The Development of an Instructional Model Based on Experiential Learning Theory and Six Thinking Hats to Improve the Critical Thinking Ability of Undergraduate Students

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Abstract

Yulin Normal University preschool education major existing children's game course instructional model more in passing test knowledge and practice test skills, students used to passively accept knowledge, rarely use critical thinking to treat knowledge, with a critical eye to question, thinking, and discovery, long-term students will not be able to adapt to the needs of the new era of social development of survival ability and professional competitiveness. Therefore, the objectives of this study were (1) to study the factors affecting the development of critical thinking ability, (2) to develop an instructional model based on experiential learning theory and six thinking hats, and (3) to compare the critical thinking ability of Third Year college students before and after the instructional model of experiential learning theory and six thinking hats. The sample group was 30 students from preschool education majors at Yulin Normal University. The research was conducted in three steps: studying the factors that affect the development of critical thinking ability, developing the instructional model, and the experimental and improvement process. The research instruments were a questionnaire about factors that affect the development of critical thinking ability, an interview form about factors that affect the development of college students' critical thinking ability, an observation form about student behavior, an interview form about opinions on teaching, lesson plans, and a critical thinking ability test. The study's results were 1) the main factors affecting the development of critical thinking ability include the instructional environment, the teachers, and the students, respectively, 2) the instructional model based on experiential learning theory and six thinking hats was developed consisting of four core components: a) principles, b) objectives, c) learning process, and d) results, and 3) after the implementation of the instructional model based on experiential learning theory and six thinking hats, the critical thinking ability scores of the students were higher than the critical thinking ability of the students before the experiment, with a statistical significance of 0.01 level. Finally, this paper strives to develop a based on Experiential Learning Theory and Six Thinking Hats instructional model to improve the critical thinking of preschool education students at Yulin Normal University.

Keywords: instructional model development, experiential learning theory and six thinking hats, critical thinking ability

1. Introduction

1.1 Introduce the Problems

In the face of the new challenges brought by the information age and the knowledge society, all countries in the world are actively promoting education reform-oriented by "core literacy". In 2014, the Ministry of Education announced that "it will organize research, establish the core literacy framework for student development at all stages, and define the key qualities and important skills that students should have to meet the needs of lifelong development

and social development". With the economic boom and the expansion of the education scale, Chinese higher education institutions have become among the top in the world in terms of the total number of undergraduates. However, the quality of undergraduate education is the core index of the development of higher education, and the level of critical thinking is an important basis for evaluating the quality of education. It is regarded as an academic skill as important as reading and writing skills, and also one of the core skills necessary for undergraduate graduates in the knowledge society. Therefore, judging the development of critical thinking ability has become an important dimension to measure the academic performance of college graduates. Critical thinking is regarded as one of the four core qualities in the world, just like the basic skills of reading, writing, and computing in the information age. Nowadays, in the wave of curriculum reform oriented toward core literacy, critical thinking, as an important part of students' core literacy, should be placed in the core position.

Since the early 1980s, critical thinking has become the central issue of Western education reform. Nowadays, critical thinking has significantly penetrated the educational goals and curriculum standards of many countries and is regarded as one of the necessary talents and cultivation of citizens in the 21st century. Critical thinking teaches people in the face of complex problems how to think and make decisions, it requires us under the guidance of the problem actively search for evidence and reason, different information comparison, analysis, and evaluation, and pick out a set of relatively robust or optimal ideas to guide our behavior, which makes the risk and variables to a certain extent, to enhance our confidence and concentration in dealing with unknown. Critical thinking can help people in the process of mining and selecting information to identify authenticity and remove multifarious, using critical thinking methods to consider the authenticity of information, the integrity of reasoning and argument, thus away from blind follow and trust others, and based on the instinct, intuition, feelings, habits, or religious beliefs to make an unwise choice. In critical thinking, exploring implicit assumptions and finding alternative arguments are inseparable from the support of creative thinking, and the exploration ability and complex problem-solving ability cultivated by exercising critical thinking are also the source of promoting knowledge innovation.

