The Development of an Instructional Model Based on Interactive Learning Theory to Improve Undergraduate Students' Reflection Ability

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Abstract

This research aimed to: 1) study the factors that affect the development of the third-year students' reflection ability in Baise University; 2) develop an instructional model based on interactive learning theory; 3) compare the third-year students' reflection ability before and after using the instructional model based on interactive learning theory. The sample group was 32 third-year students' reflection ability at Baise University. The research instruments were 1) questionnaires, 2) interview forms, 3) lesson plans, 4) questionnaire on reflection ability, and 5) teaching opinion interview form 6) observational records of student behaviour. The research was conducted in three steps: studying the factors that affect the development of third-year students' reflection ability, developing an instructional model based on interactive learning theory, and the experimental and improvement process. The study results showed: 1) the factors that affect the development of students' reflection ability consisted of three aspects (1) school teaching management, (2) teachers' teaching style, and (3) students' learning behaviour 2) The instructional model based on interactive learning theory included four elements: (1) principle, (2) objectives, (3) learning process, and (4) results; 3) students' reflection ability was improved after the implementation of an instructional model.

Keywords: instructional model, interactive learning theory, reflection ability, improvement

1. Introduction

1.1 Introduce the Problem and Explore the Importance of the Problem

As early as 2008, European and American countries, represented by the United States, began to discuss related topics such as education and teaching, teacher and curriculum reform in response to 2030. The research report Teaching 2030: What We Must Do for Students and Public Schools -- Now and in the Future, the traditional 3R (Reading, Writing and Arithmetic courses and "new Three Arts" courses (math, science, and foreign language) are far from meeting the social development and survival requirements in 2030. In the 21st century, learners need to learn more than the content of 3R courses. They need to master 4C (Critical Thinking and Problem-Solving, Collaboration, Creativity and Innovation, namely critical thinking and problem-solving skills, communication skills, cooperation skills, and Creativity and Innovation skills, or 4C) is the core of the 21st-century skills "(Deng, 2017).

In 2016, China's Ministry of Education released the "Chinese Students Develop Core Literacy". The report pointed out that the core quality of Chinese students' development includes cultural foundation, independent development, and social participation. It is comprehensively expressed as six qualities: cultural heritage, scientific spirit, learning, healthy life, responsibility, practice, and innovation, and detailed into 18 basic points, such as national identity and independent reflection (Lin, 2016). After the report's release, curriculum, and teaching reforms based on the development of students' core literacy quickly spread out in theoretical research and practice of education. As the "mother machine" of future talent training, teacher education needs to be promoted and reformed.

In the field of China teacher education, the disconnection between theory and practice has been a prominent problem

for a long time (Hao, 2015). At present, increasing trainee teachers generally adopted in the field of practical education (Li et al., 2018), extend the practice time(Lin et al., 2021), strengthen the practice link (Li et al., 2015), strengthen cooperation with universities and elementary and secondary schools common coping styles(Luo & Mou, 2016), such as positive theory research focus on practice orientation of teachers' education concept, education practice running mechanism, foreign education practice mode and experience of specificity issues such as system discussed in this paper. Objectively speaking, these responses and actions have exerted positive effects, enhanced the practical ability of normal university students to a certain extent, and alleviated the prominent problem of the disconnect between theory and practice. However, this kind of positive utility is far from satisfying the practical demand of educational practice for teachers' ability (Miao et al., 2019). On the one hand, the practice of commonality in practice adopts a kind of thinking of "addition," hoping to reverse the weak position of practice in the relationship between theory and practice by extending educational practice time. It has "the education internship duration and students' practical ability strong or weak causality, and there was a positive correlation between the simple linear thinking, thought the education internship length is sufficient, and necessary condition of students practice ability strong or weak, ignore practice ability to generate the intermediate links, internal factors, namely the self-reflection and evaluation of students"(Chang & Ren, 2005; Dai, 2020).This kind of thinking pattern that blindly emphasizes the cultivation of normal university students' practical ability through the accumulation of time and repeated practice to comply with the practice is bound to cause the teacher education to pay insufficient attention to the reflection ability of normal university students and the ability of continuous improvement of practice based on reflection(Wang, 2013; Du, 2005; Guo, 2008; Yao, 2014; Yu & Luo, 2018).

