

# Research on the Hierarchical Teaching System based on the Training of Professional Post Ability

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**Abstract.** With the diversification of students' source in Vocational colleges, students' learning abilities and knowledge levels are quite different which leads to the poor effect of organizing teaching activities in accordance with the unified teaching model and teaching standards. Through the pilot study and research in Xi'an Aeronautical Polytechnic Institute, it explores the hierarchical teaching system based on the training of vocational post competence in this paper, aiming at providing reference for the reform on teaching mode and hierarchical teaching research in relevant specialties and fraternal institutions.

**Keywords:** Post competence; Students' learning abilities; Hierarchical teaching; Teaching system.

## 1. Introduction

Hierarchical teaching based on post competence have been carried out in Higher Vocational Colleges, which mainly focuses on the difference of students' learning ability and the great differentiation of knowledge level. In order to achieve the goal of talent training and meet the demand of competence for employment posts, several aspects of teaching reform, such as carrying out hierarchical teaching and diversifying learning objectives have been explored in this paper [1].

## 2. New Zealand Teaching Evaluation

### 2.1 Issues on Students' Source

The source of vocational college students in our country comes from three parts: high school students ( enrollment after attending the gaokao), students from secondary vocational schools and students attending the independent recruitment of vocational colleges. Because of the differences in the training objectives from the original schools before entering vocational colleges, the knowledge and ability levels of these three types of students are also different. There are great distinctions in students' cultural foundation and professional knowledge among these three kinds of students. After three years' systematic learning on cultural knowledge in high school, graduates there have relatively solid theoretical knowledge of culture, but rarely no relevant professional knowledge, poor practical proficiency, and even less professional accomplishment and skills; while secondary vocational students together with their counterparts from vocational schools have basic professional knowledge and practical ability but cultural knowledge is relatively weak[1] ; students enrolled through the independent examination, whose cultural knowledge, learning ability and the competency in accepting professional theoretical knowledge, are also relatively low. Students of different learning proficiency would not satisfied with learning materials because of the consequence of arranging the same learning content and tasks for students of different levels in one major. Thus, the progress and quality of teaching will seriously affected by this situation.

### 2.2 Capacity in Employment Orientation

Made-in-China 2025 plan, putting forward the requirements of innovation-driven, intelligent transformation, strengthening foundation and green development [2], gives the specific proposes on vigorously developing digital rapid design and manufacturing, improving product quality and speeding up transforming China from a manufacturer of quantity to one of quality. There is an increasing demand for skilled personnel with innovative design and precision measurement capabilities, especially for advanced manufacturing technology processes such as data acquisition,

reverse modeling, innovative design, rapid prototyping and precision testing. Therefore, it is very urgent and significant in training high-quality digital design and manufacturing technology skilled personnel. The main employment positions for the training objectives of mechanical design and manufacturing are product structure analysis and design posts and production posts of mechanical parts. At present, due to the limited hours of training talents in Higher Vocational Colleges and the uneven ability of students to accept knowledge, most of students are inexperienced in learning if students' product design ability and parts manufacturing ability are taken into account, while the other part of students who have strong ability to accept knowledge and are interested in digital design are not able to develop this part of the ability. Therefore, it is necessary to teach in different levels and in different directions from the perspective of the orientation of employment ability of mechanical design and manufacturing .

### **2.3 Diversification of Learning Objectives**

With the development of industry 4.0, Internet Plus and the requirements of the state for the innovation and Entrepreneurship of college students, more and more students major in mechanical design and manufacturing cater to taking part in digital designing. Especially in recent years, the students of this major have made great achievements in mechanical innovation design, digital innovation design and industrial product digital design and modeling competitions. Since having cooperated with Changzhou 3D special training camp, some students have successfully stepped onto product design positions in well-known companies in our country, and they are well paid. Meanwhile, some enterprises such as Magic Airlines, Kunshan Handing Precision Metal Co., Ltd. intend to cooperate with us in cultivating talents of product design. At the same time, the learning interests and goals of students majoring in mechanical design and manufacturing have been divided into different kinds. Some students who have great learning proficiency have a strong interest in product digital design, and hope that their ability in this area can be further developed. The rest of the students wish to be more competent in product manufacturing. Therefore, it is necessary to teach them in different levels and directions considering students' interest in the professional direction and learning objectives of mechanical design and manufacturing.

