Empirical Research of Oral English Teaching in Primary School Based on 4C/ID Model

Siqi Zhou[1], Yangli Zhang[2*], Xiao Liu[3], Yunhuan Wang[1], Xiaoqin Shen[2]
[1] Department of Education, Yibin University, Yibin 644000, Sichuan, China
[2] School of Computer Science, Sichuan Normal University, Chengdu 610101, Sichuan, China
[3] The Experimental School Attached to Sichuan Normal University, Chengdu 610066, Sichuan, China
Email: 489289495@qq.com.

Abstract: 4C/ID model is a typical model that it develops students' complex ability. The effectiveness of 4C/ID model is approved by many scholars of vocational education and higher education fields. This research takes interactive self-introduce skill training of primary school English as an example, and relevant experiments were carried out based on the instructional design of 4C/ID model for the need of developing complex skill in elementary education. Research shows that 4C/ID model can be applied to develop primary English complex skills. Compared to other traditional English teaching model, 4C/ID model is beneficial to improve pupils' oral English ability, improve self-directed learning ability and close the achievement gap of students and so on. However, the deficiency of 4C/ID model is that it cannot improve students' learning goal skill and it cannot strengthen students' knowledge memory and so on.
***Keywords*:** 4C/ID, comprehensive learning, primary school English, oral English teaching, empirical research

1. Introduction

With the rapid development of science and technology, mechanized and regular tasks are completed by machine increasingly, but comprehensive and cognitive tasks are still completed by man mainly in a short time due to the comprehensiveness and complexity of these cognitive tasks. Comprehensive learning design model, which promotes that students' complex skills can train in a series of real and comprehensive tasks to improve the ability to solve complex problems and transfer knowledge effectively, is different from traditional teaching design idea that breaks complex skill into single skills to separately train. In multiple comprehensive learning design models, the most representative and operational model is 4C/ID model, which is proposed by Van Merrienboer and Dijkstra of Open University of the Netherland[1]. Previous research has shown that this mode has drawn scholars' attention and application of abroad vocational education and higher education, and it acquires a great of achievements[2]. However, scholars in China has not fully recognized the importance of 4C/ID model, causing that correlational researches are stuck at the level of theoretical introduction and lacking in the experiment support. In addition, correlational researches are restricted to higher education domain and there are lack of empirical researches empirical combined with basic education. Accordingly, this research takes oral English skill training in primary school as an example, exploring application problems of complex skill straining in primary schools based on 4C/ID model.

2. Theoretical framework

2.1 Theory overview

4C/ID model equips students with a series of tasks they need to accomplish in authentic situation and masters complex skills during the resolution process of practical problems even learning migration to equip the ability that students can perform comprehensive and cognitive tasks efficiently[3]. Teaching design is developed based on 4C/ID model, including ten steps. Thereinto, design learning tasks, schedule relevant content knowledge, design support programs and arrange part-task practice are four critical steps and corresponding learning tasks, relevant skills, support programs and part-task practice are four basic elements[4]. The other six steps are developing evaluative tools, ordering learning tasks, clarifying cognitive strategies, determining psychological models, clearing cognitive rules and prerequisite knowledge. Therefore, six steps are supplement for above-mentioned four elements, which are used only when it is essential[5].

2.2 Four basic elements

Learning task, the most core element in 4C/ID[6], consists of task groups what the difficulty increases gradually. Every task group also includes a series of subtasks that they have gradual degradation support and various specific subtasks which

integrat knowledge and skills and so on. The first step for designing learning tasks is that the complex skill is categorized and then create learning task groups, which inset different task support or provide learning subtasks with different guidance for problem solving. These subtasks are helpful to students to gradually master relevant complex skills and migration. To avoid excessive cognitive load of students, learning tasks are adjusted by three ways such as simplified conditions, key regulation and knowledge evolution in order to help students to complete learning tasks better[7].

