Research on the Construction and Application of Project Oriented Instructional Model Based on Work Process—A Case Study of Information Technology Fundamentals Course in Vocational Institutes

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\textbf{Abstract.} This paper analyzes the existing problems in the instruction of information technology fundamentals course in vocational education, designs the processes of the construction of project oriented instruction based on work process, and constructs the project-oriented instructional model based on work process in vocational education. The model was used in the instruction of information technology fundamentals course. A quasi experimental study was conducted to validate the effecteness of the model. The result shows that project-oriented instructional model based on work process can strengthen the weak link between theory and practice which used to be a problem existing in information technology fundamentals course in vocational education. It is conducive to the vocational institutes to cultivate the practical talents and technical talents which meet the requirements of social development.

\textbf{Introduction}

The practical instruction content of information technology fundamentals course in vocational institutes is no longer the verification of the theoretical content, but focus on students' professional skills training. So that students can meet the requirements of the job. Practical instruction became an independent part and separate from theoretical instruction in the traditional practice instruction in vocational education. Practical instruction pays attention to the external knowledge and skills, highlights the practicability and pertinence of profession. But the cultivation of the abilities for judgments making and action taking in the context of specific work is still insufficient. Then, students may don’t know how to do when the original professional knowledge and skills are no longer suitable for the new job \cite{1}.

Modular instruction method which is a kind of skill storage based on a static level instead of the ability construction in a complete instruction process. It is difficult for students to obtain the key abilities for vocational activities when the complete process of instruction which based on the information acquisition, plan, implementation and evaluation was absent.

Vocational education should focus on the actual requirements of the job, and develops students’ technics, knowledge and working ability for their future job. Project-oriented instruction based on work process is a cross boundary instruction method which combines professional disciplinary system with working process system. It pays more attention to the cultivation of students' comprehensive quality, such as the ability in working, knowledge application, creativity and so on. It is conducive to the instruction of information technology fundamentals course in vocational education and the cultivation of applied-type skilled talents which can meet the requirements of social development. It has become one of the hot research spots in the curriculum reform of vocational institutes.
The Processes of the Construction of Project-oriented Instructional Model Based on Work Process

Project-oriented instructional model based on work process was constructed based on the analysis of students' professional ability. It needs the identification of typical work tasks according to the practical work, the setting of the instructional objectives, the design of corresponding instruction projects, and the implement of project instruction activities according to the complete working procedure. It includes the following five processes.

The Analysis of Work Process and Professional Ability

The analysis of work process and professional ability is the process of the decomposition of tasks in vocational activities which related to students’ future occupation and should be complete by students in different majors in vocational institutes [2]. Vocational activities in different vocations were divided into relatively independent task modules according to the analysis of work process and professional competence. Then, specific tasks in every work project were set up according to the analysis of task modules. Finally, detailed descriptions were made to explain the vocational abilities which needed for the completion of tasks.

The Design of Project-oriented Instructional Objectives Based on Work Process

The project-oriented instructional objectives of information technology fundamentals course in vocational education should be set up according to the requirements of the practical professional position. The following are four objectives which should be achieved by means of project learning.

(1) The objectives of vocational abilities. The educational objectives are career-orientated and focus on the specific vocational position or position group or technology fields.

(2) The objectives of knowledge abilities. Know and understand are two kinds of learning level of knowledge abilities according to the instructional principle of necessity and sufficiency in vocational institutes. The learning objective of “know” means to recognize knowledge, discriminate and identify facts or evidence, illustrate, describe the basic characteristics of an object. The learning objective of “understanding” means to build up the internal logical connection and relationship between knowledge, interpret, deduce, distinguish, extent, provide evidence, collect and organize information, etc.

(3) The objectives of practical skills. The cultivation of talents with high skilled is the educational objectives of vocational institutes which highlights the learning of operation skills in vocational institutes. There are two kinds of learning objectives of practical skills, imitation and operation. The instructional objectives of project-oriented instruction based on work process are more focus on the instructional goal of practical skill. The tasks of knowledge instruction should be combined with the tasks of skill instruction, to improve student’s understanding to topics or accumulate background knowledge for specific solution to the problem or design works.

