uses reinforced concrete wallboard to replace the columns and beams of the frame structure. It can bear the internal forces caused by various loads and effectively control the horizontal forces of the structure. Modeling components are mainly columns, shear-walls, beams, floors and filled walls. Secondary members include structural columns, ring beams, coupling beams, etc. | The aim is to complete component modeling and valuation summary. | 1. frame column 2. shear wall 3. frame beam 4. cast-in-place slab 5. infill wall 6. Strip Foundation 7. pile foundation |
| 2 | Spring college examinees | Outline of Spring College Entrance Examination <i>Application of Cost Engineering Software</i> | Primary package | Firstly, Primary package built each floor according to the project information, and then adjusted the project setting information. The next step is to draw the orthogonal axis network, establish the components and input the steel bar information correctly. At last, Primary package calculated accurately the quantity of steel bars in frame structure and exported the report forms, and saved the files the designated location. | The aim is to complete the modeling and valuation summary of basic components of steel bar in frame structure. | 1. frame column 2. frame beam 3. cast-in-place slab 4. Report Export |

| Cont. to TABLE II. | | | | | | |
|--------------------|-----------------------------|--|------------------|--|--------------------------------|--|
| 3 | Second-level cost engineers | National Examination Program for Second-level Cost Engineers | Advanced package | Valuation summary, statement export, cost summary. | Cost aggregation | 1. Cost aggregation |
| 4 | First-level cost engineers | National Examination Program for Second-level Cost Engineers | Premium package | Premium package established and audited budget estimate, budget, settlement and completion settlement. Premium package prepared and audited bill of quantities, bid base and tender quotation, signing and adjusted project contract price, payment project money and calculation of claim cost. | Cost summary, price adjustment | 1. Cost aggregation 2. Modify price |

A. Primary training package for Higher Vocational Colleges

The frame structure training package includes the basic sampling model of steel bar, such as frame column, frame beam, cast-in-place slab, and wall. The training package models, draws and calculates the secondary construction such as column, ring beam, connecting beam, crossbeam and other basic components. In the foundation type, the typical strip foundation, raft foundation and pile foundation are selected. This basic structure enables students to master basic commands and operations quickly. On this basis, the primary "training package" was developed.

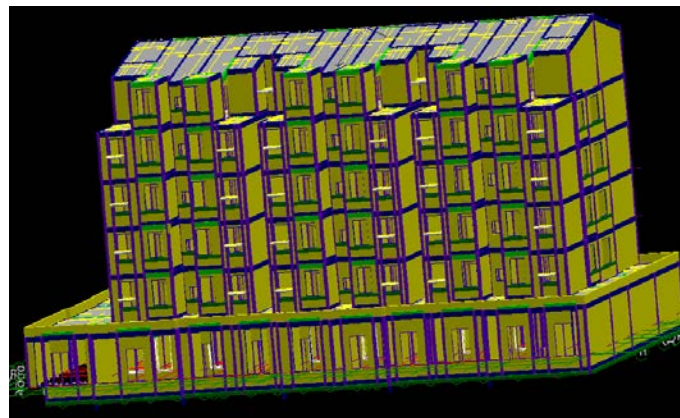


These are some information for Fig. 1—Name: 2 # Teaching Building, Building area: 588m², Number of level: The number of levels in ABCD zones is 6, 7, 4 and 4, respectively, and Usage: Teaching Building, Structure type: frame structure.

Fig. 1. Development Project "Training Package" for Frame structure

B. Intermediate training package for Higher Vocational Colleges

The brick-concrete structure includes the main load-bearing components such as structural columns, girders and load-bearing walls. Reinforced concrete and brick structure is a kind of relatively detailed and trivial structure type. There are many trivial and detailed structural modeling in the exterior balcony wall, such as eaves, shape etc. This part is medium difficulty, and on this basis, the researcher developed the intermediate "training package".

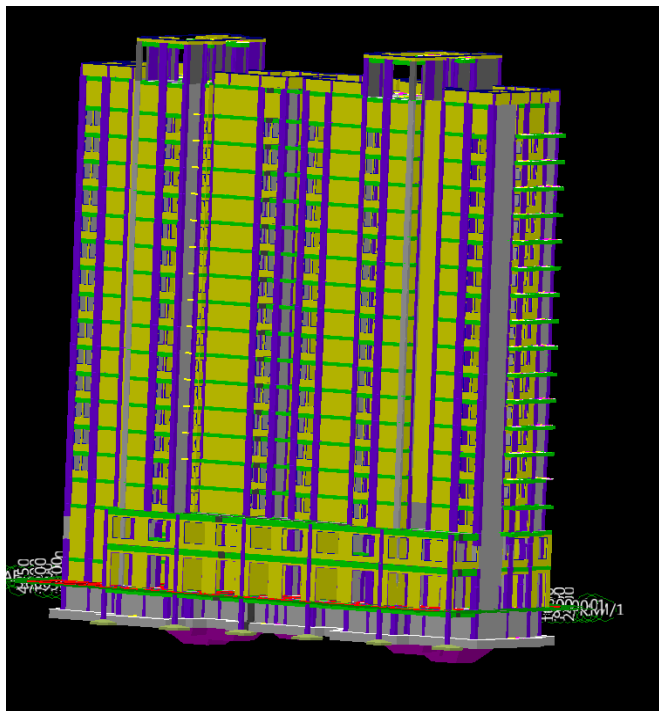


These are some information for Fig. 2. —Name: 3 # Mall Building, Building area: 4125m², Number of level: 6, Usage: Shops located on level 1 along the street. Residential buildings located on level 2-6, Structure type: brick-concrete structure.

Fig. 2. Development Project "Training Package" for Brick-concrete Structure

C. Advanced training package for students in Higher Vocational Colleges

The modeling components of frame-shear wall structure mainly includes columns, shear walls, beams, floors and filled walls. Secondary components include structural columns, ring beams, coupling beams, etc. In terms of structure type, it becomes more complicated. On this basis, the research developed the advanced "training package".



These are some information for Fig. 2. —Name: 4 # residential building, Building area: 14500m2, Number of level: 8, Usage: Ordinary Residence, Structure type: frame-shear wall structure.

Fig. 3. Development Project of "Training Package" for Frame-Shear Wall Structures

III. CONCLUSION

The research developed a progressive and integrated training package for the course of "Application of Engineering Cost Software", which is for different learners both inside and outside the school. The training resources are compatible and cross-used. And they rely on real project and form a system.

In addition, the researcher will adjusted and update timely the development of training packages according to the training target and training requirements. They can use results of this study, who are cost consultation enterprise, industry training, cost engineering in Higher Vocational colleges, engineering project management of undergraduate colleges, other related specialties and the development of teaching materials. Based on the form of "training package", the researchers with Dalian University of Technology Press has used part of the content of this research to develop high-quality resource information textbooks. The idea of resource development and the curriculum resources are certainly valuable on extending application TABLE I.

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