As we all know, in today's times and society, everyone has to have strong critical thinking skills to survive and control their destiny. This is not only the ability to identify, select, and judge various environmental information or ideas, but also the ability to form clear decisions. In this process, we need to cultivate the spirit and quality of being good at thinking, daring to question, daring to innovate, and constantly surpassing them, and showing the survival ability and innovation ability to meet the needs of social development. Thus, critical thinking ability is recognized as one of the five key skills that future citizens should possess. However, due to the influence of multiple factors such as mode of thinking, social culture, and traditional education, Chinese students tend to develop the thinking pattern of obeying and relying on teachers, who are not good at questioning and lack rational thinking and active inquiry spirit. And to some extent, this situation hinders the comprehensive and healthy growth of students. It is worth noting that the poor current situation of students' critical thinking is quite related to the instructional model of teachers. In traditional teaching, teachers often use "obedient" and "clever" as an important indicators to evaluate students' performance. Their teaching philosophy mainly revolves around "teaching test-taking knowledge and practicing exam-taking skills". They adopt indoctrination teaching methods to impose the existing knowledge conclusions on students but rarely encourage students to use critical thinking to deal with knowledge, and to question, think, and find with critical eyes. Therefore, this research will focus on the cultivation of students' critical thinking by the needs of The Times and social development.

1.2 Rationale of the Study

The American critical thinking authority Robert Ennis points out: "Critical thinking is reasonable and mature thinking when determining what to believe or what to do (Robert Ennis, 1984). Ennis (1991) believes that critical thinking is a series of skills based on logical reasoning, including six abilities: Focus, Reasons, Inference, Situation, Clarity, Overview, the first letter combination of six English words, or FRISCO. Critical thinking plays a guiding role in people's decision-making or problem-solving. Internationally recognized authority of critical thinking authority, "Critical Thinking National Top Council", "Critical Thinking Center" research director Dr. Paul pointed out: "Critical thinking is an actively, skilled, dexterous application, analysis, synthesis or evaluation by the observation, experiment, reasoning, and its guidance and action (Paul, 1987). Critical thinking is teaching people how to think and decide in the face of complex problems, it requires under the problem of traction actively seeking all aspects of evidence and reason, a comprehensive balance, analysis, and evaluation, and choosing a relatively perfect or best ideas to guide their actions, so that the risk and variables to a certain extent is placed under the control of people, with the future confidence and professional competitiveness.

To meet the new challenges of the information age and the knowledge society, education reform based on "core

literacy" has been carried out in the world. Core literacy leads to the further deepening of China's curriculum reform and defines the necessary character and key abilities that students should have to meet the needs of lifelong development and social development. To survive in today's era and sociology, and grasp fate, people must have strong critical thinking ability, in the complicated environment of information or ideas critically identify, select, and judgments, make a clear decision, and thinking, dare to question, innovation, and constantly beyond the spirit and quality, with survival ability to adapt to the social development and innovation ability. Therefore, critical thinking ability is also regarded as one of the five skills needed for the citizens of the future society. However our country full-time undergraduate education in the cultivation of critical thinking is still not enough, few high school speculative courses are required for students, currently most college students are given priority to receptive learning, and mechanical, passive, and rote learning is still the main way of students learning, students 'thinking rigid and curing, there is a strong dependence, lack of critical spirit and active explore consciousness, students this worrying critical thinking situation is inseparable with teachers' teaching, rarely let students use critical thinking to treat knowledge, with critical eye to analysis, reasoning and evaluation.

Yulin Normal University preschool education major students after graduation, mainly in the kindergarten and other preschool education institutions to become a preschool teacher, Before entry, it is necessary to master basic theoretical knowledge of preschool education and solid teaching skills, After entering the company, they need to have a strong professional key force, And the existing curriculum model is more stuck in the transfer of test-taking knowledge and practice test-taking skills, Adopt the teaching method to instill the existing knowledge conclusions to the students, Students have developed the mindset of obedience and excessive reliance on teachers, Accustomed to being passively taught by teachers, Dare not and will not question the reliability and effectiveness of teachers' teaching, Rarely ask students to use critical thinking about knowledge, To question, think, and find, with a critical eye, This is clearly inconsistent with the direction of the talent needs of the new era, Therefore, we need to reform the curriculum model. Chen (2014) summarizes three models of critical thinking, namely the direct instructional model aimed at special training, the indirect instructional model based on realistic consideration, and the comprehensive instructional model based on complex thinking. Hitchcock, D. (2017) of McMaster University in Canada makes some specific suggestions on the principles of cultivating critical thinking by offering separate courses, which are very practical.

