A STUDY OF THE METACOGNITION PERFORMANCE IN ONLINE INQUIRY LEARNING

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ABSTRACT

The purpose of this study is to probe into the effect of metacognitive thinking strategies with different teaching strategies in an online inquiry-based junior high course. Two types of teaching strategies were applied in classes with totally 69 students of 9th graders in New Taipei City. Among participants, 34 students were in the experimental group accepting the strategy of "Collaborative Online Inquiry" while the control group of 35 students with "Personal-based Online Inquiry". Data were collected for a six-week lesson on this topic "Campus Folk Song". ANCOVA and class observations, instructors' diary, and interviews with students are measured to understand the different effects of two teaching strategies on students' metacognitive thinking strategies. The result shows that students by 'collaborative online inquiry' in experimental group perform their metacognitive strategies better than those by "Personal-based Online Inquiry" in the control group.

KEYWORDS

Online Inquiry, Collaborative Learning, Metacognition

1. INTRODUCTION

"Campus Folk Song" is popular during the 1970s to 1990s in Taiwan. The music style is similar to country song but with more local consciousness. They were originated from the student singers in colleges and those song revealed the inner voices of the man in the street and some aroused many deep thoughts about the Taiwan positioning in world politics and it was resonatory in that times.

Though "Campus Folk Song" represents a period of historical moment of Taiwan democracy progress and was with great impact on ordinary people in many respects, it is hard to catch the attention of junior high students, not to mention to investigate in further the historical background, famous composers, famous songs, etc. In order to motivate the net generation to research this topic, online inquiry learning strategy were used in the class. Wallace and Kupperman(2000) indicate that online information seeking is a complex and difficult process. The intension to develop students' understanding of content through use of the Internet is a challenging task for both students and teachers though this learning strategy may more attractive to the digital natives. Because Internet-based learning environment is with high degrees of freedom, it may favors students who possess mature computer skills and metacognitive skills(Park et al. 2009). Tsai(2009) reported that students' metacognitive strategies play important roles in their online inquiry learning, and Huang, Shen and Chang(2011) also pointed out that promote metacognitive thinking is very important when using online inquiry learning.

The metacognitive activities involved in online inquiry include metacognitive knowledge and metacognitive regulation. Metacognitive knowledge is knowledge about one's self as a learner, task knowledge and strategic to learn(Flavel,1979; McCormick,2003). While metacognitive regulation of online inquiry includes (1)planning the online inquiry; (2)monitoring and controlling the progress through the online inquiry process; and (3)reflecting on what was learned after reading certain information(Schraw,1998; Howard et al. 2011).

In order to help teachers facilitate students' learning and to ensure learners are really involved in higher levels of cognitive activities rather than just copy and paste aggregately, this study used collaboration as a teaching strategy to stimulate learners metacognitive thinking, and the effect on metacognition performance of online inquiring learning is examined.

2. RESEARCH METHOD

2.1 Participant

A pretest-posttest quasi-experimental design was executed in a New Taipei City's junior high school. Participants were sixty-nine students among two classes. One class with thirty-four students was assigned to the experimental group, and another class with thirty-five students was assigned to the control group. They are ninth graders and their families are with ordinary social status.

2.2 Instructional Design of Online Inquiry Learning

A six-week online inquiry learning on "Campus Folk Song" was held in two classes. Basically the online inquiry journey had 4 steps: planning the web inquiry strategy, searching web resources, analyzing & synthesizing, evaluating. Researchers designed four questions to guide students' investigating activities and the online inquiring steps were scaffold through learning sheets which were distributed in the beginning of each class. Two classes of students should finfish their own learning sheets and submit in the end of each class. Besides, students in experimental group needed to finish one extra group activity learning sheet.

