

# *Research and Practice of Modern Apprenticeship Curriculum Informatization Teaching Based on TPACK Theory*

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**Abstract:** Under the background of modern apprenticeship system, personnel training reform based on information technology is the key direction of vocational colleges. The article first analyzes the current situation of the teaching mode in vocational colleges and the problems existing in the talent training mode under the background of modern apprenticeship, and then from the establishment of a talent training platform, dealing with daily management problems and effectiveness evaluation problems, and integrating the talent training information platform. This paper expounds the reform and practice of the talent training mode of modern apprenticeship course informatization teaching based on TPACK theory - taking the industrial robot technology major of Yunzhi Information Technology College as an example, to improve the effectiveness of industrial robot technology talent training in vocational colleges in an all-round way.

## 1. Introduction

In the increasingly in-depth management of the pilot project of the reform of the modern apprenticeship system, all vocational colleges across the country are making efforts to cultivate talents. However, during the specific practice, a series of problems have emerged, such as the difficulty in managing the process of student rotation and replacement, and the lack of implementation of the evaluation of enterprise teachers. Therefore, it is imperative to reform talent cultivation by using information technology, it can be said that modern apprenticeship talent training based on information technology is the main direction of college reform. Therefore, every college should pay special attention to the improvement of talent training efficiency, and promote college information construction through effective ways [1].

## 2. Current situation of Talent Training Mode in Vocational Colleges

In the analysis of the practice of vocational colleges over the years, the construction of a talent

training model with enterprises and schools as the two main bodies and a talent training method with three stages of growth are shown in the application of the modern apprenticeship system. In other words, both schools and enterprises, according to the goal of apprenticeship training, conduct vocational integration in the first stage of college, work study integration in the second stage of college, and vocational practice in the third stage of college, The three stages of talent training enable schools and enterprises to implement different talent training methods around each stage. Effectively allocate the responsibility of the main body and implement the concept of differentiated responsibility sharing, which includes not only division of labor, but also cooperation. The details are as follows: in the first stage, students are organized to learn theoretical courses and practical courses, and teaching evaluation is dominated by college teachers, supplemented by enterprise teachers; In the second stage, the mode of combining work with learning is used to carry out the integrated teaching of theory and practice and the experiential learning of enterprises, and the overall evaluation of students' learning is carried out through college teachers and enterprise teachers; The third stage is to lead students to carry out comprehensive project practice, that is, post employment practice, and implement the scheme of enterprise teacher evaluation as the main and college teacher evaluation as the auxiliary. Therefore, both schools and enterprises join in the process and hierarchical learning activities of both sides, work together to formulate talent training plans, build a strong teaching team, and implement the joint assessment mechanism between schools and enterprises. This talent training program scientifically meets the specific needs of enterprise talent training, reduces the time for talent training and student position promotion, promotes teachers' teaching ability to be strengthened, and the stability rate of student practice is higher, so as to achieve the goal of win-win for enterprises and students. The operation of "grounding" of colleges and universities has played an exemplary role in the talent training period nationwide, but there are many problems during the implementation, It needs high attention from the university administrators.

### **3. Problems in Talent Training Mode under the Background of Modern Apprenticeship**

#### **3.1 Management Level of Enterprise Job Rotation Training and Replacement Practice**

For the modern apprenticeship teaching model, the important links are the second stage of enterprise rotation training and the third stage of post placement practice. Even though the rotation training requires three students to be equipped with a master, teachers are arranged to follow the enterprise every day and professional class directors are provided, but because the specific characteristics of the major and the students' personality growth are different, there are different factors in the corresponding post needs, In the process of student training, students are often arranged to work in different enterprise workshops, which hinders students' daily management to a certain extent. College students are taking turns.

During this period, due to the reason of entering the production workshop for the first time and contacting with the teacher for the first time, the students always showed a bad state of unsmooth communication and fear of hardship. The potential loopholes in the teacher's supervision and management may lead to the situation that the students may leave without permission or not participate in the training, which restricts the comprehensive effect of the training management. In addition, when students leave colleges and universities during the period of post thinking, their social growth experience is increasingly enriched, which will inevitably weaken the importance of practice management of both schools and enterprises. The head teacher has a sense of separation and lack of skills in the management of students scattered in multiple posts. In summary, the college's training results are poor.