To sum up, the cultivation of critical thinking is the ardent call of today's information age and the knowledge society, and it is one of the necessary core qualities for students majoring in preschool education. Therefore, this paper focuses on the cultivation of critical thinking in preschool education for third-year university students and strives to develop a based on the Experiential Learning Theory and Six Thinking Hats instructional model to improve the critical thinking of preschool education students in Yulin Normal University.

1.3 Research Objectives

(1)To study the factors affecting the development of critical thinking ability of third-year students at Yulin Normal University.

(2)To develop an instructional model based on experiential learning theory and six thinking hats.

(3)To compare the critical thinking ability of Third Year college students before and after the instructional model of experiential learning theory and six thinking hats

1.4 Research Hypothesis/Hypotheses

The instructional model of experiential learning theory and six thinking hats helps improve the critical thinking ability of the third-year students at Yulin Normal University.

1.5 The Variable

Independent Variable: The instructional model is based on experiential learning theory and six thinking hats.

Dependent Variable: The critical thinking ability

1.6 Content (s)

This study aims to develop an instructional model based on experiential learning theory and six thinking hats. The developed instructional model is used to learn critical thinking ability in the course Children's Play. The study of this course is divided into three units as follows.

Learning Unit 1: Role Games

Learning Unit 2: Ordering of quantities

Learning Unit 3: Learning Method

2. Method

The research method used in this paper is research and development. This study combines multiple sequence designs and equivalent state designs and details the overall sample group, research tools, research process, and data analysis. Details are as follows:

2.1 Population and Sample Group

2.1.1 Population

In the spring semester of 2023, there are 150 college third year of Children's Play courses majoring in preschool education at Yulin Normal University.

2.1.2 The Sample Group

This study adopts the method of cluster random sampling to select 30 college third year of Children's Play courses in preschool education major of Yulin Normal University in the spring semester of 2023.

2.2 Research Instruments

Research instruments were presented as follows:

• Questionnaire about factors that affect the development of critical thinking ability

• Interview form about factors that affect the development of college student's critical thinking ability

• Observation form about Student behavior

• Interview form about opinions on teaching

• Lesson plans

• Critical Thinking Ability Test

2.3 Research Process

This study is divided into three key stages: exploring the factors that affect the development of critical thinking, developing the development of instructional models, and the experiment and its improvement process. The study process is detailed and summarized as follows:

2.3.1 Step 1 Studying Factors that Affect the Development of Critical Thinking Ability

The details of step 1 are as follows:

• Questionnaires and interviews were distributed to five senior education experts to collect the main factors affecting the development of critical thinking.

• Conduct X and SD analysis of the data obtained to determine the key factors affecting the development of critical thinking.

• Comprehensively organize and summarize the obtained data, and apply them to the development of the instructional model.

2.3.2 Step 2 The Development of Instructional Model

The development process of the teaching model is described below.

• Explore the instructional model development process

• Clarify the elements of the components of the instructional model

• Detailed planning of all aspects of the instructional model: principles, objectives, learning process and results

• Five outstanding experts from academia are invited to test the details of the instructional model and to revise the instructional model according to their feedback

• Make necessary adjustments to the details of the instructional model according to the feedback from experts

2.3.3 Step 3 Experimental and Improvement Process

The process of experimentation and improvement is summarized as follows:

• Third-year students majoring in preschool education at Yulin Normal University will take a pre-test of critical

thinking before entering the experiment.

• Third-year students majoring in preschool education at Yulin Normal University used the instructional model based on experiential learning theory and six thinking hats to carry out course practice, with an experimental period of 10.5 hours and a total of 3 weeks.

• With the help of observation and interviews, researchers can deeply explore the learning situation in the experiment.