Relevant content knowledge, refers to the element that it is beneficial to students to master creative elements in learning tasks, including effective ways of solving problems and organization modes of task domain's knowledge in learning tasks. Systematic problem-solving methods (SPAs) and domain models need to provide for students in the process of scheduling relevant content knowledge. SPAs refers to cognitive strategy, which can solve problems effectively, that is to say, prescriptive explain to students "how to do"; domain model can explain problems to students such as "what is knowledge", "how to organize" and "How to work" and so on.

Support program is the prerequisite knowledge and the skill to help students master regenerative content in learning tasks. Demonstrations and examples are presented timely in the learning tasks during the process of designing support program. Demonstration refers to how to operate and explain support program and example refers to the specific operation process. In addition, corrective feedback should be given to students in time to help them master regenerative skills better.

Part-task practice means exercise that it helps students' regenerative skills in learning tasks to achieve a high level of proficiency. In the first place, variable and representative exercises should be set; next, exercises are ordered from simple to difficult; finally, Over-study methods are adapted such as distributed practice times, compress the time of simulation practice, which are beneficial to students' practice. This step is need to design as an automatic and special tasks practice means if students' self-guided learning skills want to be developed.

3. Teaching design

3.1 Overview

Related design is conducted in this research themed "interactive self-introduction skill training" of English curriculum standard in primary school. The subject contains both listening and speaking in language skills as well as the pronunciation, word and grammar in language knowledge[8]. Thereinto, listening and speaking of English belong to generative skill in 4C/ID model and how to master the skill depends on schema construction of students. Then, schema construction consists of two steps: induction and fine processing, which needs to design corresponding learning tasks and schedule related content knowledge to support the generation of the skills in this part. Next, grammar, pronunciation and word in English belong to regeneratable skill, and how to master the skill needs to depend on the students' schema proficiency process. Schema proficiency consists of two steps: editing and strengthening, which needs to design corresponding support program and arrange part-task practice to support the generation of the skills in this part[9]. Based on the above analysis, the whole design of this theme is listed in Table 1.

Table 1. The whole design of interactive self-introduction skill training based on 4C/ID model

Skills content	Skill categories	The main learning process	The learning sub-processes	The blueprint elements	Design content
Listening Speaking	generative skill	schema construction	induction	learning task	case study imitating tasks completion task common task
			fine processing,	related content knowledge	systematic problem-solving methods domain model
Grammar Pronunciation Word	regeneratable skill	schema proficiency	editing	support program	word, phrase, sentence phonetic symbol video body language grammar courseware
			strengthening	part-task practice	identification exercise correction exercise common exercise

3.2 Design learning tasks

Three modules of Primary School English textbooks in fifth and sixth grades such as "what would you like", "how can I get there", "I have a pen pal" and language knowledge such as "self-introduction", "food introduction", "family introduction", "greetings" of English curriculum standards for primary schools are selected according to theme's request

about skill training objectives and the actual level of students. A series of learning tasks are designed based on three situations such as “school life”, “family life” and “extracurricular life”, see Table 2. Requirement for tasks are that students write relevant information firstly to get in touch with foreign pen pals then they talk to pen pals again. Three groups of learning tasks are sorted from simple to difficult according to three methods such as reduced condition, focal-point adjustment and knowledge evolution to effectively reduce students’ cognitive load. The content that students complete the task from form (phrase), post (fragment) to E-mail (complete and well-formed article), which grammar become more and more difficult, and the speed of oral language is faster. In addition, as the progresses of each task, the support of scaffold provided by teacher is falling all the time until students are able to complete the task independently.

