

Exploring the Influences of Elementary School Students' Learning Motivation on Web-Based Collaborative Learning

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The purpose of this study is to explore the influences of students' learning motivation on Web-based collaborative learning. This study conducted learning materials of Web pages about science and collaborative learning, a motivation questionnaire and interviews were used for data collection. Eighty Grade 5 students and a science teacher were recruited in this study. The controlled group involved 40 students who need to learn the dissolve concept on the Web pages, and complete the homework which was assigned by the Web pages by themselves. The experimental group involved the other 40 students and every four students were grouped in a team. The experimental group students not only need to learn the dissolve concept on Web pages, but also need to complete the homework which was assigned by the Web pages with team members. Besides, the experimental group students need to present their homework to other teams and provide feedbacks and suggestions to other teams. The results showed that experimental group significantly promoted their science learning motivation by using Web-based collaborative learning.

Keywords: collaborative learning, learning motivation, Web-based learning

Introduction

Job, Dweck, and Walton (2010) mentioned that the motivation could provide the unlimited willpower for people to do what they want to do. In other words, no matter what goals people want to reach, the motivation would be the most important factor to lead people to go. In the same way, the key point to promote students' active learning and learning achievement is learning motivation (Hynd, Holschuh, & Nist, 2000; Pintrich, 2003; Polich, Ehlers, Otis, Mandell, & Bloom, 1986). Therefore, to find the learning strategies to promote students' learning motivation and provide students' extensive willpower to learn science is a core issue in science education.

According to technical changes with each passing day, the Web-based learning is more important in these few years (Berge, 1999; Jin, 2005). Previous studies indicated that the Web-based learning could have significantly improved students' engagement and motivation in learning (Lo, Chan, & Yeh, 2012). Although the Web-based learning environment could help students to learn more quickly and conveniently, it is better for elementary school students to learn science with peer relationship (Wentzel & Watkins, 2002).

Collaborative learning requires students in small groups to solve ill-structured problems, such as real-life situation problems, with peer relationship (Slavin, 1997). The concept of collaborative learning is suitable for

elementary school students to learn with their team members and try to solve problems which were connected with their real-life situations.

Due to these reasons, the purpose of this study is to combine the Web-based science learning environment with collaborative learning as a new style of learning strategy for elementary school students, and to explore the influences of students' learning motivation on this new learning strategy. The research question is based on the purpose of this study.

Research Design

Participants

Eighty Grade 5 grade students ($n = 80$, mean age $\pm SD = 11.20 \pm 0.40$ years) and a science teacher (female, age = 37 years old, teaching science of elementary school for five years) were recruited in this study. The controlled group involved 40 students ($n = 40$, mean age $\pm SD = 11.25 \pm 0.44$ years) who need to learn the dissolve concept on the Web pages and complete the homework which was assigned by the Web pages by themselves. The experimental group involved the other 40 students ($n = 40$, mean age $\pm SD = 11.15 \pm 0.4436$ years), and every four students were grouped in a team. The experimental group students need to learn the dissolve concept on Web pages as same as the controlled group, and also need to complete the homework which was assigned by the Web pages with team members. Furthermore, the experimental group students need to present their homework to other teams and provide feedbacks and suggestions to other teams.

The science teacher was responsible for choosing the science Web pages about dissolve concept and answer students' questions after they learned the concepts from Web pages by themselves completely. Although the science teacher had taught science in elementary school for five years, she did not teach the students in this study before.

Instruments

The Web pages about dissolve concept. The Web pages about dissolve concept were chosen by the science teacher in this study and determined by the other two experts to reach consensus. The expert panel was made up of one science educator and one science teacher who had taught science in elementary school for 12 years. At the beginning of this study, the science teacher chosen eight Web pages about dissolve concept, and all of the experts discussed the appropriateness of the Web pages. At last, one Web page about dissolve concept (see Figure 1) was been chosen until all the experts reached consensus.



Figure 1. The examples of the Web page about dissolve concept in this study. Retrieved from <http://science.edu.tw/index.jsp>

The Web page about dissolve concept in this study included teaching module, conceptual teaching with animation, virtual experiments, multiple assessments on line and the illustrations of scientific histories. The participants need to learn the dissolve concept on this Web page for three weeks (45 minutes per week, total: 135 minutes) (see Figure 2). If they had any questions, they could ask the science teacher in this study.