• Third-year students majoring in preschool education at Yulin Normal University will take the post-test of critical thinking after completing the experiment.

• According to the analysis results, the instructional mode should be improved.

2.4 Data Analysis

The details of the data analysis are as follows:

• Use content analysis technology;

• Analysis of quantitative data by using frequency, percentage, mean, and standard deviation and t-test for dependent samples.

3. Result

Research results are presented as follows.

3.1 Results on Factors Affecting Critical Thinking Ability Development

Table 1. Summary Table of Influencing Factors

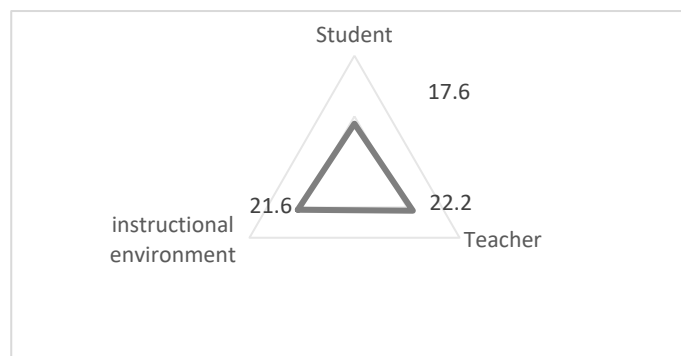| Factors	$\overline{X}$	S.D	scoring rate%	Ranking within Factors
Student	17.6	4.28	88	3
Teacher	22.2	0.84	111	1
instructional environment	21.6	0.55	108	2
Total Average	20.5	1.89	102	

Figure 1. Comparison Radar Chart of the Average Value of Influencing Factors

As shown in Table 1 and Figure 1, all the factors affecting the development of critical thinking of students at Yulin Normal University are generally at a high level ($\overline{X}$=20.4). When exploring each item, we found that the mean value of the teacher factor was high ($\overline{X}$= 22.2), followed by the instructional environment factor ($\overline{X}$=21.6), and the variance of the student factor was the minimum ($\overline{X}$=17.6). The above results are a questionnaire survey conducted by teachers on the factors affecting the development of critical thinking, which thoroughly summarizes the various factors affecting the development of students' critical thinking. These factors used the mean, standard deviation, scoring rate, and rank of all factors to present the results.

3.2 Results of Developing an Instructional Model based on Experiential Learning Theory and Six Thinking Hats

The Instructional model consists of 4 components, as follows.

3.2.1 Principle

In 1991, Ennis defined critical thinking as Critical thinking is reasonable, reflective thinking that is focused on deciding what to believe or do. According to Ennis, the basic elements of critical skills mainly include: focus, reasons, inference, situation, clarity, overview, Ennis refers to these six basic elements simply as FRISCO. Six Thinking Hats is a thinking training model developed by Edward de Bono, which provides a tool for "parallel thinking", It's a simple operation, repeatedly verified thinking tools, it has six hats of different colors, representing six thinking directions, each hat has its thinking model and rules, according to this rule thinking can make some problems surface faster, to get faster and better solutions, wearing a certain color of hats represents a specific type of thinking mode and thinking direction, thinkers can distinguish logic and emotion, creation and information, etc. Six thinking hats refer to the use of six different colors of hats to represent six different models of thinking (Bono, 1985). Using six thinking hats will make chaotic thinking clearer, turn meaningless arguments in the group into brainstorming creations, and make everyone creative. In 1984, Kolb put forward the theory of experiential learning in the book "Experiential Learning - Let Experience Become the Source of Learning and Development", he believed that "the learning process is not passive, but requires learners to actively experience", at the same time, he proposed that the experiential learning model is also the experiential learning circle theory, four-stage cycle theory model: Concrete Experience, Reflective Observation, Abstract Conceptualization, Active Experimentation/application. In the experiential learning theory model, it can be seen that in the actual experiential learning process, students participate in specific experiences, observe and reflect on the entire experience process, and the knowledge, skills, and emotions acquired by individuals in practice (Kolb, 1984).