Table 2. Interactive self-introduction learning task design

Scene	Learning task	Speed	Grammar	Prompt
School life	Case learning: students are provided for a full sample video about school life, which tells students some ideas about how to fill in the form and how to communicate with each other in English; students should understand what aspects are involved in self-introduction after learning and students need to analyze what the characteristics of speaker’s regenerative skills. Imitating task: examples of self-introduction in school life are introduced to students, including thinking, writing guide for form filling and complete dialogue; the similar scenario is provided to students so that they can finish the form to make pen pal and introduce themselves in English by imitating the sample Completion task: incomplete form and self-introduction’s thinking are provided to students; they need to complete the rest of the form and introduce themselves in English. Common task: scenarios related to school life are provided to students; they need to make form first then they introduce themselves in English.	the lowest	the structure of each sentence is similar.	videos and pictures
Family life	Case learning: the sample video related to self-introduction in family life is provided to students, which explains ideas about post writing and oral communication separately; students need to introduce what aspects of self-introduction has and analyze what is the characteristic of speakers’ generative skill. Imitating task: the sample video of self-introduction in family life is provided to students, including ideas, post’s writing guide and part of your conversation; next, similar scenario is provided to students and they need to write post to make pen pal and introduce themselves by imitating the sample video. Common task: scenarios related to family life are provided to students; students write a post to make pen pal firstly, then they introduce themselves in English.	relatively slow	a few sentences have different grammatical structures.	English words
Extracurricular life	Case learning: the sample video of self-introduction in extracurricular life is provided to students, which explains some ideas of how to write E-mail and how to communicate with each other in English; students need to understand what aspects self-introduction have and what characteristics excellent self-introduction have after learning that video. Completion task: The format of E-mail is provided to students; they finish E-mail to make pen pal first, then they introduce themselves in English from the perspective of extracurricular life. Common task: scenarios of extracurricular life are provided to students; students write down E-mail to make pen pal first, then they communicate with classmate in English.	normal	grammar structure in every sentence is different.	without any prompting

3.3 Schedule relevant content knowledge

Relevant content knowledge reveals how to organize complex skills and how to handle problems in this area. Systematic problem-solving methods (SPAs) is an important step for scheduling relevant content knowledge. Students need to construct systematic problem-solving methods quickly before the conversation between students and their pen pal and then ideas of oral English conversation are formed as shown in Figure 1. On this basis, the old and new English knowledge and skill are fine processed so that it is helpful to promote the knowledge migration and actually improve oral English.

Mastering relevant content knowledge needs students to build domain models including conceptual model, structure model and cause-effect model. Conceptual model of self-introduction is made into interactive media format n this research, as shown in Figure 2. Domain model can be shrunk and expanded on the electronic whiteboard when they are teaching, which is beneficial to cultivate students' divergent thinking in the oral English conversation. In addition, grammar knowledge is made into structure model, which is helpful to build a so precise grammar structure that students are no

error of grammar in the oral English conversation. Key knowledge and skills are presented by teacher using induction recommended 4C/ID model with bending down and giving instruction to students, which is beneficial to students to master relevant domain models quickly and effectively.