### **3.2 Evaluation Effectiveness of Job Rotation Training**

During the period of talent training, colleges and universities often set up a one month rotation training plan for talent training in the second stage. Before the training, colleges and enterprises combine the preparation of corresponding learning assignment book around the probation task and post competency standard. The students of colleges and universities will write the harvest and summary after the probation is completed, and the students will fill in the internship report after the probation is completed, which will be assessed by the enterprise master in a timely manner. Because the assignment book contains students' daily learning performance and task implementation, it is difficult to avoid the phenomenon that teachers assign tasks and students' communication is not timely. In particular, the head teacher and professional teachers cannot dynamically evaluate students' daily performance, causing students to not correctly understand the enterprise posts, and the daily training objectives have not been implemented.

### **3.3 Feedback Level of Students' Graduation Tracking Information**

The graduation tracking content is mainly to make statistics on the employment confirmation date, position promotion and salary treatment data. To a large extent, the acquisition of relevant information supports the optimization of professional curriculum and curriculum structure of colleges and universities, as well as the design of school enterprise cooperation mode, which is convenient for the full implementation of modern apprenticeship talent training. In the past, the relevant information relied on the manual telephone and went into the enterprise to carry out the investigation, and then the specific scheme was set through manual recording and manual statistics. This mode will consume a lot of time, and it is difficult to ensure the accuracy of information statistics. Therefore, it is necessary to introduce information means in time to better conduct personnel training.

## **4. Modern Apprenticeship Curriculum Informatization Teaching Based on TPACK Theory**

TPACK theoretical model [2] divides the research of modern apprenticeship curriculum information teaching into three modules, namely: technical pedagogical knowledge (TPK), technical content knowledge (TCK) and teaching knowledge (PCK).

The teaching design mainly starts from the construction of PCK model, and introduces the 4C/ID four element teaching design model [3] to sort out the curriculum knowledge content system. The 4C/ID teaching model requires that the content learned should first be divided into multiple complex task groups containing different levels of skills, that is, multiple teaching units. Each teaching unit should have several sub task groups with gradually decreasing reusable and non reusable information.

### **4.1 Construction of Modern Apprenticeship Classroom Management and Teaching Organization Informatization Teaching Management Platform**

Due to the decentralized and dynamic learning locations of modern apprenticeship courses, a course is jointly completed by two or more tutors, which brings severe challenges to teaching organization and management [4]. For modern apprenticeship courses with multi person cooperative teaching, it is necessary to establish a system of course team leader, unify teaching materials, unify teaching plans, and establish a cooperative teaching mode with coordinated processes on a unified information based teaching management platform.

The quality control of modern apprenticeship education requires that the process evaluation of

enterprise teachers be included in the student evaluation. In the modern apprenticeship class, the homework score of a course assignment may be given by the master of multiple enterprises. These process evaluation data can be recorded and saved uniformly to avoid loss after the data is given, and can be fed back to students as learning evaluation objectively and stereoscopically.

The teaching activities of modern apprenticeship enterprise teachers need to comply with the relevant teaching system requirements of the school and accept the supervision of the teaching supervision [5]. Through this model, the teaching behavior of enterprise teachers can be more objectively quantified into data that can be evaluated by the teaching supervision group, and submitted to the teaching supervision for analysis of the teaching effectiveness of enterprise teachers together with students' learning data, which are introduced into the teaching management system.

Students in modern apprenticeship classes are scattered in different enterprise learning points to learn professional knowledge from different enterprise teachers. Through the unified teaching platform, students can understand the learning progress of other students, share their learning experience with others, and form a unique learning atmosphere of the university. Under the mode of modern apprenticeship enterprise teaching, the teachers of the school play an auxiliary role in the process of classroom teaching management. They can cooperate with enterprise teachers to do a good job in classroom teaching organization through a unified teaching platform, forming a classroom management mode in which two teachers jointly use the teaching management platform to organize the classroom.