Therefore, this instructional model will use experiential learning theory and six thinking hats together to integrate the course into a four-stage circular structure: Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation/application. Teachers create real-life experiential situations, in which students gain direct experience and put on six different hats in turn (the function of the white thinking hat is to focus on collecting relevant information honestly; The function of the red thinking hat is to point directly at our feelings, intuitions and hunches; The function of the blue thinking hat is to control the global situation and the use of the hat; The function of the black thinking hat is warning and criticism, caution and potential difficulties; The function of the green thinking hat is creativity and new ideas; The function of the yellow thinking hat is optimistic thinking), understand and follow the thinking mode and rules of each hat, comprehensively observe and analyze all aspects of the problem such as positive and negative, advantages and disadvantages, and conduct a comprehensive evaluation, and finally reason to form a concept. Teachers give new perspectives and once again enter a new cycle of four stages, through the instructional model based on Experiential Learning Theory and Six Thinking Hats, hoping to improve students' critical thinking ability including analysis, reason, and evaluation.

3.2.2 Objective

Through learning based on the experiential learning theory and six thinking hats, students can improve their critical thinking ability including analyzing, reasoning, and evaluating.

3.2.3 Learning Processes

Step 1: Concrete Experience

• The teacher explains the learning objective and six thinking hats.

• The teacher divides students to work together and provides students with situations.

• Students in each group put on hat color to think about the situation according to hat color sorting: white \yellow \black \red and green. And record information.

Step 2: Reflective Observation

• Students in each group share their information

• The teacher adds missing information

Step 3: Abstract Conceptualization

• Students in each group conclude the idea by using a graphic organizer

• Students in each group decide the situation by putting on blue hats.

Step 4: Active Experimentation/application

• The teacher provides new situations to students in each group.

• Students in each group put on hat colors to think about the situation according to hat color sorting: white \yellow \black \red and green and decide by putting on blue hats.

3.2.4 Result

Students improve their critical thinking ability including analyzing, reasoning, and evaluating.

3.3 Critical Thinking Ability Improves Results

This paper reveals the results from two perspectives:

• Comparing the single-sample group of students' critical thinking before and after the experiment through a t-test to show that the learning results are significantly different;

• Reporting the development score and growth percentage, to measure the degree of progress.

Table 2. Analysis of the Differences before and after the Critical Thinking Test

critical thinking ability	Scores	N	$\bar{X}$	S.D.	df	t	sig(p-value)
Analyze	post-test scores	30	4.17	1.12	29	8.06	0.000**
	pre-test scores	30	7.07	1.34			
Reason	post-test scores	30	4.67	1.32	29	6.03	0.000**
	pre-test scores	30	7.17	1.42			
Evaluate	post-test scores	30	4.87	1.55	29	7.67	0.000**
	pre-test scores	30	7.43	1.30			
Summary	post-test scores	30	13.7	2.31	29	11.04	0.000**
	pre-test scores	30	21.67	2.75			

** p<0.01

As can be seen from Table 2, the scores of the analysis before and after the examination were very different ($\bar{X}$= 4.67 before the test, x = 7.17 after the test). The t-test revealed the significance of the p-value, where 0.000 (**p <0.01) determined students to score significantly different in the analysis part, proving that learning had a profound impact on this, with the significance level as high as 0.01.

The score of reason also varied before and after the exam ($\bar{X}$= 4.17 before the exam, $\bar{X}$= 7.07 after the exam). The t-test also revealed the significance of the p-value, where 0.000 (**p <0.01) determined that students had significant differences in their reasoning scores, and learning also had a profound impact on this, with the significance level also being 0.01.

The score of the evaluation also changed ($\bar{X}$= 4.87 before the test, $\bar{X}$= 7.43 after the test). The t-test again revealed the significance of the p-value, where 0.000 (**p <0.01) identified students with significant differences in assessment scores, and learning also had a significant effect, with the significance level still 0.01.

The overall score of critical thinking also varied before and after the exam ($\bar{X}$= 13.7 before the exam, $\bar{X}$= 21.67 after the exam). The t-test again revealed the significance of the p-value, namely 0.000 (**p <0.01) determined that students scored significant differences in critical thinking, and learning also had a significant impact on this, with the significance level still 0.01.