The learning motivation scale. All of the students needed to write down the learning motivation scale (Likert scale) which was developed by this study ($\alpha = 0.86$; total items = 7 items; total scores = 120 scores) before and after the employment of different learning strategies (see Figure 2).

There are four dimensions in the learning motivation scale which involved self-efficacy, goals of performance, the values of learning and the sense of achievements. Each dimension included six items, and there were 24 total items in the learning motivation scale.

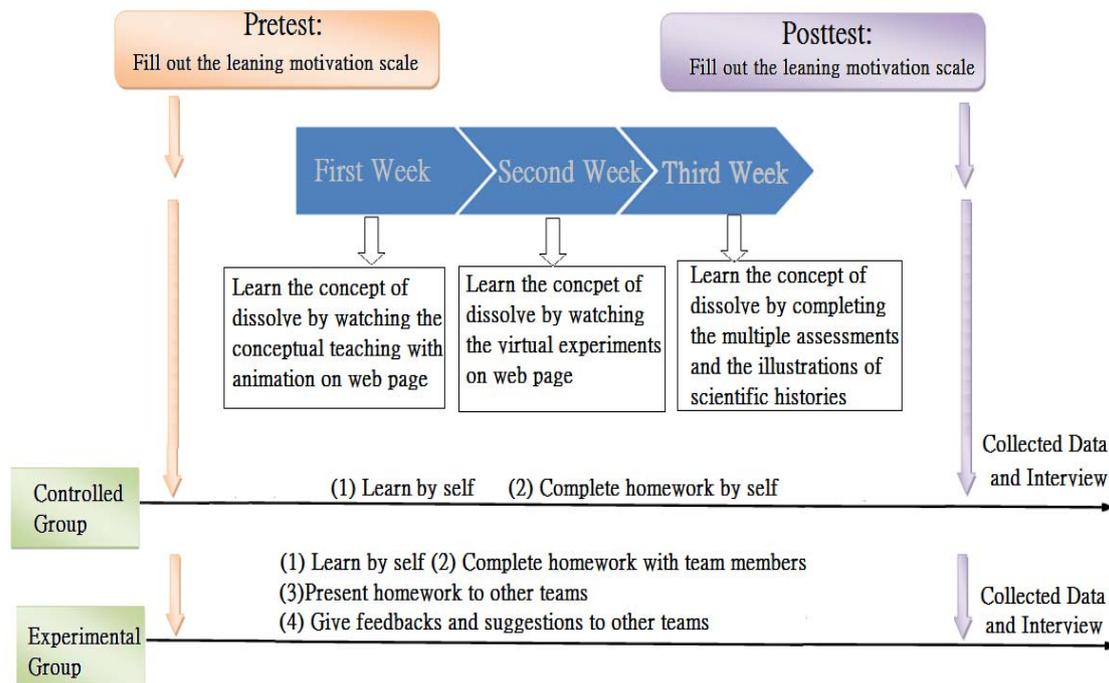


Figure 2. The research design of this study.

Data Collection and Analysis

The scores of learning motivation scale were collected for analysis. The extracted data were analyzed using paired-sample *t*-test, ANCOVA (analysis of covariance) analysis SPSS (Statistical Package for Social Science) version 17.0.

Results and Discussion

As well known for the influences of students' learning motivation on Web-based collaborative learning, 80 students were divided into two groups (a controlled group and an experimental group). All students need to write down the learning motivation scales after and before the employment of different learning strategies. The scores of learning motivation scales were collected and analyzed by using paired-sample *t*-test and ANCOVA.

Table 1 showed the paired sample *t*-test of the pre-test and post-test learning motivation from the controlled and the experimental groups. The results indicated that students in both two groups significantly

promote their learning motivations after learning on the Web page in this study. This finding was consistent with previous studies which suggested that the Web-based learning could help students to learn more quickly and conveniently, and have significantly improved students' engagement and motivation in learning (Lo, Chan, & Yeh, 2012; Wentzel & Watkins, 2002).

