

Construction of 4C/ID-CIPP Mixed Teaching Mode under the Guidance of Core Literacy of Vocational Education in the New Era

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Abstract. Under the background of Internet technology, in order to further improve the teaching quality of numerical control professional courses in vocational schools. This paper is based on online and offline mixed teaching mode, 4C/ID teaching mode and CIPP evaluation mode. This paper analyzes the characteristics of vocational school students and the problems in teaching design. On the basis of the above, combined with the advantages of these modes, a 4C/ID-CIPP mixed teaching mode is constructed under the guidance of core literacy. Taking the course of “Numerical Control Programming and Simulation Processing ” as an example, a comparative experiment was conducted between the experimental class and the control class, The control class adopts traditional teaching methods such as students' preview before class, teachers' teaching in class and students' homework after class. The experimental class adopts the 4C/ID-CIPP mixed teaching mode. At the same time, different teaching methods are adopted for the experimental class, and the orthogonal test is used to verify the mode. The experimental results show that the comprehensive scores of the students in the experimental class are better than those in the control class. In addition, the students' comprehensive performance of 4C/ID-CIPP blended teaching mode is the best compared with other teaching ways in the experimental class. It shows that the 4C/ID-CIPP mixed teaching mode can effectively improve students' performance. The study has important practical significance, and provides a useful reference for the teaching mode of vocational schools.

Keywords: 4C/ID-CIPP; core literacy; CNC programming and simulation; mixed teaching model

1 Introduction

Vocational education has entered a new era and ushered in a major historic opportunity since the eighteenth National Congress of the Communist Party of China. With the rapid development of China's economy and industrial transformation and upgrading, vocational education has entered a stage of high-quality connotative development. The newly revised “Vocational Education Law” in 2022 is the fundamental institutional guarantee for promoting the high-quality development of vocational education and promoting students' professional core literacy [1]. Professional core literacy points to the character and ability necessary for individuals to be competent for post work and adapt to social development [2]. In the context of “Internet + vocational education”, how to break through the traditional teaching methods to achieve effective teaching and learning is a problem that teachers should consider [3]. It is

widely used in vocational skills training and has achieved remarkable results, but there are deficiencies in systematic evaluation [4]. Then how to integrate 4C/ID mode, CIPP evaluation and mixed teaching mode into a new teaching mode and apply it to the teaching design of professional courses. This study will construct and analyze the 4C/ID-CIPP mixed teaching mode, and take the course of “Numerical Control Programming and Simulation” as an example to carry out empirical research, in order to provide a design framework for the teaching of professional courses in vocational schools.

2 4C/ID-CIPP mixed teaching mode

2.1 Mode construction and value

Migration, integrity, practicality and reflection are important characteristics of core literacy [5]. The 4C/ID model emphasizes holistic task “simplified” learning in real work situations and provides a case paradigm to reduce learning cognitive load [6]. The 4C/ID model decomposes the complex skills into two types of skills, namely recurrent skills and non-recurrent skills [7]. Through the 4C/ID model to complete the learning task, so as to master the overall ability of skill operation, as shown in Figure 1. Therefore, the model has the characteristics of practicality, integrity and mobility. The 4C/ID model is suitable for the skill training of vocational education, which can be used as a reference model. However, compared with other mixed teaching design models, the 4C/ID model has shortcomings in teaching evaluation [8].

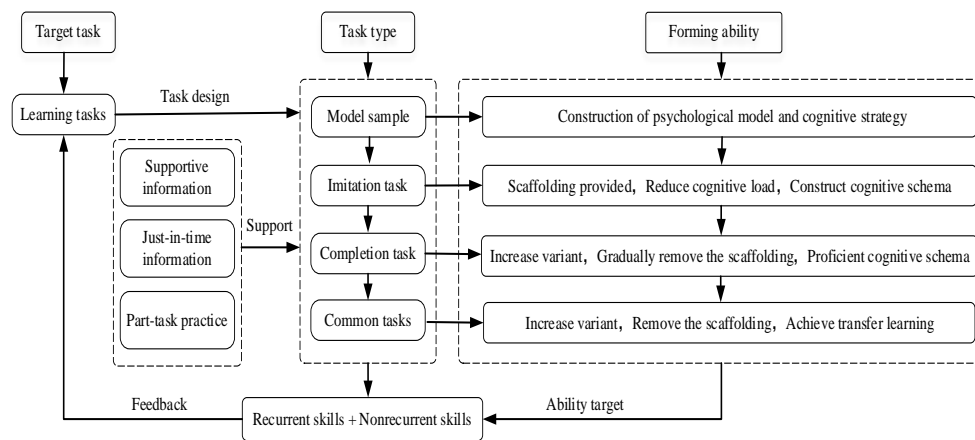


Fig. 1. 4C/ID promotes the formation of two types of skills

The CIPP evaluation model not only emphasizes the result evaluation, but also highlights the process evaluation and diagnostic evaluation [9], Through information technology, students' process performance is mastered, timely feedback is improved, and accurate teaching is realized [10]. Based on this, the three modes are integrated to form a teaching mode used in the teaching design of professional courses in vocational schools to promote the cultivation of students' professional core literacy. 4C/ID-CIPP mixed teaching mode as shown in Figure 2.