1.2 Explore the Importance of the Problem

After the accumulation and experience of the first and second years of study, the third-year students majoring in Primary education at Baise University have acquired certain basic knowledge of teacher education and professional beliefs. They can finish the homework and after-class exercises teachers assigned on time and clearly judge what they have learned. But it is vague to identify the specific gaps between what they get and what they should to get, and how to close them (Leng & Lu, 2020). For example, how to actively and consciously determine whether the knowledge they have learned meets the requirements of the course objectives? How to combine the educational theory knowledge with educational practice, objectively understand and explain the phenomena in the educational practice, and analysed the problems from multiple angles; How to take the initiative to seek theoretical support in combination with specific educational practice; How to use the power of peers to promote learning in the process of learning. This requires the cultivation of reflection ability to highlight professional characteristics and enhance pertinence (Tian & Li, 2008). Some scholars believe that in teacher education courses, such as teaching methods courses, cooperation among peers, self-observation, dialogue, writing, teaching plans, and so on (Jansong & Congman, 2014; Wu et al., 2014; Yang et al., 2011; Yin, 2012), can be used to cultivate preservice teachers' reflection ability.

On learning style, American professor Ji (2014) proposed the ICAP framework in 2014. ICAP framework proposes four learning styles, namely interactive, constructive, active, and passive, and their relationships, which can be summarized as follows: According to the four ways of learning activities (passive, active, construction, and interaction), the four processes of knowledge change (storage, selection, inference, and cooperative inference), and the four results of knowledge change (memory, application, transfer and co-creation), there are correspondingly four different levels of learning: the first level of learning is the most superficial understanding, and the second level of learning is shallow understanding. The third level of learning is deep understanding, and the fourth is the deepest understanding (Chi & Wylie, 2014; Aera, 2016a, 2016b; Sheng et al., 2017). She proposed interactive learning is one of the most effective learning styles. Interactive learning can promote students' deep learning and promote their knowledge and skills to develop to a higher level. (Jansong & Congman, 2014; Leng & Lu, 2020; Rotova, 2018)

A descriptive qualitative design was used among 16 undergraduate university students at a governmental university. It showed several advantages of learning health promotion courses using interactive learning, including enhancing understanding, sharing ideas and opinions, promoting self-esteem and self-confidence, keeping their minds active and attentive, and improving interpersonal communication. Updated and contemporary learning strategies and methods should be introduced for enhancing interactive learning courses and suggested to enhance interactive learning in other courses and adopt updated learning strategies and methods (A Al-Natour，2021). This inspires this study.

In summary, reflection ability is important to students, and reflection ability can be well exercised and improved by interactive learning theory. Therefore, the researcher is interested in developing an interactive learning theory

instructional model to improve third-year students' reflection ability at Baise University.

1.2 Research Objective

1.2.1 To study the factors that affect the development of the third-year students' reflection ability in Baise University

1.2.2 To develop an instructional model based on interactive learning theory

1.2.3 To compare students' reflection ability before and after using the instructional model based on interactive learning theory

1.3 Research Hypothesis

The students' reflection ability will be improved after using the instructional model based on interactive learning theory

1.4 The Variable

Independent Variable: The instructional model is based on interactive learning theory.

Dependent Variable: reflection ability

2. Method

This research was a multi-sequenced design and equivalent status design: qualitative research and quantitative research. Research design, research processes, and data analysis were presented as follows.

2.1 Population and Sample Group

2.1.1 Population

64 third-year students who major in Primary Education and enrol in an Instructional Strategy course at Guangxi Baise University in the spring semester of 2023. They were randomly divided into two classes, 32 third-year students per class.

2.1.2 The Sample Group

32 third-year students in class 1 selected through Cluster Random Sampling with mixed ability (strong, medium, and weak) who enrolled in the Instructional Strategy course at Baise University in the spring 2023.

2.2 Research Instruments

Research instruments were presented as follows:

(1) Interview form on influencing factors of reflection ability

(2) Questionnaire on influencing factors of reflection ability

(3) Questionnaire on reflection ability

(4) lesson plans

(5) Interview form about opinions on teaching

(6) Observation form about Student behavior

Submit the revised research Instruments to experts for verification to verify the accuracy, appropriateness, and completeness of all research Instruments; the IOC consistency index of each is 1.00. The confidence level was measured by the coefficient method Questionnaire on reflection ability was tested. The test of this confidence is level high = 0.91. So, it's good for research.

2.3 Research Process

This research was conducted in three steps: studying the factors that affect the development of reflection ability, the development of instructional model, and the experimental and improvement process. The research process was presented as follows:

2.3.1 Step 1 Studying factors that affect the development of reflection ability.

The details of step 1 were as follows:

(1) Collect data about factors that affect the development of reflection ability from 10 Academic experts by using a questionnaire about factors that affect the development of third-year undergraduates' reflection ability and an interview form about factors that affect the development of third-year undergraduates' reflection ability.

