



# Using the Networked Peer Support Strategy to Enhance Reading Comprehension for Students with Various Thinking Styles

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## ABSTRACT

How to enhance students' reading comprehension as well as reading interest is a currently serious problem for elementary school students. Students can learn various knowledge through reading, as a result of this reason, the advantage and disadvantage of reading ability could directly affect the learning efficiency. This study proposes networked peer support strategy which is different from previous networked peer assessment strategy. It adopts the method to ask students' to give one another positive feedback during the activity. It can also reduce competitive pressure among students and enhance interaction willingness and learning fun, and then increase the degree and depth of reading reflection. The results show that using networked peer support strategy is much better than using networked peer assessment strategy in improving reading comprehension. Further, students who get medium-achievement in the pre-test and belong to site-dependent cognitive style and executive thinking style all have significant improvements in reading comprehension.

**Keywords:** reading comprehension, networked peer assessment, networked peer support

## INTRODUCTION

Improving the reading comprehension skills of students has become an important issue in educational and civilian institutes. With the generation of large quantities of information and knowledge in the current information era, personal competitiveness bears heavily on one's reading comprehension skills and whether one is able to effectively learn and use a wide range of good phrases and expressions. Thus, the quantity and quality of reading are also significant indicators of national and social progress. The Progress in International Reading Literacy Study (PIRLS) is an international study of the reading literacy of fourth graders conducted by the International Association for the Evaluation of Educational Achievement (IEA). Current statistics in this study indicate that Taiwan ranks 22 among the 45 countries participating in

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### **State of the literature**

- A large quantity of knowledge is gained through reading, so reading comprehension skills wield a crucial impact on learning efficiency.
- With the asynchronism of peer activities on online platforms, students do not have to respond immediately and have more time to reread and reflect on issues before making responses in text.
- Most existing peer support activities have been used in special or remedial education, and few studies have focused specifically on peer support. We therefore developed a peer support model based on relevant theories and incorporated features of the Internet to construct a networked peer support learning model.

### **Contribution of this paper to the literature**

- The study results indicate that networked peer support strategy can more significantly improve reading comprehension skills than networked peer assessment strategy.
- Networked peer support strategy significantly enhances the reading comprehension skills of students with a moderate level of reading comprehension skills, a site-dependent cognitive style, or an executive thinking style.
- All of the students expressed approval of the networked peer learning activities afterwards, whether it was networked peer support or networked peer assessment.

the study, which is last among nearby countries. Moreover, only 24% of elementary school students in Taiwan do extracurricular reading every day for fun, causing Taiwan to rank at the bottom (international average is 40%). Many studies have found that even if language teaching activities at school assign large amounts of reading homework to students, it does not mean that reading comprehension skills of the students will improve (Chen, Chang, & Ko, 2011). This is because conventional reading assignments such as book reports and worksheets require improvement. Thus, it is imperative to find a new strategy to improve reading comprehension skills.

A number of studies have indicated that networked cooperative learning has significant and positive effects on learning effectiveness (Boondee, Kidrakarn, & Sa-Ngiamvibool, 2011; Huang, Hsiao, Chang, & Hu, 2012; Li, Wang, & Chang, 2013). Due to the widespread popularity of wireless networks and mobile devices, networked cooperative learning models have become increasingly common. Learning activities in these models offer synchronous or asynchronous learning as well as greater flexibility in the time and place of learning. They can be tailored to different learners, who can also engage in cooperative learning activities with other learners via the convenient internet (Palonen, & Hakkarainen, 2013; Liao, Huang, Chen, & Huang, 2015). Networked cooperative learning also has the advantages of effectively reducing stress among peers, and with asynchronous learning, learners have more ample time to think and express themselves than they would have in the conventional classroom setting (Chang, Liu, Shung, & Chen, 2012; Yu, & Sung, 2015). Determining the influence of peer interactions and attitudes on learning effectiveness in networked learning is thus a crucial issue. Nevertheless, most existing studies involving

networked learning activities merely focuses on strategies for networked peer assessment and rarely discussed networked peer support. Despite the many merits of peer assessment, some researchers feel that it places students under too much pressure, causing learning anxiety and thereby affecting assessment quality (Yu, Wu, & Hung, 2014; Liu, Lin, & Yuan, 2002). Thus, employing a peer strategy without the adverse effects of peer assessment can be beneficial to the implementation of reading activities.