## **3. The Implementation of Hierarchical Teaching based on Post Ability**

### **3.1 Constructing Professional Course System based on Professional Post Ability**

According to the development of Made-in-China 2025 and the actual needs of enterprises, adhering to the concept on "Follow-up the Base, Promoting Service" in Xi'an Aeronautical Polytechnic Institute, the curriculum system of "One Platform, Two Directions" is constructed in the training of professional ability of mechanical design and manufacturing. In the course of one semester's study of science and technology culture and professional basic knowledge on the professional basic platform, teachers carefully observe the learning situation of each student in the class. After familiarizing with the students' personality differences and learning characteristics, they make a thorough exploration of students. In the second semester, according to the students' learning ability, professional development goals as well as respecting students' personal wishes, different orientation classes of post competence (majors are digital design and intelligent manufacturing and aeronautical parts manufacturing) were set up. In this way, it fully makes use of students' learning proficiency, mobilizes the enthusiasm of students, gives full play to the advantages of students' abilities, strengthens the cultivation of students' professional skills for excellence, thus improves the quality of professional training. The specific curriculum system is shown in Figure 1.

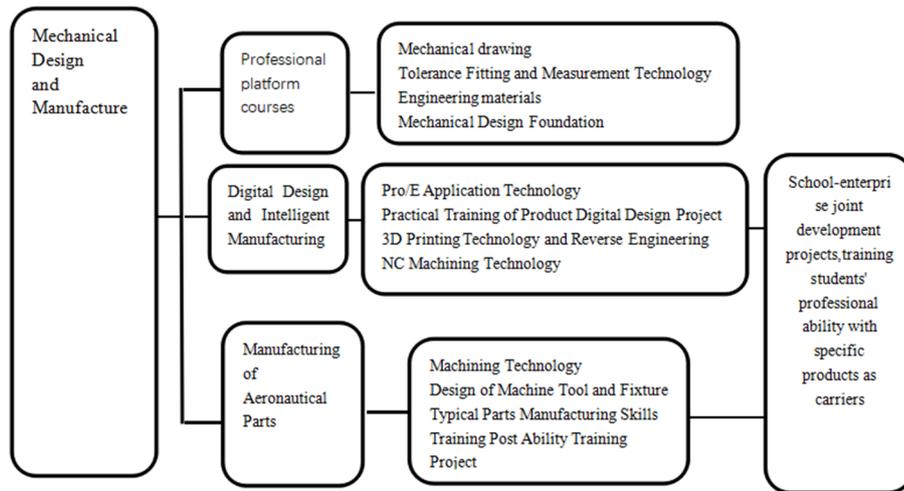


Figure 1. Course System Based on Professional Post Ability

### 3.2 Layered Teaching Design based on Students' Proficiency

Taking full account of our national conditions and the current situation of education, it is not easy to implement hierarchical teaching design based on students' proficiency. However, professional post competence of mechanical design and manufacturing has been experimented for 6 years in Xi'an Aeronautical Polytechnic Institute. It has the basis of hierarchical teaching design, but it is only a form of hierarchical teaching design based on students' competence. The reason is what we have to face is teaching for all the students in the whole major.

Even in the same class and the same course, it is inevitable that some students have strong knowledge acceptance ability, while others not. Teachers can set the teaching content step by step gradually and set up a variety of knowledge levels and different ability requirements of teaching activities and teaching topics. In teaching activities, teachers can divide students into groups according to their abilities, and assign appropriate teaching activities and topics to each group. In this way, students can brush up their sense of self-existence in the learning activities corresponding to their abilities, and get a sense of pride in learning, which can stimulate students' interest in learning and improve their enthusiasm for learning. Curriculum Design Framework is shown in Figure 2.

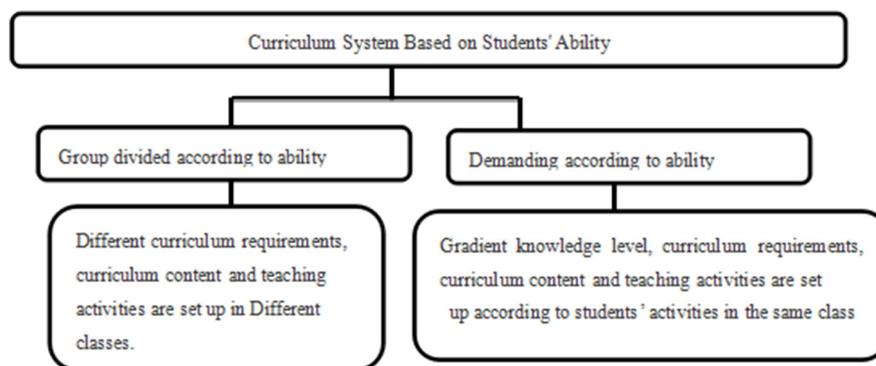


Figure 2. Curriculum Design Framework Based on Students' Ability

### 3.3 Changing Thought and Model, and Establishing a Student-centered Curriculum Evaluation Model

In the course evaluation, we should change the thought of "examining students". In order to break away from the traditional "teacher-centered" final evaluation model, we should establish a curriculum evaluation mechanism that integrates process evaluation, summary evaluation and diagnostic evaluation[3].

