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Utilizing Hiteach Platform to Support 5E Inquiry-based Learning for Elementary School Students

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Abstract: The purpose of this study is to explore the effect of using the HiTeach platform to support the 5E inquiry teaching method, and to study the learning performance of the students in the subject of "natural science and technology aqueous solution". This study is based on the experimental study. The experimental group adopted HiTeach interactive platform to support 5E inquiry teaching mode, but the control group didn't. The results indicated that although there is no significant difference between the two groups of teaching methods, but can effectively improve the learning effectiveness of the experimental group of students in the "memory" type of results to enhance the results have been significant. And the experimental group of low achievement students learn better than the control group of low achievement students, "memory", "analysis" and "application" has a significant effect.

Keywords: HiTeach, 5E Inquiry Teaching, Science Teaching

1. Introduction

It is common that teachers adapt lecture to teach, but neglect the development of scientific inquiry ability and problem-solving ability, simplifying many teaching steps, such as causing motivation, experimental steps, watching the experimental videos teaching and then experiment. Therefore, in traditional teaching can only give students standard answers. The learning goal is only to cope with the exams, but the development of scientific inquiry ability and communication argumentation ability is neglected.

"Inquiry" is the core of science education. The 5E learning cycle applied the inquiry approach to teaching into a series of planning strategies is proposed by Bybee and Landes (1988), not only emphasizes the motivation of learning, the connection of prior knowledge, it also emphasizes the student's inquiry prouder, the students' interpretation and extended application of the learning. Inquiry is the process that students work collaboratively with others to solve problems, plan investigations, and solving problems. It's also a way of thinking, a process of finding information and understanding things. Students can learn science in a way that reflects how science actually works. There are five stages in 5E Learning Cycle Instructional Model proposed by BSCS (Bybee et al., 2006): Engagement, Exploration, Explanation, Elaboration, and Evaluation. It's a student-oriented teaching activity. Teachers can guide students to explore, verify, summarize, discuss and explain problems, and then achieve goals by asking questions, teaching units and other relevant materials.

Inquiry-based approach is beneficial to students and that even young children can learn through inquiry processes (Etheredge & Rudnitsky, 2003). In this study we adopt the subject of "Natural science and technology aqueous solution" is designed by Nan-yi Science and Technology textbook in Taiwan, supplemented by HiTeach system, hoping to enhance their knowledge of natural subjects through highly interactive teaching discussions and listening to others' opinions.

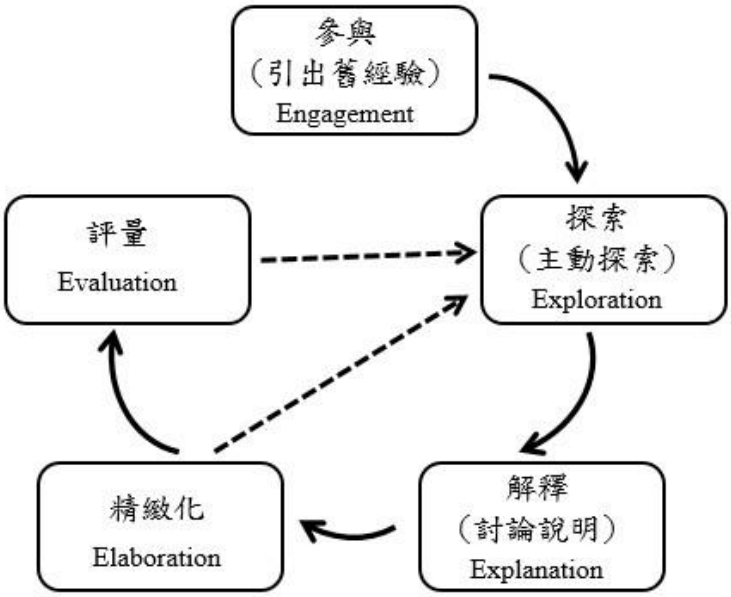

Figure 1. The 5E learning cycle

2. Research Method

2.1 Research Design

A quasi-experiment design was adopted to investigate whether HiTeach system to support 5E Inquiry-based learning could bring about improved learning effectiveness. There are 51 students in Grade 5 (ages 11 or 12) in two classes participated in our study. The two classes are divided into experimental group and control group. Before the experimental teaching, the "Natural science and technology aqueous solution" is applied. The experimental group adopted HiTeach interactive platform to support 5E inquiry teaching mode, but the control group didn’t.

2.2 Research Tool

2.2.1 Learning effectiveness test

This experiment divided into four categories base on pretest and posttest as memory question type, comprehensive type, application type, analysis type. The test questions are reviewed by the senior science teachers, determined to meet the teaching objectives and curriculum requirements, and revised according to the advice provided by the teacher.

2.2.2 Learning attitude scale

This research questionnaire aims to collect data from the students involved in this experiment. This questionnaire is based on the Likert five-point scale design, which includes four aspects: (1) system operation (2) cooperative learning (3) individual performance (4) learning attitude, and transforming students' opinions into quantitative data to analyze the course. The results of the questionnaire were returned to describe the experimental group's views on the experimental activities.

2.2.3 HiTeach interactive platform

The Hiteach interactive teaching system combined with I-pads as the platform shared by teachers and students. This platform includes the following functions:
1. The image transmission and reception.

2. Immediately feedback system
3. Quickly sharing of the student's group discussions, opinions and collecting contents and images.