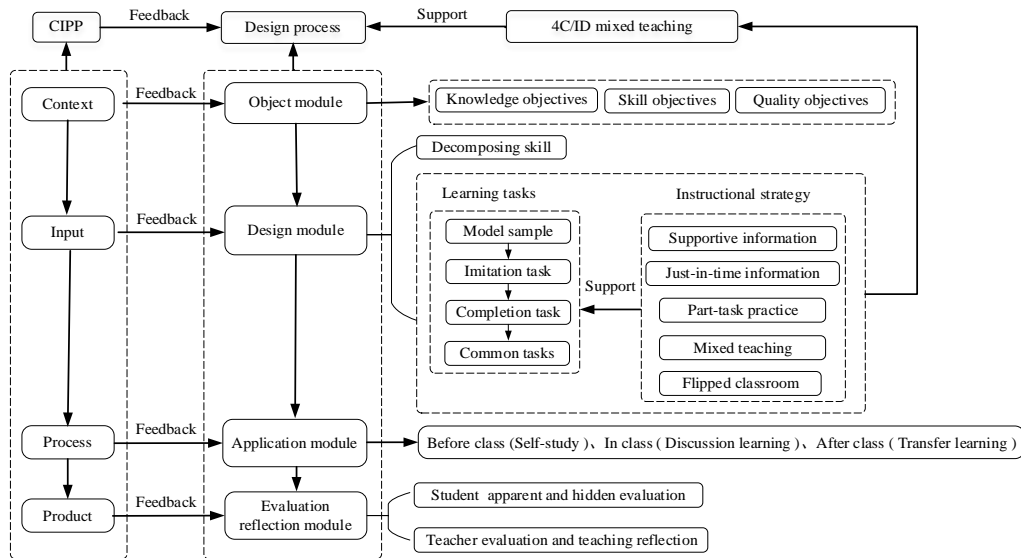


Fig. 2. 4C/ID-CIPP mixed teaching mode

2.2 Mode features

2.2.1 Task integrity emphasizing work situation; Scaffolding teaching to reduce cognitive load; Task discoloration promoting migration.

First of all, typical cases are taught to present the cognitive strategies and psychological models of industry experts in the face of similar problems, and provide relevant knowledge, support procedures, premise knowledge, etc. Then students imitate the psychological model and cognitive strategy of experts to solve problems, complete the task of the case, and construct cognitive schema. This imitation can reduce students' cognitive load.

2.2.2 Achieve precise teaching through online and offline combination; Teacher-led highlights the student body.

Before class, the teaching objectives and teaching resources are uploaded to the platform. In class, teachers combine face-to-face teaching with student activities, that is, first, teachers teach cases, then implement group cooperative learning, teachers tour guidance, present timely information, and finally group report results and multi-dimensional evaluation, while the teaching platform records student performance data.

3 Mode application and verification

In order to test the effect of this teaching mode, a comparative study was conducted on two parallel classes of grade 2 students majoring in “numerical control technology” in a secondary vocational school in northern Jiangsu. Before the experiment, there was no significant difference between the two classes in all aspects. In the experiment, the control class adopted traditional teaching, and the experimental class adopted different teaching methods. In 18 class

hours, the best teaching plan was selected by orthogonal test, as shown in Table 1 and 2. Verify whether the best teaching plan is 4C/ID-CIPP mixed teaching mode, and finally compare the experimental results of the experimental class and the control class.

Table 1. Factor level table

Levels	A (Teaching process)	B (Teaching resource)	C (Instructional mode)	D (Teaching evaluation)
1	Traditional process	Offline resources	Traditional teaching	Result evaluation
2	Flipped classroom	Online resource	4C/ID model	Process evaluation
3	Half flipped classroom	Online and offline	Module teaching	CIPP evaluation

Table 2. Test scheme and test result analysis

Test number	A	B	C	D	Combined average score
1	1	1	1	1	66
2	1	2	2	2	85
3	1	3	3	3	88
4	2	1	2	3	91
5	2	2	3	1	77
6	2	3	1	2	75
7	3	1	3	2	82
8	3	2	1	3	85
9	3	3	2	1	88
K_1	239	239	226	231	
K_2	243	247	264	242	
K_3	255	251	247	264	
R	16	12	38	33	
Primary and secondary factor	C>D>A>B				
Optimum schem	A ₃ B ₃ C ₂ D ₃				

The best scheme A₃B₃C₂D₃, namely 4C/ID-CIPP mixed teaching mode, was screened by orthogonal test. The comparative analysis of the last two classes' test results (as shown in Figure 3) showed that the number of excellent students in the experimental class was more than three times higher than that in the control class.

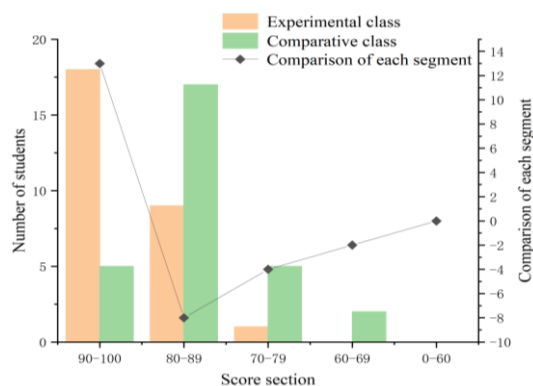


Fig. 3. Comparative analysis of post- test scores

4 Summary and outlook

In summary, the 4C/ID-CIPP blended teaching model provides a useful reference for the teaching design of professional courses in vocational schools.

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