#### **4.2 Use Information Technology to Transform Modern Apprenticeship Courses into Open, Shared and Free Information Teaching Resources**

The state and schools have invested huge manpower and material resources in the pilot project of modern apprenticeship. The pilot class of the industrial machine technology major in our school is 1 class, while there are 3 parallel regular classes of the same major and grade, which is expected to expand to 6 after enrollment this year. How to develop the teaching process and content of enterprises in the modern apprenticeship system into a series of complete sets of teaching resources or even information online open courses according to the standardized model, so that students in parallel regular classes and even other colleges can share these resources in different time and space, free of charge, is an important way to promote the teaching achievements of the modern apprenticeship system.

#### **4.3 Arrange the Most Reasonable Course Information Teaching Design Based on Subject Knowledge and Teaching Method Knowledge**

Instructional design is the starting point of the curriculum. Informational instructional design is the starting point of the curriculum informatization teaching, and it is also the content of PCK (curriculum knowledge design combined with teaching method) in the module of TPACK theory research. Based on the 4C/ID teaching design model, each teaching unit is required to take project teaching as the main teaching method, analyze the teaching content classification of non reusable skills and reusable skills in each project, and develop the corresponding information presentation means in the form of instant information and supporting information, and integrate them into a complete project training.

The 4C/ID teaching mode requires that, in a unit of different training projects, supporting information must follow the rule of gradual decline and eventually complete the task of transferring students' knowledge after withdrawing from the project, which also fully conforms to the requirements of modern apprenticeship courses: "nanny type" projects, "consulting type" projects

and "collaborative type" projects, In order to combine the 4C/ID teaching mode and the teaching task setting rules of modern apprenticeship courses [6], the "nanny" project, "consultant" project and "collaborative" project of professional courses are designed, and the most reasonable information teaching design mode of apprenticeship courses is obtained through the theoretical research and teaching practice verification of this project. Table 1 takes the module teaching design of "FANUC Industrial Robot Teaching and Programming" in the course of "FANUC Industrial Robot Configuration and Programming Technology" as an example to elaborate the law of gradual decline in the participation of teachers in nanny type projects, "consultant type" projects and "collaborative type" projects.

Table 1: Teaching Design Based on 4C/ID Teaching Mode.

Modular	Teaching link	Basic elements of the model	Task Type	Theoretical knowledge points
FANUC industrial robot teaching programming	Before class,	Supporting information	"Nanny style" project	Programming industrial robots
		Instant messaging		Setting up micro courses for teaching methods and designing basic programming sentences
				Micro course of motion command operation and coordinate system setting
	During class,	Supporting information	"Consultative" projects	Teaching and programming simulation of continuous path
		Instant messaging		Teacher guided participation in student project production and evaluation
				Programming operation and professional skills to answer questions
	After class	Supporting information	Collaborative projects	Handling workstation programming
		Instant messaging		Jointly complete entries
				Teachers complete a skill operation in the project or guide students to complete a part of the operation

#### 4.4 In the Modern Apprenticeship Curriculum, the Two Teachers Jointly Use Information Technology to Organize Teaching and Manage the Classroom

On the basis of the information-based teaching design of the course, the school monitors the teaching process of enterprise teachers through the unified teaching platform, and obtains the objective and data-driven teaching evaluation of enterprise teachers. In the dual teacher classroom, the homework questions, examination questions, and homework scores in the teaching management platform are given by enterprise teachers and school teachers according to different stages [7]. The process scores of students' learning in the enterprise classroom are composed of teaching interactions such as enterprise informatization, practice task driven, and teacher skills teaching. The process scores of these teaching interactions can be saved by the unified teaching platform. These are TCK module contents in TPACK model. The feasibility model of double teachers using information technology to jointly manage the modern apprenticeship classroom is obtained.