(4) The objectives of emotional attitude. Emotional education reflects the cultivation of students' professional ethics and professional quality in the instruction in vocational institutes. Experience, perception, internalization are the three kinds of objectives of emotional attitude which rank from low to high according to its learning level.

The Principles of the Selection and Design of Instructional Projects

The selection and design of instructional projects directly determine the effect of project-oriented instruction. There are four basic principles which should be followed in the project-oriented instruction based on work process in the information technology fundamentals course in vocational institutes.

The first principle is student-centered. Students are the principle executor of the tasks of projects. They overcome all difficulties through continuous learning and practice, and finally complete the project tasks based on their knowledge and skills.

The second principle is practice-centered. The curriculum setting of vocational institutes should highlight the occupationality, applicability and practicality of curriculum, the cultivation of abilities
and qualities and technology application ability. The vocational institute education curriculum system should be constructed according to the requirement of industry.

The third principle is opening. It means the design of projects should not in unidirectional and closed structure. It should be a multiple and cyclic development structure with multiple participants which could enhance the practicality and feasibility of projects.

The fourth principle is propriety. All resources and conditions for the implement of the project tasks should be taken into comprehensive consideration in the design of projects to enhance the propriety of projects, such as time, place, teachers, students, social practice, hard resources, soft resources, and so on.

The Implementation Process of Project-oriented Instruction Based on Work Process

The implementation process of project-oriented instruction could be divided into the following five steps.

(1) Identify project tasks. Whether project-oriented instruction based on work process is successful or not depends on the formulation of the project tasks. The topics, objectives and content of tasks and the integration with information technology fundamentals course in vocational institutes are needed to be taken into consideration in the process of the identification of project tasks. [3]

(2) Divide project group. All factors involved in the task should be organically combined together in the form of heterogeneous group for cooperative learning and practice as soon as the project tasks were identified. Group members have different roles. They communicate and coordinate in a variety of ways, and complete a specific working project under the guidance of common objectives.

(3) Make project plan. The project plan was composed of a series of sub-plans which have closed relationship. It defines the deployment of project task, personnel allocation and project resource allocation. The effect of project-oriented instruction based on work process depends largely on whether the project plan is comprehensive and thoroughly or not.

(4) Implement project plan. Students identify their own tasks and the group member cooperation form according to the optimal project plan which set by teachers or themselves, and completes the project according to the steps and procedures of project plans.

(5) Achieve successful project outcomes. The learning outcomes of project-oriented instruction based on work process not only embody in the accumulation of knowledge, but also in the improvement of intelligence, skill and attitude during the practice in different activities or works in project tasks. The latter outcomes embody the comprehensive professional abilities of students. It is more important than the former outcomes.

Instructional Feedback and Evaluation of Project-oriented Instruction Based on Work Process

The instructional evaluation of project-oriented instruction based on work process in information technology fundamentals course in vocational institutes should thoroughly integrate the characteristics of work process. The following five methods should be introduced into the instruction evaluation mechanism to reflect the outcome of this instructional model. Then, teachers could know whether students achieve the expected learning goals, have the abilities to learn, work and innovation, and have the abilities for a desired job position.

(1) Using professional standardization evaluation to emphasize the connection with the professional scene, and actively promoting enterprise personnel to develop instructional evaluation criteria.

(2) Establishing the evaluation system in different phases and levels. There is a great gap in the knowledge and skills between students in higher vocational institutes. In order to encourage all students, teacher only evaluates the best performance parts of students in every phrase of project task. But the weakness were pointed out by teacher and gradually improved by students under the guidance of teacher. The evaluation of learning about specific work task could be conducted after the task was completed. The overall course grade is the comprehensive evaluation results of multiple work tasks.
Both of formative assessment which was conducted during the instructional process and summary evaluation which were conducted at the end of the course were used in the evaluation. But the former is much more important than the latter [4].

Using portfolio assessment as evaluation tool. Portfolio comprehensively shows the development of skills and learning abilities in a certain field in a certain period. It can promote the integration of evaluation and instruction [5].

The project evaluation was carried out by multiple evaluation subjects, such as self-evaluation, student evaluation, teacher evaluation and so on.