The above analysis shows that the instructional model helps to improve students' critical thinking.
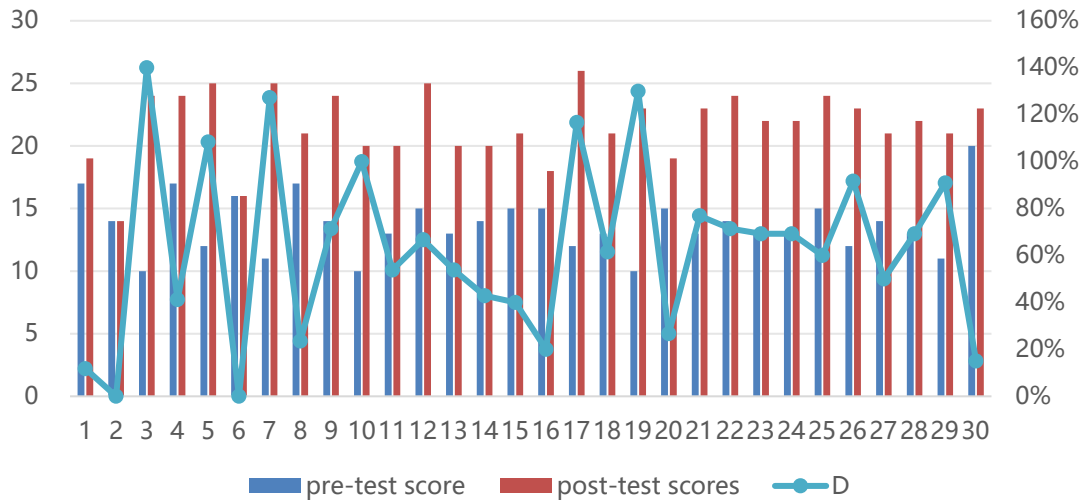
Figure 2. Pre-test Score, Post-test Scores, and Increasing Percentage of Individual Students' Critical Thinking Ability

In Figure 2, we can observe the distribution of students' pre-test and post-test scores. From the considerable figure, the average score of the pre-test was 13.7 points, and the average score of the post-test was 21.67 points, an increase of 8 points. In addition, the 17th student had the highest score in the post-test, who scored 26 points. The most significant improvement came from students 3 and 7, who scored a total of 14 points. However, the lowest remained for students 2 and 6, whose scores did not change.

Table 3. Number of Students with Critical Thinking Ability Improvement in Different Score

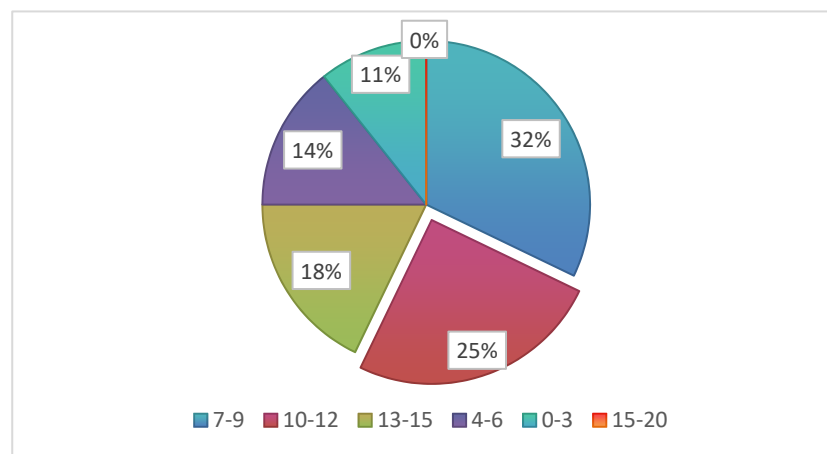| Increased score range	number of people	Rank
7-9	9	1
10-12	7	2
13-15	5	3
4-6	4	4
0-3	3	5
15-20	0	6
Total	28	

Figure 3. Percentage Number of Students in Different Scores

Table 3 and Figure 3 show that the largest number of people increased by 7-9 points, with a total of 9 people, accounting for 32%, followed by 7 people with an increase of 10-12 points, accounting for 25%. A total of 28 people improved their scores.