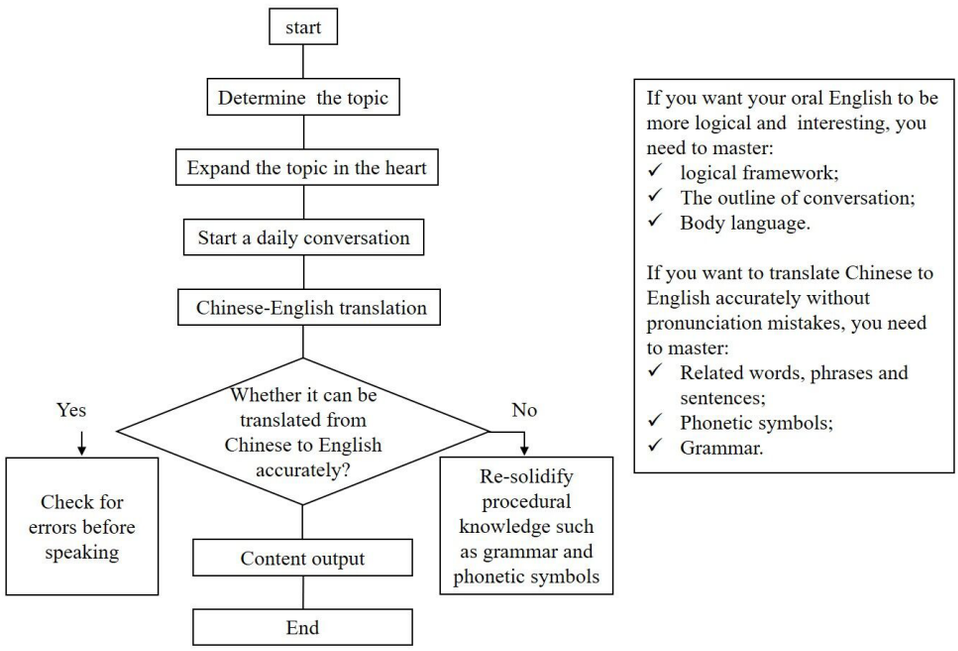

Figure 1. Interactive self-introduction SPAs

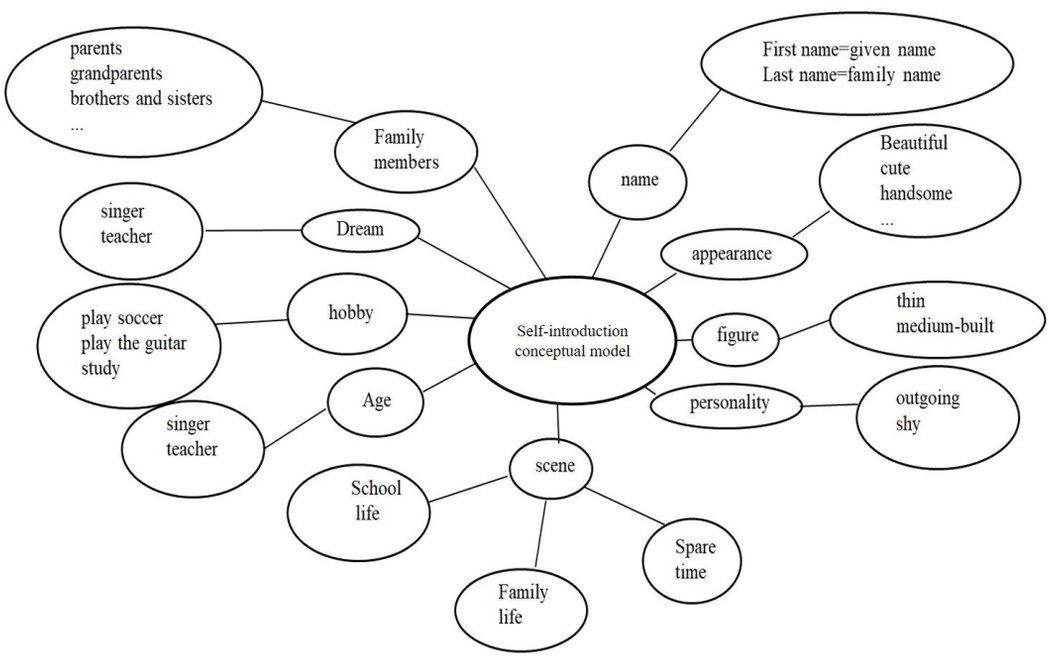

Figure 2. The conceptual model of interactive self-introduction

3.4 Design supporting procedures

This research uses accessible language, picture and animation such as English body language video, educational videos of phonetic symbol and grammar courseware to create modularized support programs in order to allow students to master reproductive skills in interactive self-introduction complex skills. In the process of completing the learning task, students need to watch videos and courseware over and over when needed; what's more, students' attention needs to be

concentrated by marking key points so that they can master the reproductive skill efficiently. In order to prevent disjunction effect, teacher provides corrective feedback to students in time with concise and understandable language during the process of students finishing tasks and relevant help and support should gradually be withdrawn with the mastering of reproductive skills of students.

3.5 Schedule part-task practice

The core of scheduling part-task practice is using highly supportive training wheels methods to design practice questions, that is to say, follow the segmentation and simplification principles of practice content while gradually dwindling support. This research divides part-task practice tasks into three parts: identification, correction and common exercises and let students finish one by one from simple to difficult, as shown in Table 3.