Table 1. Instructional Design Outline

<table>
<tr><td>Cycle</td><td colspan="8">Questions to answer and Online Inquiry Process</td></tr>
<tr><td rowspan="3">Cycle 1</td><td colspan="8">Questions to investigate in cycle 1:
What is the definition of "Campus Folk Song"?</td></tr>
<tr><td>Personal-based Online Inquiry (control group)</td><td colspan="2">Planning the web inquiry strategy</td><td>Searching web resources</td><td colspan="2">Analyzing & synthesizing</td><td colspan="2">Evaluating</td></tr>
<tr><td>Collaborative Online Inquiry (experimental group)</td><td>Collaborative Discussing</td><td>Planning the web inquiry strategy</td><td>Searching web resources</td><td>Analyzing & synthesizing</td><td>Collaborative Discussing</td><td>Evaluating</td><td>Collaborative Discussing</td></tr>
<tr><td rowspan="3">Cycle 2
Cycle 4</td><td colspan="8">Questions to investigate in cycle 2:
Why "Campus Folk Song" is so popular during 1970~1990 in Taiwan?
Questions to investigate in cycle 3:
What are the style and lyric characteristics of "Campus Folk Song"?
Questions to investigate in cycle 4:
Are there some typical composer or singer of "Campus Folk Song" ?</td></tr>
<tr><td>Personal-based Online Inquiry (control group)</td><td colspan="2">Planning the web inquiry strategy</td><td>Searching web resources</td><td colspan="2">Analyzing & synthesizing</td><td colspan="2">Evaluating</td></tr>
<tr><td>Collaborative Online Inquiry (experimental group)</td><td>Collaborative Discussing</td><td>Planning the web inquiry strategy</td><td>Searching web resources</td><td>Analyzing & synthesizing</td><td>Collaborative Discussing</td><td>Evaluating</td><td>Collaborative Discussing</td></tr>
<tr><td rowspan="3">Cycle5</td><td colspan="8">Task to complete:
Prepare an oral presentation in front of the class with ppt.</td></tr>
<tr><td>Personal-based Online Inquiry (control group)</td><td colspan="2">Evaluating</td><td colspan="2">Planning the web inquiry strategy</td><td colspan="2">Searching web resources</td><td colspan="2">Analyzing & synthesizing</td></tr>
<tr><td>Collaborative Online Inquiry (experimental group)</td><td>Evaluating</td><td>Collaborative Discussing</td><td>Planning the web inquiry strategy</td><td>Searching web resources</td><td>Analyzing & synthesizing</td><td>Collaborative Discussing</td><td>Work on group presentation ppt</td></tr>
<tr><td rowspan="3">Cycle6</td><td colspan="8">Task to complete:
Deliver the presentation and finish the peer evaluation sheet.</td></tr>
<tr><td colspan="3">Personal-based Online Inquiry (control group)</td><td colspan="5">Oral presentation, evaluating , discussing and reflecting</td></tr>
<tr><td colspan="3">Collaborative Online Inquiry (experimental group)</td><td colspan="5">Oral presentation, evaluating , discussing and reflecting</td></tr>
</table>

2.3 Instruments

2.3.1 Metacognitive Strategy Scale for Online Inquiry Learning

The Metacognitive Strategy Scale for Online Inquiry Learning (MSSOIL) used in this study was developed by Huang(2011) which was developed based on Metacognition Rating Scale for General Biology (MRSGB) and Metacognive Self-regulation sub-scale of Motivated Strategies for Learning Questionnaire(MSLQ). The MSSOIL is a 6-point Likert scale reflecting students' metacognitive behavior when working on their online inquiry learning. The overall Cronbach's coefficient alpha of MSSOIL was .91 while the subscales' are from .75 to .87. The dimension description of MSSOIL is presented in the following table.

Table 2. Description of MSSOIL'S Dimensions

Dimension	Item	alpha	
Self-plan (SP) (4 items)	● In terms of doing the online inquiring assignment, students have some thoughts about the purposes, searching strategies, reading skills before browsing the web	.82	
Learning-monitor (LM) (4 items)	● Students usually think about the relationship between the course content and the information on the web, and also the connections between the assignment project and the information on the web.	.87.	
Comprehension monitor(CM) (3 items)	● Students usually know whether there is anything not understood yet when browsing the web, and try to make sense to information which is usable but unfamiliar.	.77	.91
Self-modify (SM) (7 items)	● Students can usually find a better way to search for appropriate information and adjust personal views toward project topic if there is problem to complete the job.	.85	
Self-evaluate (SE) (4 items)	● Students usually try to examine the proficiency of knowledge acquired after navigating the web, and they also have interests to review peers' comments if possible.	.75	

3. FINDINGS

The results of covariance in metacognition performance are showed Table 3 and table 4 which summarize the regression homogeneity test and ANCOVA respectively for "Collaborative Online Inquiry" group and "Personal-based Online Inquiry" group in the metacognition performance of online inquiry learning.