(2) Analyse data about factors that affect the development of reflection ability

(3) Conclude data and use to develop an instructional model

2.3.2 Step 2 The Development of Instructional Model

The process of development of the instructional model is presented as follows.

(1) Study about instructional model development process by literature and references

(2) Identified the instructional model components

(3) Drafted the details of the instructional model: principle, objective, learning process, and result

(4) Verified the details of the instructional model by adviser

(5) Modify the detail of the instructional model according to suggestions

(6) Verified the details of the instructional model by the five professional scholars and modified the instructional model according to suggestion

2.3.3 Step 3 Experimental and Improvement Process

The details of the experimental and improvement process are presented as follows:

(1) Third-year undergraduates majoring in Primary Education and enrolling in the Instructional Strategy course in Guangxi Baise University in the spring semester of 2023 were tested before using the instructional model through a questionnaire on reflection ability.

(2) Third-year undergraduates majoring in Primary Education and enrolling in an Instructional Strategy course at Guangxi Baise University in the spring semester of 2023 were experimented with using four units /7 lesson plans according to the instructional model for 20 hours: 5 weeks, with 180 minutes of lessons per week.

(3) The researcher observed and interviewed the third-year undergraduates majoring in Primary Education and enrolling in the Instructional Strategy course at Guangxi Baise University about the activities gained after learning from lesson plans according to the instructional model.

(4) Third-year undergraduates majoring in Primary Education and enrolling in an Instructional Strategy course in Guangxi Baise University were tested after using an instructional model through the questionnaire on reflection ability.

(5) Analysed data and improved instructional models according to data.

2.4 Data Analysis

The data are analysed as follows.

(1) Qualitative data are analysed through content analysis.

(2) Quantitative data are analysed through descriptive statistics: frequency, percentage, means, and standard deviation, and the scores of reflection ability before and after using the instructional model are analyzed through a pared-samples T test.

3. Results

Research results are presented as follows.

3.1 Results on Factors Affecting the Development of Reflection Ability

Ten experts with five years' training experience in normal university students participated in the questionnaire survey on the influencing factors of the reflection ability of normal university students. The survey results are shown in Table 1.

Table 1. Table of Influencing Factors on Reflection Ability

Factors	$\overline{x}$	S.D.
School teaching management	4.05	0.50
Teachers' teaching methods	4.14	0.68
Students' learning behaviour	3.70	0.42

Table 1 showed that School teaching management, teachers' teaching methods, and students' learning behaviour affect students' reflection ability development. Teachers' teaching methods have the greatest impact on students' learning reflection ability. School teaching management also has a great impact, and students' learning behaviour has an impact.

3.2 Results on the Development of an Instructional Model Based on Interactive Learning Theory

The Instructional Model based on Interactive Learning Theory is shown as follows:

3.2.1 Principle

Ability is formed and developed in activities. To improve students' reflection ability, teachers must organize various reflective activities around specific themes and guide students to participate actively. Reflection is a personal thinking activity; it is undeniable that other people's views/ ideas are one of the important sources of reflection.

Interactive learning is one of the most effective deep learning. It makes students several developments, include enhancing understanding, sharing ideas and opinions, promoting self-esteem and self-confidence, keeping their minds active and attentive, and improving interpersonal communication (Natour,2021). Interactive learning is dependent on the participation of two or more learners in teaching activities, equitably constructing and generating knowledge and understanding. Everyone within the group must be primarily constructive, with the contribution of each partner participating in the group members' contribution. Students' understanding of knowledge will be multi-dimensional in dialogue, communication, and feedback. It is helpful to develop students' advanced ability and thinking quality and promote students' deep learning.

3.2.2 Objective

This model can promote the improvement of students' reflection ability. That is, students can analyse things from their own personality, attitude, and other aspects through reflection on learning activities: 1) Can describe something 2) Can think about solutions to problems based on problem-solving 3) Can measure the rationality of the solution to the problem and 4) Can analyse things from personality, attitude and other aspects.

3.2.3 Learning Process

Step1 Require

Put forward learning requirements to attract students to perceive new knowledge. By reviewing the old knowledge, presenting the learning objectives and rubic of the new lesson, students' interest in learning new knowledge is aroused.