Figure 4. Pre-test Scores and Increased Scores of Individual Students' Critical Thinking Ability, Analyze, Reason, and Evaluate

Figure 4 shows that the average pre-test score of reason is 4.17 and the average post-test score of reason is 7.07, up by 2.9 points. Considering only each item, Student 15 was found to have the highest improvement score (D=7).

4. Discussion

The factors that influence the development of critical thinking ability among students at Yulin Normal University are as follows:

4.1 Student

The results show that students themselves are one of the main factors in improving their critical thinking. Paul (1999), an authoritative scholar in critical thinking research, believes that " critical thinking is the process of actively, skillfully analyzing, quoting, analyzing, integrating, and evaluating that information that governs beliefs and behavior, which is collected through observation, experimentation, reflection, reasoning, or communication. The results of this study are consistent with Paul's opinion, emphasizing that learners actively do it. In this study, teachers encourage students to critically think about and examine the sources of knowledge and information, including the source and position of knowledge and information, whether the logical argument is reasonable, whether the conclusion is reliable, etc. Students under the guidance of chain analysis problems, willing to break the inertia thinking, get rid of the bondage of inertia, thinking, willing to participate in learning, actively participate in exploration, in the discussion with team members take the initiative to collect valuable information, participate in thinking and analysis, justified to state their views and effectively evaluate, these can promote students' critical thinking ability.

4.2 Teacher

After analyzing the data information collected by the questionnaire and interview, we concluded that teachers are one of the important factors influencing the development of students' critical thinking. Whether teachers pay attention to cultivating and training students 'critical thinking in the process of teaching plays a very important role in cultivating students' critical thinking. Li and Fu (2012) agree with the important role of school education in the cultivation process of individual critical thinking and point out that teaching methods and the development level of teachers 'own critical thinking all affect the development and cultivation of students' critical thinking to a large extent. This study is consistent with the view of Li et al., who believe that teachers should realize that students 'cognition of simple knowledge and single learning model will imprison the development of students' critical thinking and should try to challenge students' "standard answer" thinking set with multiple perspectives. Qi and Sun (2020) put forward

whether individual teachers encourage students to question and continue to question students the formation and development of critical thinking has a significant influence, and if the teacher can in the classroom questions for students, guide students' independent thinking is the most conducive to the development of students' critical thinking. This study also believes that teachers 'teaching methods and teaching methods can be said to be directly involved in the development process of students' critical thinking, which is particularly important.

4.3 Instructional Environment

The third important factor influencing the development of students' critical thinking is the instructional environment. Xia and Zhong (2017) proposed that teachers should create an inclusive learning atmosphere, guide students to fully discuss the different views of many scholars on a certain issue, and let students choose the views that they recognize, expand the breadth and depth of thinking, and stimulate critical thinking. This study is consistent with Xia and Zhong's point of view, that teachers should become "intervening participants" in students' thinking, dare to create messy but lively classrooms, and create more opportunities for students to actively participate in learning, induce students to think positively and ask questions, and encourage students to be brave in innovation and practical exploration. Brookfield (2005) argues that teachers should recognize that the best way to overcome and transform the "standard answer" mindset is to provide teaching materials and learning materials with different perspectives and even conflicting perspectives in the classroom. This study is consistent with Brookfield's view that teachers should pay attention to the creation of supporting environmental resources to help college students' cognitive development, promote students' multiple expressions, and improve their critical thinking development.

Discussion of the differences that arise when instructional models of Experiential Learning Theory and Six Thinking Hats are used to improve students' critical thinking ability.

This study examines the relative progress of students' critical thinking from three key perspectives: analysis, reasoning, and evaluation. The analysis of the research data revealed that there were significant differences between the pre-test data and the post-test data in the three aspects of analysis, reasoning, and evaluation, among which the improvement of analytical ability was particularly significant, and the data also clearly pointed out that each student showed different degrees of improvement in the three levels of analysis, reasoning, and evaluation, which undoubtedly proved the use of Experiential Learning Theory and Six Thinking The HATS-derived instructional model has had a significant impact on student's critical thinking quality.