When networked peers assess one another, it may increase the perceived workload or learning anxiety of the learners when they review the works of their peers. They may lack the ability to give any constructive opinions, give false reviews for the sake of harmony, or write negative views due to peer competition (Tsivitanidou, & Constantinou, 2016; Yousef, Wahid, Chatti, Schroeder, & Wosnitza, 2015). To overcome these issues, we adopted a positive and supportive method of networked peer assessment: when learners assess one another, they do not criticize but offer positive feedback and encouragement, which has been shown to have a positive influence on student learning in special education. Most existing peer support activities have been used in special or remedial education, and few studies have focused specifically on peer support (Becker-Cottrill, McFarland, & Anderson, 2003; Bauminger, Shulman, & Agam, 2003). Also, the learners do not assess and discuss one another's works collectively in groups rather than individually. This approach of extending student knowledge via group learning can effectively enhance learning abilities and has been demonstrated in many studies (Chen, Wei, Wu, & Uden, 2009). To enhance reading comprehension skills and willingness to participate and reduce study-induced stress and anxiety, this study adopted replaced individual peer assessments with group discussion to provide feedback and solicited positive encouragement and support rather than criticism and correction. This approach can increase the positive interactions among peers and develop their potential for reflection. We refer to this interactive method with group feedback and support as networked peer support.

This study proposed the application of networked peer support to reading activities, which is unlike conventional book report assignments in that it involves positive group feedback following online reading assignments to motivate students to read and increase their willingness to share their views. In turn, this improves the reading comprehension skills of the students. During the process of the networked peer support activity, students interact with one another via encouragement and thereby develop greater potential. Therefore, networked peer support strategy can also reduce competitive pressure among students and increase the degree and depth of reading reflection.

Based on the research background and motives above, the objective of this study was to effectively enhance the reading comprehension skills of students with online reading, review writing, and sharing activities using the peer learning model and the networked peer support strategy. We used standardized tests to gauge the reading comprehension skills of the students and compared their pre-test and post-test scores to assess the effectiveness of networked peer support and whether it helped us achieve our objective. The specific research questions that guided this study was: can sharing book reports with peers online using the

networked peer support and networked peer assessment strategies significantly enhance the reading comprehension skills of students?

### CONCEPTUAL FRAMEWORK

The objective of this study was to investigate the influence of the networked peer support strategy on the reading comprehension skills of elementary school students. We therefore constructed a platform for networked peer learning activities using the educational community website Edmodo (<https://www.edmodo.com/>). Via this platform, teachers can manage courses, and students can engage in networked peer support and networked peer assessment activities.

In determining the influence of networked peer support activities on the reading comprehension skills and learning attitude of students, this study examined the following independent, dependent, and control variables:

The activity strategy for networked peer learning was the independent variable in this study. The networked peer support strategy was employed for sharing book reports and giving feedback in the experiment group. Discussions were performed on the online platform, and the learners gave each other positive feedback. The subjects were not limited to a single learner; rather, sharing and discussions were conducted as a community. The networked peer assessment strategy was employed for writing book reports, giving ratings, and making corrections in the control group. Assessments were performed on the online platform, and learners could play the role of student and teacher at the same time, in which they rated the book reports of peers, gave them suggestions, and made corrections.

The dependent variables in this study included reading comprehension skills and learning attitude. The former was gauged using Version A of the Elementary School Chinese Reading Comprehension Screening Test for fifth graders (Ko, & Chan, 2002). Higher scores indicated better reading comprehension skills.

The control variables in this study were the book content, teacher, teaching environment, and the time length of the networked peer learning activity. In book content, all of the students were required to read *My Family, My Home* online. Due to the design of the teaching experiment and necessity of the internet to operate the learning platform, the experiment was performed in the computer classroom. The teacher was a full-time computer teacher at the school where the experiment was conducted. The experiment lasted six weeks with two forty-minute class periods each week for both groups.

The book content, teacher, teaching environment, and the time length of the networked peer learning activity were the same for both the experiment group and the control group, each of which was a class.