Step2 Ask

Guide students to understand new knowledge (Ask). Teachers present new knowledge through presentation, questions, and other ways, supplemented by PPT, to help students understand new knowledge. The teacher asks important questions. After the students answer the question, the teacher organizes students to share/reflect on their ideas.

Step3 Interact

Instruct students to interact with each other. Teachers organize interactive learning activities, such as asking questions, arranging study assignments, organizing group discussions or exercises, etc., to help students consolidate new knowledge. Students are guided to further think about their learning by organizing interactive learning activities.

Step4 Share

Organize students to share their learning achievements in groups. Guide the students to take the study group as the unit and recommend the group spokesman to share the learning results on behalf of the group.

Step5 Evaluate

Teachers guide students to summarize and comment on the learning process and results and appropriately present the evaluation results.

3.2.4 Result

In achieving the expected learning goals, dialogue and feedback are common learning strategies that are part of the learning process. Through dialogue and feedback, students will participate in reflective activities. By guiding students to participate in reflective activities, students can 1) describe something, 2) think about solutions to problems based on problem-solving, 3) measure the rationality of the solution to the problem , and 4) analyse things

from personality, attitude, and other aspects.

3.3 Results on the Improvement of the Third-Year Undergraduates' Reflection Ability

The results are presented in 2 ways in this section: (1) comparing students' reflection ability before and after the experiment through a pared-samples t-test, which provides whether the difference is significant between before and after using the instructional model based on interactive learning theory, and (2) reporting individual relative development scores and increased percentages and assessing the level of development.

Table 2. Comparison between Students' Reflection Ability before and after Using the Instructional Model Based on Interactive Learning Theory

Items	Scores	N	$\bar{x}$	S.D.	Df	t	p
Reflection on oneself	Pretest	32	3.60	0.57	31	3.16**	0.00
	Posttest	32	3.81	0.51			
Reflection on learning	Pretest	32	3.05	0.62	31	2.02	0.05
objectives	Posttest	32	3.28	0.55			
Reflection on learning	Pretest	32	3.27	0.70	31	1.93	0.06
methods	Posttest	32	3.48	0.49			
Reflection on learning	Pretest	32	3.38	0.61	31	3.19**	0.00
contents	Posttest	32	3.57	0.57			
Reflection ability	Pretest	32	3.38	0.53	31	3.38**	0.00
	Posttest	32	3.59	0.45			

** Statistically significant at the level. 01 ($p < .01$)

Table 2 shows that students' sum average score reflection ability after class is higher than their average score before class after using the instructional model based on interactive learning theory, indicating that students' score after class is higher than before class. $p < .01$, there was statistical significance at the level of .01. The considering each aspect, the research results found that aspect reflection on oneself and reflection on learning contents after class is higher than before class. There was statistical significance at the level of .01., Other aspects No differences found.

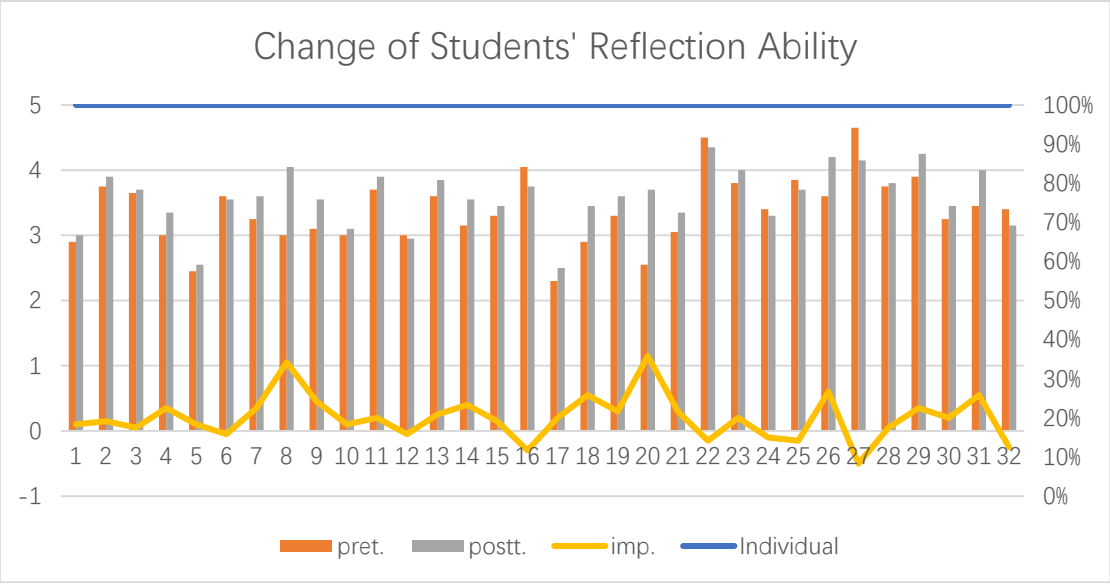

Figure 1. The Change of Every Student's Reflection Ability

Figure 1 indicates that 24 students' reflection ability are improved. The improvement is shown in the Table 3.