## 4.5 Development and Effective Use of Information Teaching Resources in Modern Apprenticeship Courses

The TPK module in TPACK model mainly studies how to use information technology to transform professional curriculum knowledge into information based teaching resources [8]. Standardized micro courses and virtual simulation training software development and other information means have become effective methods to improve the teaching efficiency of enterprise teachers [9]. In the standardized operation micro course, it is necessary to make standardized arrangements for the parameters, attributes and processes of knowledge. The project production process in the course can be used as the theme of the development of virtual training software. Each unit knowledge point of the course is developed using information technology. The application of the network teaching platform runs through the entire teaching process to achieve a seamless diagonal street of "online"+"offline". The comprehensive score of students is a process based diversified assessment and evaluation result formed through the whole teaching process in the form of students' classroom sign in, participation in discussion, classroom interaction, completion of task points, assignments, chapter tests, etc., taking into account the self-evaluation, mutual evaluation, group leader's comments, etc. in classroom performance. A closed-loop learning path of "self-study before class, intensive teaching in class, and consolidation and expansion after class" has been formed, which extends the time and space of teaching activities and improves the teaching effect. With the combination of theoretical teaching and practical operation, teaching activities can be carried out normally even in the context of epidemic situation, without relying on campus training equipment. The teaching activities are "student-centered" before, during and after class. The whole process is mainly through the pre-set teaching activities in the Learning Pass. Under the guidance of teachers, students can find problems, analyze problems and finally solve problems. Push resources, publish tasks and assign homework before class, so that students can use fragmented time to learn independently; In class, teachers guide students to complete practical training in stages according to their tasks, and widely carry out students' mutual evaluation of groups and mutual evaluation and concessions, so as to give full play to students' leading position in the classroom; In the part of knowledge expansion after class, teachers assign tasks, supervise and guide students, and students take the initiative to learn and explore, consolidate knowledge, and improve their comprehensive ability to solve problems [10]. Students are the main participants in the above processes. Under this teaching concept, students' classroom participation rate has been improved to a certain extent, students' interest in learning has been further stimulated, and students' ability to solve practical problems has also been improved to a certain extent.

## 5. Conclusions

This paper takes the industrial robot technology major of higher vocational education as the research object, deeply studies the standard mode of modern apprenticeship curriculum information teaching design, the feasibility mode of modern apprenticeship curriculum sharing information teaching management platform to manage the classroom, organize teaching, and the standard mode of modern apprenticeship curriculum information teaching resource development, in order to explore the standardized mode of combining information teaching with modern apprenticeship curriculum, It provides reference for comprehensively promoting modern apprenticeship.

## References

[1] Xia Chunrong. *Research on the reform of industrial robot technology talents training mode by information means under the background of modern apprenticeship*. *China New Communications*. 2021, 23 (10): 184.

- [2] Niu Cui, Xian Yang, Xu Zhanghai, Bai Jing. *TPACK practice framework and teacher's TPACK development learning environment design*. *China Information Technology Education* 2016, (20): 65-66.
- [3] Xu Yan. *Construction and application of instructional design model based on 4C/ID model*. *China Educational Technology Equipment*. 2019, (19): 85-86.
- [4] Jia Xiaowei, Zhang Lili. *Research on the Construction of Modern Apprenticeship Talent Training Mode under the Education Informatization Environment*. *Journal of Nantong Shipping Vocational and Technical College*, 2020 019 (001): 92-96.
- [5] Yan Cailing. *Difficulties and Countermeasures of Vocational Education Curriculum Development under the Background of the New Industrial Revolution*. *Research on Higher Engineering Education*, 2020 (2): 148-153.
- [6] Zhang Yong. *Construction of Advanced Higher Vocational Education Curriculum System Based on Modern Apprenticeship*. *Vocational Education Forum*, 2022:62-63.
- [7] Zeng Tianshan. *Practical exploration of "post course match certificate integration" to cultivate highly skilled talents* *China Vocational and Technical Education*, 2021 (8): 5-7.
- [8] Yao Jia, Zhu Zhiwei. *Construction and Practice of Practical Training Teaching System of Electromechanical Major in Higher Vocational Education from the Perspective of Mass Entrepreneurship and Innovation Education and Modern Apprenticeship*. 2022, 39 (6): 200-201.
- [9] Tang Shuhong, Jiang Xinchu. *Research on Information Technology Application Ability of Normal School Students Based on TPACK Theory*. *Education Research and Experiment*, 2020, (3): 72.
- [10] Cao Jinjiang, Chen Gui, Huang Jiakai. *Design and practice of integrated practice platform for automation specialty under the background of intelligent manufacturing*. *Experimental Technology and Management*, 2021, 38 (3): 279-280.