Table 3. Interactive self-introduction part-task practice design

Question category	Schedule part-task practice	difficulty
Identification	Find the one with the best self-introduction ability in the whole class.	low
Correction	Find mistakes in the E-mail of classmates; Find mistakes in the self-introduction dialogue of classmates.	medium
Common	Introduce yourself to teachers who didn't teach you in English.	high

In specific education practice, on the one hand, teacher answers questions for the students by getting some coaching on demand, that is pointing out some mistakes to students and giving the reason for mistakes and correcting methods; on the other hand, over learning should be adopted by students. In addition, part-task practice should be adapted by students to reach highly skilled reproductive skills by constantly practicing part-task practice such as pronunciation, grammar, words, phrase and so on.

4. Experimental research

4.1 Experiments design

4.1.1 experiment object

This research selects as the experiment object, thereinto experimental class has 45 students and control class has 44 students.

4.1.2 Experimental hypothesis

4C/ID model can improve students' oral English and self-directed learning ability more effectively compared with the traditional teaching model; 4C/ID model can narrow the achievement gap between top students and underachievers (top 10 and bottom 10 students of pretest) more effectively.

4.1.3 Experimental method

Experiment was conducted during the fall semester in 2019. Experimental class conducted interactive self-introduction oral English teaching based on 4C/ID model; control class conducted traditional self-introduction oral English teaching, including some teaching activities such as reading words, imitating and practicing, group activities.

4.2 Experiment results

4.2.1 Pretest analysis

Students are divided into some groups to the pretest and their oral English shows are recorded. Questions for the pretest come from “National English Competition Proficiency for Students (NECPS) and the oral English test for fifth-grade group”, and questions for the competition are similar to this teaching content. Pretest score of experimental class and control class are analyzed by independent-sample T-test with SPSS 23.0, and the results of the two classes show a normal distribution. Thereinto, the average of control class is 78.23; the average of experimental class is 79.53; the P value is 0.422>0.05. Therefore, there is no significant difference in experimental class and control class and subsequent studies can be conducted.

4.2.2 Posttest grade analysis

Two classes are divided into some groups to conduct oral English posttest and record. Test subjects also come from NECPS. In the posttest, students are rated on five dimensions such as listening, speaking, pronunciation, word, grammar[10]. Each dimension is sored by centesimal system and the average score of all dimensions as the final grade of the student. Posttest score is analyzed by independent-sample test, The result is shown in Table 4. The data show that there is a

significant difference in experimental class and control class（P<0.05） from three dimensions: listening, speaking, word and total points. There is no significant difference between the two classes in pronunciation and grammar (P>0.05).

The score of experimental class is obviously higher than the control class in two dimensions: listening and speaking combined with score mean. However, students' score of experimental class is significantly lower than the control class on the word dimension, which shows 4C/ID model can effectively improves the mastery degree of students' generative skill compared with traditional teaching mode, but for the teaching content of knowledge and memory, traditional teaching mode works best.

Table 4. The achievement analysis of post-test in experimental class and control class

Content	Class	Average	Standard deviation	P value	Content	Class	Average	Standard deviation	P value
Listening	experimental class	88.89	2.83	***0.000	Pronunciation	experimental class	83.82	4.74	0.585
	control class	71.14	19.58			control class	83.15	6.56	
Speaking	experimental class	96.77	2.50	***0.000	Grammar	experimental class	83.85	3.47	0.489
	control class	72.20	19.45			control class	83.12	6.05	
Word	experimental class	86.78	4.57	***0.000	Total Grade	experimental class	88.02	1.58	***0.000
	control class	91.99	6.38			control class	80.32	5.75	

Note: *** represents P<0.001.