Table 3. Students' Improvement on Reflection Ability

Improving range	Students No.
<0	8
0.00-0.49	19
0.50-0.99	3
1.00-1.50	2
Total	32

Table 3 shows that 19 students had an increase between 0 and 0.49 points, 3 students had an increase between 0.50 and 0.99 points, and 2 students had an increase between 1.00 and 1.50 points in terms of increase.

4. Conclusion

The research results indicated that: 1) the factors that affect the development of students' reflection ability consisted of three aspects (1) school teaching management, (2) teachers' teaching style and (3) students' learning behavior;2) The instructional model based on interactive learning theory included four elements: (1) principle, (2) objectives, (3) learning process, and (4) results; 3) students' reflection ability was improved after the implementation of the instructional model based on interactive learning theory.

5. Discussion

5.1 Discussion about Factors Affecting the Development of Reflection Ability

The research results show that teachers' teaching methods greatly impact students' learning reflection ability. School teaching management also has a great impact, and students' learning behavior has an impact. According to the interviews with ten experts and scholars with more than five years of training experience in normal schools and are Doctors of Education, the facts are mainly related to the following three aspects.

(1) It is generally believed that the ability to reflect is very important, especially for normal university students. Because it not only affects the learning results of normal university students but also affects the future career development of individuals. In a broader sense, it affects the quality of teachers and the quality of education. Curriculum is the carrier of education and teaching. To improve reflection ability, certain courses should be set up in theory to support it, but in practice, the school has not set certain courses, the existing curriculum is not scientific, and there is no time for students to reflect. The cultivation of reflective ability is mainly achieved by teachers guiding students to carry out reflective activities when organizing educational internships and practice. In the questionnaire survey, the average scores of "the curriculum do not reserve students' reflection time" and "the lack of certain curriculum support" were 5 and 4.3, respectively.

(2) Because the curriculum is not enough to support the improvement of reflection ability, the improvement of students' reflection ability mainly depends on teachers to adopt appropriate methods to guide and organize in classroom teaching. It is more important for teachers to choose proper teaching methods. In the interview, 10 experts and scholars discussed their teaching experience. They believed that teachers should adopt group cooperative learning as much as possible and organize more interactive activities, which can better improve students' reflection ability. The questionnaire item about teachers' teaching methods scored higher in the survey. For example, "Teacher explanation is a common teaching activity in class" and "Teacher organizes teaching activities according to the logical sequence of teaching materials in class" scored 4.8 and 4.3, respectively.

(3) Passive learning still exists. Regarding students' learning behavior, the scores of "students are satisfied with learning according to the curriculum prescribed by the school" and "students rarely record the confusion in learning" are relatively high, both of which are 3.9 points. In the interview, ten experts and scholars also pointed out that students' active learning needs proper guidance and encouragement from teachers.

These views coincide with Yu and Luo (2018), who claimed that the development of normal university students' reflection ability depends on the curriculum setting, content reform, and the effectiveness of curriculum implementation. Centering on curriculum design and implementation, school teaching management, teachers' teaching methods, and students' learning behavior improve students' reflection ability.

5.2 Discussion about the Instructional Model Based on Interactive Learning Theory

The research results show that third-year undergraduates' reflection ability was improved after implementing the instructional model based on Interactive Learning Theory because is developed systematically.

(1) Its theoretical basis is Interactive Learning Theory. Interactive Learning Theory emphasizes the interaction between students and environments combined by students, teachers and physical environments. (Zhou & Pan, 2014). In the interview with students, Nos. 7 and 11 believe that the biggest difference in learning this course is more interaction, which helps them to learn more effectively. For example, questioning focused their attention, while self-assessment and mutual assessment made them more aware of themselves and their level of learning.

(2) It has been checked by five experts thoroughly. They put forward valuable suggestions for revision, helping researchers develop a scientifically feasible instructional model. Students who participated in implementing this model generally felt that they had a positive learning experience in this course and were willing to accept evaluation and feedback during the learning process.