Research data shows that the instructional model developed with Experiential Learning Theory and Six Thinking Hats can improve students' critical thinking. However, improvement varies from person to person, and this study also looked at the impact of factors such as an individual's cognitive level, self-efficacy, personal hobbies, and mental health on critical thinking, as demonstrated in Dehghani's study. Dehghani's research on college students confirmed a significant positive correlation between general self-efficacy and critical thinking and suggested that self-efficacy can be used as a motivating factor for cultivating students' critical thinking (Dehghani et al., 2011). Soucy (2011); Tsui (1999) believes that innovative Instructional models that certain courses such as writing, history, mathematics, foreign languages, and ethics will also help students develop critical thinking. The results of this study were consistent with those of Soucy (2011); Tsui (1999) as follows: 1) The experimental results confirm that the instructional model developed by Experiential Learning Theory and Six Thinking Hats can improve students' critical thinking. It focuses on training and assessing students' three abilities of analysis, reasoning, and evaluation, helping to improve their core literacy and enhance students' vocational skills and competitiveness; 2) To improve students' critical thinking more effectively, questionnaires and interviews were conducted to explore and confirm the key factors influencing the improvement of critical thinking, and the instructional model was formulated after analyzing the results of the influencing factors.;3) To ensure the scientific and validity of the research, it is rigorously reviewed and evaluated by five professional scholars in the field; 4) This study proposes an instructional model that uses Experiential Learning Theory and Six Thinking Hats to improve students' critical thinking, which includes four key elements: principle, objective, learning process and result, and designs three learn plans, including four steps.

The four steps in the learning process based on the Experiential Learning Theory and the Six Thinking Hats model are as follows:

1) Concrete Experience: First, the teacher explains the learning objectives, the principle of the six thinking hats, and the use of the six thinking hats. Secondly, the teacher divides the students into small groups to provide students with specific teaching situations. Finally, each group of students wore a hat of a different color, and the order of wearing the hats of different colors was white, yellow, black, red, and green. The group recorded the information about wearing different colored hats.

2) Reflective Observation: The group shares the information collected, and the teacher supplements the missing information.

3) Abstract Conceptualization: The group uses a mind map to summarize information and ideas, and students put on blue hats to make final decisions.

4) Active Experimentation/application: The teacher provides a new teaching situation for each group of students, and the group puts on a hat again in the order of white, yellow, black, red, and green, and finally puts on a blue hat to decide.

5. Conclusion

This study uses questionnaires and interviews to conduct an in-depth discussion on the factors that affect the development of critical thinking, and the results reveal three key factors: students, teachers, and the instructional environment. According to the results of the data analysis, the influence of teachers is the most prominent, followed by the instructional environment, and the role of students is relatively small.

Based on the theory of experiential learning and the instructional concept of the Six Thinking Hats, we have constructed a set of instructional models with four core modules, which are 1) Principle, 2) Objective, 3) Learning process, and 4) Result.

We use the t-test to identify whether there is a significant change in students' critical thinking ability before and after applying the experiential learning theory and the Six Thinking Hats instructional model.

6. Future Research

This study explores the influence of critical thinking from the three dimensions of students, teachers, and instructional environment, and will explore the influencing mechanisms of these influencing factors in future research, such as students' growth environment, gender differences between men and women, and national culture.

This study uses the instructional model developed by Experiential Learning Theory and Six Thinking Hats to improve critical thinking, including analysis, reasoning, and evaluation, and will try to explore more models to improve more elements of critical thinking, such as interpretation, explanation, and induction, or improve students' communication, writing, or reflection skills.

This study has developed a test questionnaire to evaluate critical thinking, and other types of test questionnaires will be explored in the future, and more assessment methods will be explored in the future, to strive for a more comprehensive and scientific test of critical thinking.

The teaching and research objects selected this time are three-year students of Yulin Normal University, and the scope of the survey will be further expanded, the sample size will be increased, and the current situation of the cultivation of critical thinking tendency will be explored for students in different regions and different school levels. At the same time, the selection of teaching content will be expanded and further in-depth discussions will be continued.

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