Performance analysis of top students and underachievers: top 10 and bottom 10 students of pretest are separately selected in the experimental class and the control class, forming four groups such as experimental group A, experimental group B, control group A, control group B. Validating the data of four groups' pretest and post-test achievement by normality test, only to find that the data does not follow a normal distribution, so the difference is analyzed by nonparametric U test, the results are shown in Table 5. There are significant gaps in pretest achievement between A and B groups of experiment class and control class in all dimensions (P<0.01). The difference between A and B groups of the experiment class is diminished in listening, speaking dimensions and total grade after experiment (P>0.05). However, there are still significant gaps in post-test achievement between A and B groups of the control class in all dimensions (P<0.01). Therefore, 4C/ID model narrows the gap between top students and underachievers of the experiment class, which is beneficial to underachievers to master generative skill and improve their performance.

Table 5. Listening and speaking grade analysis of top students and underachievers

Content	Test	Groups	Median	Z value	P value	Groups	Median	Z value	P value
Listening	pretest	experiment group A	51.98	-3.78	***0.000	control group A	40.84	-3.78	***0.000
		experiment group B	86.51			control group B	96.89		
	post-test	experiment group A	86.80	-0.76	0.447	control group A	44.55	-3.70	***0.000
		experiment group B	86.45			control group B	97.70		
Speaking	pretest	experiment group A	62.22	-3.78	***0.000	control group A	48.65	-3.10	**0.002
		experiment group B	90.37			control group B	72.72		
	post-test	experiment group A	98.70	-1.45	0.165	control group A	52.05	-3.02	**0.002
		experiment group B	99.05			control group B	73.25		
Pronunciation	pretest	experiment group A	79.45	-3.18	**0.001	control group A	77.98	-3.18	**0.001
		experiment group B	86.58			control group B	84.59		
	post-test	experiment group A	79.90	-2.95	**0.002	control group A	84.35	-3.78	***0.000
		experiment group B	85.70			control group B	85.35		

Content	Test	Groups	Median	Z value	P value	Groups	Median	Z value	P value
Grammar	pretest	experiment group A	81.63	-2.57	**0.001	control group A	78.57	-2.65	**0.008
		experiment group B	85.29			control group B	84.39		
	post-test	experiment group A	83.50	-3.21	*0.010	control group A	85.50	-2.99	**0.003
		experiment group B	85.80			control group B	89.85		
Word	pretest	experiment group A	69.50	-3.25	**0.001	control group A	86.70	-2.64	**0.008
		experiment group B	84.23			control group B	96.60		
	post-test	experiment group A	84.40	-2.42	*0.015	control group A	95.25	-3.41	**0.001
		experiment group B	89.00			control group B	96.05		
Total Grade	pretest	experiment group A	68.13	-3.780	***0.000	control group A	68.14	-3.78	***0.000
		experiment group B	87.19			control group B	85.93		
	post-test	experiment group A	85.48	0.151	0.912	control group A	73.05	-3.78	***0.000
		experiment group B	85.50			control group B	86.35		

Note: * represents P<0.05, ** represents P<0.01, *** represents P<0.001.

Self-guided learning ability test: giving "Self-Guided Learning Skills Assessment Questionnaire" to students after the course. The questionnaire is prepared according to self-guided learning skill level relevance theory proposed by Boom, including five dimensions such as orientation, plan, surveillance, adjustment and self-assessment[11]. Likert five-class scale is used for scoring. This research distributes 89 questionnaires, the actual recovery of 84 copies, 80 valid questionnaires, the recovery rate is 94.4% and the effective rate is 95.2%. The reliability of questionnaires are analyzed and questionnaires have good reliability because Krenbach coefficient is 0.906.

Data analysis shows that there is significant difference in self-directed learning ability's five dimensions of experimental class and control class in the five parts' score (take the average of five parts' score) and overall score after the experiment (P<0.05), see Table 6 for details. Thereinto, experimental class is superior to control class in plan, surveillance, adjustment, self-assessment dimensions and overall aspects. However, students in the experimental class was slightly worse than those in the control class in the orientation dimension because teaching of 4C/ID model is too comprehensive to students have a vague understanding of specific curriculum objectives. Therefore, detailed explanation of specific teaching and curriculum objectives should be added in teaching design in the future to help students improve their self-directed learning ability in the orientation dimension.