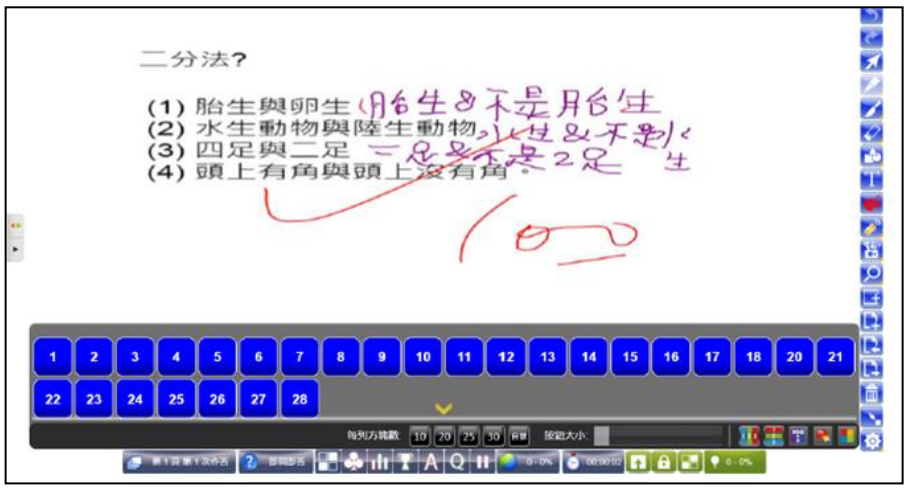

Figure 2. The image of HiTeach IRS

3. Results

3.1 Analysis the effectiveness of Pre-test procedures

Before intervention, an independent sample t-test was administered to examine whether the experiment class and the control class had equal proficiency. As no significant difference was observed($F=1.582$ ， $p=.214 > .05$), these two classes were considered equally competent.

3.2 Analysis effectiveness of Post-test procedures

The average score after the learning achievement of the Experiment class is 89.42, and the control class is 85.00. The number of Experiment class is higher than the control class, however the t value ($t = .911$) and significance ($p= .367 > .05$). The results with no significant difference. The effect of the two groups is improved by the standard deviation. The relevance between the experiment group and the control group discovered by the standard deviation which the experiment group increased from 12.119 to 10.226, the control group decrease from 16.062 to 22.470.

Table 1

Comparison of Participants' Posttest Scores: ANCOVA Analysis

	Experiment class（26）		Control class（25）		t	P (two tailed)
	M	SD	M	SD		
Pretest	60.44	12.119	54.71	16.062	1.441	.156
Posttest	89.42	10.226	85.0	22.470	.911	.367

In the view of the standard deviation, the overall score of the experiment group was concentrated and improved. The test results of the students in the control group are more polarized. Low-level students have limited progress, which also shows that the Hiteach platform incorporates 5E inquiry-based learning to help lower-achieving students' learning effective.

3.3 Analysis of the effects of students with different achievement

We administered pre-tests and post-tests and performed Paired sample t-test of deferent achievement on their results. The learning result of the high, medium and low achievement students in the experimental group were significantly different.

Table 2

Paired sample t-test of deferent achievement

	Experiment class			Control class		
	high	medium	low	high	medium	low
Pretest	68.182	58.674	51.34	64.286	54.018	41.84
M	9.375	9.858	11.121	1.865	15.205	12.663
Posttest	98.051	90.816	76.34	98.214	91.518	58.67
M	1.865	1.909	7.127	1.882	1.848	29.223
Progress	29.869	32.142	25	33.928	37.5	16.83
Paired Sample t test	t=10.595 p= .000**	t=9.222 p= .000**	t=7.897 p= .000**	t=8.013 p= .000**	t=7.114 p= .000**	t=2.197 p= .070

p<.05* p<.01** p<.001***

The reason for the inference maybe in group learning activities. The students who have medium achievement have the opportunity to participate in discussions, used the iPad with the Hitech platform or watch the results of other groups, and the progress is improving. The low-achievement groups in Experiment class were found to have the highest increase in post-test scores at a high level of significance (P=0.000). This indicates that low- achievement of these collaborative groups derived the most benefits in this study.

3.4 Analysis of different types of questions

There are significant differences in the learning outcomes of the three types of "memory", "analysis" and "application" by analyzing the learning result of different achievement students, among the low-level students, High-level students have significant differences in the learning result of the two types of "understanding" and "analysis". Inference the reason, High-level's students are more sharing different answers in class than other groups during the class.

Table 3

Comparison of Participants' Scores Regarding Different Question Type

Achievement / Question Type	All	high	medium	low
Memory	.042*	.305	.153	.027*
Understanding	.151	.017*	.355	.689
Analysis	.076	.048*	.961	.029*
Application	.199	.305	.949	.009**

4. Conclusion

The results indicate:

(1) There is no significant difference between the two groups of teaching methods, but can improve the learning effectiveness.
(2) There is a significant difference in "memory" type. The experimental class performs better.
(3) The experimental class of low achievement students learn better than the control class of low achievement students in "memory", "analysis" and "application".
(4) The experimental class of high achievement students learn better than the control class of low achievement students in "understanding" and "analysis".
(5) The research indicates that using the 5E inquiry-based teaching supplemented by HiTeach platform can enhance the interaction and the learning motivation.

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