(3) Students are appropriate for the five teaching steps. In teaching practice, under the guidance of teachers, students actively participate in interactive activities such as questioning, discussion, work display, self-evaluation and mutual evaluation, and summary and enjoy them. Communicating with students on the question, what kind of interaction will help you more? The interactive activities such as questioning, discussion, work display, self-evaluation and mutual evaluation, and summary have gained more recognition, and students have deepened their thinking in at least one of the interactive activities. Organizing similar interactions in the classroom increases the frequency of reflective activities. Students interact with the environment and have more opportunities to practice their reflection abilities.

5.3 Discussion Whether the Third-Year Students' Reflection Ability Was Improved after Using the Instructional Model

The research results showed that the third-year students' reflection ability is improved after using the instructional model based on interactive learning theory. The specific analysis was as follows:

(1) The reflection ability of the third-year students has been significantly improved, but there are differences in all dimensions. The paired sample t-test showed that the reflection ability of students was significantly improved after implementing the teaching mode ($P=0.002$). It is like the study that uses the Interactive Learning Model theory to explore the nature of self-awareness within each of the three L2 learners. The study showed that the self-awareness gained from understanding their combination of learning patterns and expanded by the self-reflection activities increased the participants' ability to articulate the nature of their self-awareness and to identify evidence of their growth in self-awareness during L2 learning. (Johnston et al., 2022). However, this study has some differences: self-reflection and learning content reflection were significantly improved ($P<0.01$). Still, reflection on learning goals and methods was not significantly improved ($P>0.05$). This shows that the interactive activities based on learning content design and organization in teaching implementation directly impact the improvement of students' reflection ability. In interactive activities such as questioning, discussion, achievement presentation, summary, and evaluation, students pay more attention to their understanding of learning content and their performance in the learning process and pay less attention to learning objectives and methods. This also suggests that researchers first we should think about how to guide students to pay attention to whether the learning goal is achieved and whether the learning method is feasible. The second is to continue to do a good job of tracking research to confirm whether there is a lag in the appearance of education effects.

(2) The reflection ability of the third-year students has been significantly improved, but there are differences among different individuals. By calculating individual relative development scores and increased percentages and assessing the level of development, the research learned that the reflection ability of 24 students had definitely improved, but the assessment scores of 8 students had decreased and needed to be considered. The eight students interviewed by the researchers said that at the beginning of the course, they always thought they were good learners and answered the questions more positively. With the deepening of the course learning and the interaction and communication in the course learning, they gradually found that they still have a lot of things to learn, and compared with other students' learning, they have no obvious advantages, and even think that they have some gaps in the specific learning content and learning methods with other students, and they are more rational in the post-test. This also shows that the application of this model enhances students' self-reflection.

6. Recommendations

Reflection ability is important for the development of normal university students. Based on the above analysis, this study recommends the following:

(1) It is difficult for teachers to change the curriculum, but they can improve the teaching mode in combination with the curriculum teaching tasks they undertake, and organize interactive activities such as questioning, discussion, self-evaluation and mutual evaluation, and summary and feedback in classroom teaching as much as possible.

(2) According to the assessment dimension of reflection ability and students' performance, when selecting activity objects and organizing interactive activities in classroom teaching, in addition to learning content, learning objectives, and learning methods should be appropriately expanded.

(3) On the premise that classroom teaching progress is difficult to change, teachers can also explore the integration model of in-class and extra-class, design certain exercises with learning objectives and methods as objects, and guide students to carry out self-reflection activities after class.

(4) In teaching practice, teachers can improve their classroom teaching from specific teaching steps and guide students to carry out certain extracurricular learning activities independently. Teachers should observe students' behaviour as comprehensively as possible and give timely guidance when necessary.

(5) Would the results have changed if the sample size had been larger or if any of the five teaching steps had been adjusted? It deserves further study.

7. **Future Researches**

This study explores an instructional model aimed at improving students' reflection ability. Combined with the research process and results of this study, it is suggested to further study the improvement and perfection of instructional models from the following aspects.

(1) Enhance the capacity for reflection by employing suitable pedagogical strategies.

(2) Explore and devise novel instructional methodologies rooted in diverse theoretical frameworks to foster reflection ability.

(3) Research study on reflection ability within alternative cohorts or demographics.

(4) Conduct research that employs Interactive Learning Theory to cultivate the skill set requisite for navigating the demands of 21st-century learners.

(5) Investigate, utilizing Interactive Learning Theory, the multifaceted problematic attributes observed among learners from varying groups or demographics.

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