Table 1

The Paired Sample t-Test of the Pre-test and Post-test Learning Motivation From Controlled and Experimental Groups (n = 80)

Group	Score	Mean \pm SD	t	p	Cohen's d
Controlled group (n = 40)	Pre-test	87.78 \pm 10.81	-9.006***	0.000	-1.167
	Post-test	95.63 \pm 9.20			
Experimental group (n = 40)	Pre-test	88.53 \pm 10.02	-8.151***	0.000	-0.782
	Post-test	100.28 \pm 10.12			

Notes. *** $p < 0.001$; t means t value from t-test; p means the significance probability.

The result in Table 1 illustrated that the Web-based learning could help to promote elementary school students' learning motivation. For further understanding the influences of elementary school students' learning motivation on collaborative learning of the Web-based environment, this study analyzed the data by using ANCOVA. Table 2 showed that the experimental group revealed significant higher scores of learning motivation than that of the controlled group after performing learning strategies in this study. In other words, combining Web-based learning environment with collaborative learning strategy could promote elementary school students' learning motivation, which is better than only building the Web-based learning environment. The finding in this study was supported by the result of Wentzel and Watkins' research which suggested that it is better for elementary school students to learn science with collaborative learning.

Table 2

The ANCOVA Analysis of Learning Motivation Between Controlled and Experimental Groups (Covariance Factor: The Scores of Learning Motivation Before Learning Treatment)

Group	Mean scores \pm SD	SS	df	F-value	η^2
Controlled group	100.28 \pm 10.12	343.657	1	7.559**	.089
Experimental group	95.63 \pm 9.20				

Notes. ** $p < 0.01$; SS means sum of square of deviation from the mean; df means the degree of freedom; η^2 means the eta-squared.

According to the data from the interviews (the examples are as below), the experimental group students in this study indicated that the collaborative learning could help them to think about the different opinions, and they will learn some knowledge from peers through discussion.

S66: Originally, I thought... but S80 (the code name of one of her team members) said... Maybe he is right.

S72: ... I do not know. My team member told me. He said that he had read the dissolve concept in other books... Yes.

I thought he is very smart. I learn a lot from him.

(S66, S72 are the case students)

Furthermore, Slavin (1997) mentioned that collaborative learning will be useful for students to solve problems in real-life situation. In this study, we selected "dissolve" concept, since the concept is related to the real-life situation. However, many elementary students could not understand the dissolve concept. By observing

the macro-phenomenon, elementary school students thought the sugar “disappears” after dissolving (Johnstone, 1991). Because the micro-phenomenon is difficult to display in the real world environment, the misconception of “Dissolve is the meaning of something disappear in water” are existing in students' mind. The misconceptions of dissolve from elementary school students are also shown according to interview data of this study.

S07: The dissolve means disappear... I cannot see the sugar anymore.

S29: I am not sure. I cannot see the sugar in water, but if I put a lot of sugar, it will appear in the bottom of cup.

S63: No! The sugar disappeared after it dissolves in water.

(S07, S29 and S63 are the case students)

As same as interview data, at the beginning of this study, there are 73.7% (59 participants/80 participants) of students who mentioned about “dissolve is the meaning of sugar disappear in water”. However, after learning on the Web page which the experts selected, a lot of students in this study understood the true meaning of dissolve. The students pointed out a key virtual animation in the Web page (see Figure 3) which performed that the sugars disperse in water. That is to say, the students could learn the micro-phenomenon of dissolving through media or Web-based environment.



Figure 3. The virtual animation of micro-phenomenon of dissolving.

Conclusions

The most important key point to promote students' active learning and learning achievement is learning motivation (Hynd, Holschuh, & Nist, 2000; Pintrich, 2003; Polich, Ehlers, Otis, Mandell, & Bloom, 1986). The purpose of this study is to explore the influences of students' learning motivation on Web-based collaborative learning.

The results of this study proved that the Web-based collaborative learning could promote elementary school students' science learning motivation. Besides, combining Web-based learning environment with collaborative learning strategy could promote elementary school students' learning motivation, which is better than only building the Web-based learning environment. Further, the students could learn the micro-phenomenon of dissolve concept through Web-based environment and change their misconceptions.

We suggested that Web-based learning should be a good learning strategy for students, especially in illustrating the micro-phenomenon. But it might be better to improve elementary school students' learning motivation by using a Web-based collaborative learning strategy to share their opinions and discuss with peers

than that only to construct a Web-based learning environment.

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