**The Construction of Instructional Model of Project-oriented Instruction Based on Work Process**

The project-oriented instructional model based on work process were constructed in the perspective of instructional design and based on the analysis of its characteristics and the characteristics of information technology fundamentals course in vocational institutes. It was shown in Fig. 1.

The analysis of working process and professional ability in the first part of the model is very important. The abilities which were needed for students in different vocations or vocation groups in different majors in vocational institutes were decomposed into relatively independent work projects. Then, working projects were decomposed into concrete tasks which could cover the vocational abilities for the implement of the job.

The cultivation of vocational abilities was putting into the key place in the second part of the model. The project-oriented instructional objectives were set up according to the requirements of employment position. The instructional contents were designed and the structure of students’ knowledge, ability and quality were set up according to the cultivation of vocational abilities and vocational qualities. So that students could achieve the necessarily practice skills and vocational qualities for specific industry or position via the training of different practical instructional projects.

In the third part of the model, projects were design to organize and present the learning contents. Learning contents were divided into several closely related and also relatively independent topics according to the logic system of subject, social demands for talents and the experience of learners. Every topic has basic knowledge, methods and practice skills, etc.

In the fourth part of the model, the allocation and cooperation between students are both important. Students focus on the completion of project tasks. One of their common goals is to enhance their knowledge abilities and vocational abilities.

In the fifth part of the model, vocational standardization evaluation were introduced into the instructional evaluation to improve and promote the development of students’ vocational abilities.

![Diagram](image-url)

**Figure 1. The Project-oriented Instructional Model Based on Work Process.**
Analysis on the Implementation Effect of Project-oriented Instructional Model Based on Work Process

A quasi-experience was conducted in this research. SPSS was used to analyze data. The samples are class A which is experimental class and class B which is the reference class. All students are major in English education in a vocational technology institute in Guangzhou.

Table 1 shows the corresponding data of scores of students’ abilities in three topics. They are text layout design, table design and graphic & text layout design. Significant probability of these three topics are all larger than 0.05 (P<0.05). It shows that there is significant difference between class A and class B. The data from the row of “equal variances not assumed” in Table 1 should be taken as the result of t-test.

Table 1 also shows that the significant probability of the Sig. (2-tailed) t-test of class A are smaller than class B in all of these three topics. The corresponding data are 0.03<0.05, 0.011<0.05, and 0.005<0.05. Then, it could be concluded that the operational capability of class A is significantly superior to class B in these three topics.

<table>
<thead>
<tr>
<th>Topic one</th>
<th>Equal variances assumed</th>
<th>F</th>
<th>Sig.</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Mean difference</th>
<th>Std. Error Difference</th>
<th>95% confidence Interval of the Difference</th>
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<td></td>
<td></td>
<td>5.74</td>
<td>.000</td>
<td>2.195</td>
<td>109</td>
<td>.000</td>
<td>2.9883</td>
<td>1.36111</td>
<td>.29065</td>
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<tr>
<td></td>
<td>Equal variances not assumed</td>
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<td>.110</td>
<td>105.084</td>
<td>0.30</td>
<td>2.9883</td>
<td>1.35851</td>
<td>.29467</td>
<td>5.68196</td>
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<tr>
<td>Topic two</td>
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<td>.000</td>
<td>2.583</td>
<td>109</td>
<td>.011</td>
<td>3.3854</td>
<td>1.30822</td>
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<tr>
<td></td>
<td>Equal variances not assumed</td>
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<td>.74945</td>
<td>0.11</td>
<td>3.3854</td>
<td>1.30039</td>
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<td>2.1156</td>
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<tr>
<td></td>
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<td>2.1156</td>
<td>.73369</td>
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</table>

Topic one refers to text layout design. Topic two refers to table design. Topic three refers to graphic & text layout design.

Conclusion

The educational goals of talents in vocational education are to cultivate technical and application-oriented comprehensive talents which meet the demands of China's socialist modernization development, master the basic theory and professional knowledge of major, gain the abilities and qualities for professional work, and meet the practical needs of specific career, like production, construction, management, services, etc. Vocational education should actively explores the project-oriented instruction base on work process and its instructional mode for different courses in different majors according to the social development and the actual context of course instruction in vocational institutes, so as to provide practical instructional method for the cultivation of technical and application-oriented comprehensive talents in higher vocational institutes.

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References