## METHODOLOGY

### **School background and participants**

The participants in this study were two fifth grade classes in an elementary school in Taiwan, comprising 53 students in all. These participants were required to have basic computer skills to use computer-based technologies to locate, access, evaluate, store and retrieve information and to express ideas and communicate with others, including typing and using the internet. Therefore, the experiment results could not be extended to explain the behaviours of other students of different grades or from different kinds of schools.

The school that the participants studied at is situated in the suburbs and uses heterogeneous grouping in line with the principle of fairness. We selected two classes with the same computer teacher as the subjects of this study. The experiment group and the control group contained 27 students and 26 students and participated in networked peer support and networked peer assessment activities that lasted 12 class periods.

### **Platform for networked peer learning activities**

We performed our experiment using Edmodo (<https://www.edmodo.com/>), which is like an educational version of Facebook. Teachers can establish communities for teaching and create groups for each of the classes that they teach. The greatest difference between Facebook and Edmodo is that Edmodo is not an open community; students must have a group code from their teacher in order to join a group. Teachers can send messages, assign tasks, interact with students, give scores, and plan their calendar on the platform, whereas students can receive messages from their teachers and share their status or write messages like on Facebook. Edmodo is a free teaching platform and can operate on Windows, MAC, and Linux; its app is compatible with Android, Apple, and Windows tablet computers. Edmodo enables teachers to set up learning platforms more easily and offers an easy-to-use interface for course management, teaching activities, and community interactions. Students need only use an internet browser to access the teaching platform, learning, and interact with other students.

### **Networked peer assessment standards table**

Prior to the networked peer assessment activity, the students in the control group were instructed on how to give ratings so as to give them an understanding of the assessment focuses and reduce disparities. The networked peer assessment standards table helped the students assess book reports in the networked peer assessment activity. Based on the contents of the reports and the rating standards discussed by the students, the standards table comprised four aspects: inspiration and originality, interpretation of the main point, and structure.

### **Reading comprehension skills test**

For the reading comprehension skills test in this study, we adopted the Elementary School Chinese Reading Comprehension Screening Test (for grades two to six) revised by Ko and Chan (2009) based on the test developed by Ko (2002). The test has two versions (A and B) for each grade from two to six, and its objective is to identify students with poor reading comprehension skills. We used Version A of the test for fifth graders. The Cronbach's  $\alpha$  of this test is 0.81, which indicates fair content consistency in the various categories of questions. In terms of validity, the coefficient of correlation among the various categories of questions was moderate but reached the 0.001 level of significance. We therefore employed the original test paper, which contains 31 multiple choice questions divided into four categories: words with multiple meanings (12 questions), proposition combinations (6 questions), understanding sentences (4 questions), and understanding short passages (9 questions). Each question is worth 1 point, so the highest score is 31 points. The duration of the test is 25 minutes.

### **Group Embedded Figures Test (GEFT)**

The Embedded Figures Test is a means of determining cognitive style. In the test, subjects must identify simple shapes in complex images. If a subject can easily identify them, it means that he or she is not easily hindered by other shapes. Such subjects are categorized to have a site-independent cognitive style. In contrast, subjects that cannot easily find simple shapes in complex images and are easily distracted by other shapes are referred to as having a site-dependent cognitive style. We adopted the Group Embedded Figures Test (GEFT) modified by Wu (1987) based on that developed by Witkin, Oltman, Raskin, and Karp (1971). The reliability coefficient of this test is 0.82, which indicates a fair degree of internal consistency among the various categories. The validity coefficients of correlations with EFT, PRFT, and ABC (the articulation of body content) were -0.82, -0.39, and 0.71, respectively. We therefore employed the original test, which is divided into three portions. The first portion contains 7 questions and requires 2 minutes to take. It merely serves to familiarize the test subject with the testing method, so the results of this part are not included in the final score. The second and third parts each contain 9 questions and require 5 minutes to take. Each question is worth 1 point, so the highest score is 18 points. As suggested by Wu (1987), the range from half the standard deviation above and below the mean score of the GEFT was used to differentiate site-independent and site-dependent cognitive styles. The remainder was not included in the analysis to ensure more distinct differences in the characteristics of the students' cognitive styles.