Table 3. Summary of Regression Homogeneity Test For Both Teaching Strategies In Metacognition Performance

Dimension	Sources of variance	SS	df	MS	F	Significance
Total	Between(regression-coefficient)	66.914	1	66.914	.538	.466
	Within (error)	8079.467	65	124.299		
SP	Between(regression-coefficient)	4.264	1	4.264	.651	.423
	Within (error)	425.664	65	6.549		
LM	Between(regression-coefficient)	4.798	1	4.798	.630	.430
	Within (error)	495.113	65	7.617		
CM	Between(regression-coefficient)	1.186	1	1.186	.224	.637
	Within (error)	343.762	65	5.289		
SM	Between(regression-coefficient)	41.511	1	41.511	2.354	.130
	Within (error)	1146.121	65	17.633		
SE	Between(regression-coefficient)	1.788	1	1.788	.230	.633
	Within (error)	504.689	65	7.764		

P<.05

According to Table 3, the regression-coefficient homogeneity test did not show statistical significance in the total scores ($F=0.538$, $p>.05$) and each dimension. This means that these two teaching strategies have the same slope and conform to the fundamental assumption within regression-coefficient homogeneity.

Table 4. Summary of ANCOVA For Both Teaching Strategies In Metacognition Performance

Dimension	Sources of variance	SS	df	MS	F	Significance
Total	Between(group)	1469.813	1	1469.813	11.908	.001**
	Within (error)	8146.381	66	123.430		
SP	Between(group)	11.319	1	11.319	1.738	.192
	Within (error)	429.928	66	6.514		
LM	Between(group)	85.483	1	85.483	11.286	.001**
	Within (error)	499.911	66	7.574		
CM	Between(group)	29.655	1	29.655	5.674	.020**
	Within (error)	344.948	66	5.226		
SM	Between(group)	200.401	1	200.401	11.137	.001**
	Within (error)	1187.632	66	17.994		
SE	Between(group)	34.702	1	34.702	4.522	.037**
	Within (error)	506.477	66	7.674		

*P<.05, **P<.01

The ANCOVA results in Table 4 exclude the influence of original ability (pre-test), and the two teaching strategies in the metacognition performance assessment indicated that experimental group made significantly greater gains compared with control group in comprehension-monitor ($F(1, 66) = 11.286$, $p < 0.01$), self-modify ($F(1, 66) = 5.674$, $p < 0.05$), self-evaluation ($F(1, 66) = 11.137$, $p < 0.01$), cross-evaluation ($F(1, 66) = 4.522$, $p < 0.05$) and total scores ($F(1, 66)=11.908$, $p<0.01$). The dimension of self-plan ($F(1, 66) = 1.738$, $p > 0.05$) is not significantly different in the post test excluding the pre-test effect.

4. DISCUSSION AND CONCLUSION

In the "Learning-monitor" dimension, students in the experimental group were more aware of their learning process because they had more chances to interact with others to discuss the relationship between the questions teacher proposed and the information they inquired on the web. For the "Comprehension-monitor" dimension, groups with collaborative discussion performed better for they need to clarify the usefulness of information, and by went through this process they explained what they learned from the web messages reciprocally which can help them to be more reflective on their comprehension level of this learning topic. As the "Self-modify" and "Self-evaluate" dimensions, students in the experimental group faced more compulsion to listen to others and group activity also provided more chances to communicate different opinions which can both encourage and force learners to evaluate and modify their learning.

Whipp et al.(2004) suggested that proper self-monitor and tracking are important characteristics of computer-based learning, because students always confront with metacognitive challenges about task understanding, planning, monitoring, regulation, and reflection throughout the whole online inquiry process (Quintana et al. 2004). In this study, collaborative online inquiry learning presented better metacognition performance than personal based online inquiry significantly. This result provides a confirmation of positive effect of collaboration on metacognitive thinking, and further studies about the interaction during the collaboration are suggested.

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