Teachers set different evaluation methods according to different curriculum requirements, curriculum content, teaching activities, and they increase the percentage of process assessment, participate in previewing the lesson, classroom discussion, answering questions, test, brainstorming, classroom summary, experiment, homework and other processes of learning process evaluation [4]; Considering the evaluation of students' self-learning results, among students, teachers, peers, off-campus industries, business personnel and other diagnostic evaluation results, they set up a summary evaluation of examinations, works, papers and report at the same time. Then a certain percentage for the evaluation results of three aspects is set, the sum of which is the final evaluation results of curriculum learning. Especially in the students-centered examination, they can test themselves. Through these activities, students can have a well understanding of knowledge as well as can observe the results of students' self-evaluation. At the same time, teachers can select some excellent questions from different students' self-tests and take them as the final test. In this way can students fully realize that they lead the whole learning process by themselves. it can not only embody the significance of student-centered method, but also can enhance students' self-value. The specific course evaluation model is shown in Figure 3.

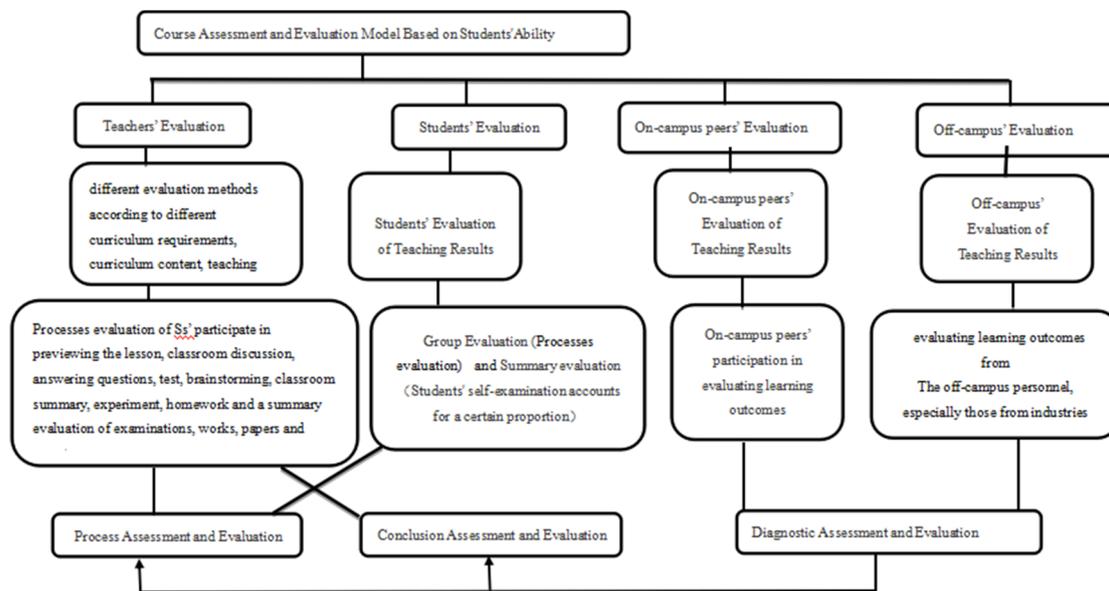


Figure 3. The specific course evaluation mode

#### 4. Conclusion

The research of hierarchical teaching system based on professional post competence can solve the problems of diversified sources of students in great differences on students' knowledge accepting ability, all-inclusive professional teaching system, and the current situation that the training effect of design ability and product manufacturing ability of mechanical design and manufacturing students in Higher Vocational Colleges. Through the pilot project in Xi'an Aeronautical Polytechnic Institute, the hierarchical teaching system guided by vocational post competence standards is perfected and summarized, which can provide useful reference and inspiration for the further research and application of hierarchical teaching system in other specialties of the same kind in the whole province and even in the whole country.

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