### **Thinking style scale for elementary school students**

The thinking style scale used in this study was revised by Lin (1999) based on the Sternberg-Wagner Thinking Styles Inventory (Sternberg & Wagner, 1991) and the learning conditions and teaching scenarios that elementary school students in Taiwan may encounter. This scale is mainly suitable for students between the grades of four and six. The purpose of

this scale is to understand the thinking style of an elementary school student, and it can be administered to individuals or groups. The scale comprises 13 subscales, one for each of 13 thinking styles, in five dimensions. There are 5 questions for each subscale, so the scale consists of 65 questions in all. Each question is measured using a five-point Likert scale, with 5 to 1 points for always, frequently, sometimes, rarely, and never, respectively. Each subscale is scored individually, and the highest and lowest scores are 25 and 5 points. A higher score for a subscale means that the thinking style of the subject is closer to the style in question. The Cronbach's  $\alpha$  of the scale is 0.9481, and the Cronbach's  $\alpha$  coefficients of the five dimensions range from 0.7721 to 0.8165, which indicates a fair degree of internal consistency among the various dimensions. In validity, the correlation among the thinking styles in each dimension reaches the 0.01 level of significance. Therefore, we used the original scale in our study.

The students in control group and the experiment group filled out the entire scale. However, only three subscales (Questions 1~15) were analysed to examine the differences among the students: legislative, executive, and judicial.

Government has many different characteristics of the organization, at least three functions: legislative, executive and judicial. Executive departments implement policy, motion, regulations, which have been reviewed by the legislative departments; judicial departments are responsible for evaluating and judging whether the regulations were performed correctly and whether there are violations of laws and regulations. From the view of Sternberg's Theory, as the government to implement the legislative, executive and judicial functions, it is the same with these features for human beings, which are (1) legislative: like in their own way of doing things, and the good performance of their own creativity; (2) executive: behaved, willing to tackle the problem set in advance; (3) judicial: like evaluation rules and procedures to deal with things that need to analyse the problems and ideas.

### **Design and implantation of teaching experiment**

The experiment was mainly implemented during class; some extracurricular time was required. The experiment lasted 12 class periods during the course of six weeks. The procedure of the teaching activity comprised the eight steps below:

- (1) In networked peer support, the book reports were posted directly on the online learning platform (**Figure 1**), whereas in networked peer assessment, the students delivered their book report by submitting their answers to simple questions. Once completed, the students could confirm that they had finished their book report on the platform webpage.
- (2) At the beginning of each class, the teacher explained the networked peer support and networked peer assessment activities and guided the students through the activities for that period.
- (3) Each student gave feedbacks (**Figure 2**) and comments (**Figure 3**) to the reports of their peers according to the activity instructions.
- (4) In networked peer support, the students could read and respond to the comments that their peers had given them. In networked peer assessment, the students could read the



Figure 1. Networked Peer Support – Post the report

feedback that their peers had given them and then revise and resubmit their answers to the questions (Figure 4). In coordination with the networked peer support activity, the networked peer assessment activity was also repeated twice to complete the three-round activities.

- (5) After the online learning activity, the students completed the reading comprehension skills post-test, GEFT, and thinking style scale for elementary school students.
- (6) Each student gave feedbacks (Figure 2) and comments (Figure 3) to the reports of their peers according to the activity instructions.
- (7) In networked peer support, the students could read and respond to the comments that their peers had given them. In networked peer assessment, the students could read the feedback that their peers had given them and then revise and resubmit their answers to the questions (Figure 4). In coordination with the networked peer support activity, the networked peer assessment activity was also repeated twice to complete the three-round activities.
- (8) After the online learning activity, the students completed the reading comprehension skills post-test, GEFT, and thinking style scale for elementary school students.

## RESULTS

The participants included two fifth grade classes in an elementary school in Tainan City. The students were divided into the experiment group and the control group using their scores on the reading comprehension skills pre-test and heterogeneous grouping. A total of 27 students participated in the networked peer support activities in the experiment group, and 26 students participated in the networked peer assessment activities in the control group. One of the students in the experiment group received special education and therefore could not participate in the entire experiment. Thus, there were 26 valid samples in the experiment group, thereby presenting a completion rate of 96.3%. In the control group, one student transferred to another school, and two students received special education; thus, there were 23 valid samples in the control group, thereby presenting a completion rate of 88.5%.