Table 6. The analysis of self-directed learning ability in the experimental class and control class

Dimensions	Content	Class	Number	Average	Standard deviation	T Value	P Value
Orientation	What is learning objective?	experimental class	45	2.85	0.56	13.32	***0.000
		control class	44	4.35	0.50		
Plan	(1) What tasks need to be accomplished? (2) How much to pay time, efforts, energy?	experimental class	45	3.96	0.55	10.73	***0.000
		control class	44	2.77	0.50		
Surveillance,	(1) Whether you get every task? (2) Whether you can terminate task?	experimental class	45	4.00	0.52	10.08	***0.000
		control class	44	2.84	0.56		
Adjustment	(1) Whether to change your learning styles? (2) Do you need any help?	experimental class	45	3.96	0.69	9.27	***0.000
		control class	44	2.62	0.67		
Self-assessment	(1) Whether the curriculum standard is met in general? (2) What place need improvement?	experimental class	45	4.06	0.57	14.23	***0.000
		control class	44	2.51	0.45		
Overall situation	——	experimental class	45	3.68	0.28	9.73	***0.000
		control class	44	3.14	0.24		

Note: *** represents P<0.001.

5. Conclusion

4C/ID comprehensive study design mode provides us new ideas for developing students' complex skills. Teaching design and relevant experiments are carried out, which take interactive self-introduction skill training of primary school English as an example by this research based on analyzing the intension of four basic element. Research show that 4C/ID model can be used for training complex skills of primary school English; 4C/ID model has the advantage of improving oral English and self-directed learning ability of students and narrowing the achievement gap of students compared with traditional English teaching mode. Certainly, research data also expose deficiencies of 4C/ID model in improving oral English level and narrowing the achievement gap between primary school students. On the one hand, teaching design improvement is conducted aimed problems emerged in 4C/ID model of this experiment in post-study to improve teaching effectiveness; on the other hand, case subject areas and the number of study sample are enlarged to examine the broader use of 4C/ID model.

References

[1] Jung L, Robert R, Zane O. The effects of part-task and whole-task instructional approaches on acquisition and transfer of a complex cognitive skill. *Education Technology Research and Development*. 2009; (1):61-77.

[2] Merriënboer J, Kirchner, Zhuyun Z. "Four elements teaching design model" under the background of subject teaching and teaching design. *Open Learning Research*. 2019; (3): 48-54+62.

[3] Hang L, Halszka J, Roland K, et al. Using sensors and augmented reality to train apprentices using recorded expert performance: A systematic literature review. *Educational Research Review*. 2018; (25):1-22.

[4] Rong Z. Constructing a design training model of distance teaching competency for higher education teachers based on complex learning perspective. *Educational Technology Research*. 2017; (6): 116-122.

[5] Merriënboer J, Kirchner. Comprehensive learning design — four elements and ten steps system method. Fuzhou: Fujian Education Press; 2012.

[6] Qiyu N, Lili L. Discussion on "cognitive load theory"-based whole-task design of complex learning. *Modern Educational Technology*. 2009; (3): 39-41+77.

[7] Yanjun Y, Feifei R, Aynur. STEM project design based on a holistic design method. *Open Education Research*. 2019; (8): 99-107.

[8] The ministry of education of the people's republic of China. Compulsory Education English Curriculum Standards (The 2011 edition). Beijing: Beijing Normal University Press; 2012.

[9] Xianlong X, Zhixun Z, Yun J. Design and effectiveness of comprehensive learning for complex skills based on 4C/ID model. *China Educational Technology*. 2019; (10):124-131.

[10] Lixia J. The correlational research on the autonomous learning mode based on strategy training and spoken English proficiency. *Modern Educational Technology*. 2016; (10): 73-78.

[11] Boom G, Paas F, Merriënboer J. Reflection prompts and tutor feedback in a web-based learning environment: Effects on students' self-regulated learning competence. *Computers in Human Behavior*. 2004; 20(4): 551-567.