Figure 2. Networked Peer Support – Students’ feedbacks



Figure 3. Networked Peer Assessment - Reviewer comments



Figure 4. Networked Peer Assessment – Revise the report

### Reading comprehension skills

This study examined whether networked peer support and networked peer assessment activities can enhance the reading comprehension skills of fifth graders and whether their influences on reading comprehension skills differ significantly. The students were grouped using their scores on the reading comprehension skills pre-test and heterogeneous grouping. We then tested the homogeneity of the two groups using an independent-samples t test. As shown in **Table 1**, the two groups displayed no significant differences in the pre-test, which means that the reading comprehension skills of the students in the two groups did not differ significantly before the experiment. This proves that the overall experiment design is fair and the results more persuasive.

The results in **Table 2** show that after the three rounds of networked peer support activities, the reading comprehension skills of the students in the experiment group improved significantly. In contrast, the results in **Table 2** indicate that after the three rounds of

**Table 1.** The learning effectiveness pre-test

Pre-test	N	Mean	SD	t
Experimental group	26	17.85	6.051	-.211
Control group	23	18.22	5.673	

**Table 2.** Paired samples t-test results of the pre and post within each group

	Control Group			t	Experimental group			t
	N	M	SD		N	M	SD	
pre	23	18.22	5.673	-.711	26	17.85	6.051	-2.659*
post	23	18.91	6.605		26	19.69	6.169	

\*p<.05

**Table 3.** Paired samples t-test results of the pre and post for the moderate level of reading comprehension skills within each group

Category		Control Group			t	Experimental group			t
		N	M	SD		N	M	SD	
Moderate level of reading comprehension skills	pre	14	17.64	3.177	-1.308	17	17.29	3.158	-2.315*
	post	14	19.14	5.376		17	19.47	4.638	

\*p<.05

networked peer assessment activities, the reading comprehension skills of the students in the control group did not improve significantly. Statistical analysis revealed that both networked peer strategies enhanced the reading comprehension skills of the students, but the improvement in the experiment group was considerably greater than that in the control group. Because this does not show whether the activities can enhance the reading comprehension skills of all the students, we conducted further analysis on the students grouped by level of reading comprehension skill, cognitive style, and thinking style to determine whether the influence of the networked peer support strategy varies with the individual traits of the student.

### Analysis based on level of reading comprehension skill

Based on the reading comprehension skills pre-test scores, we divided the students into a high level of reading comprehension skill group (scores higher than the mean plus one standard deviation), a moderate level of reading comprehension skill group (scores between the mean plus and minus one standard deviation), and a low level of reading comprehension skill group (scores lower than the mean minus one standard deviation). The results revealed that the networked peer support strategy improved the reading comprehension skills of the students in all three groups more significantly than the networked peer assessment strategy. As shown in **Table 3**, the pre-test and post-test scores of the students that had participated in the networked peer support activity in the moderate level group presented significant differences.

**Table 4.** Paired samples t-test results of the pre and post for the site-dependent cognitive style within each group

Category		Control Group			t	Experimental group			t
		N	M	SD		N	M	SD	
Site-dependent cognitive style	pre	9	15.11	5.395	.338	10	14.10	5.685	-2.986*
	post	9	14.67	5.545		10	17.00	6.146	

\*p&lt;.05

### Analysis based on cognitive style

Based on the GEFT scores, we divided the students into a site-independent cognitive style group (scores higher than the mean plus half a standard deviation) and a site-dependent cognitive style group (scores lower than the mean minus half a standard deviation). The results show that regardless of the peer learning strategy, the students in the site-independent group improved more than those in the site-dependent group. For the site-independent students, both the networked peer support and the networked peer assessment activities enhanced their reading comprehension skills. However, the positive impact of networked peer support was slightly greater than that of networked peer assessment. Thus, networked peer support is still beneficial for the reading comprehension skills of students with a site-independent cognitive style. For site-dependent students, the results in [Table 4](#) indicate significant differences between the enhancing influences of networked peer support and networked peer assessment on reading comprehension skills. The latter instead had a negative impact on their reading comprehension skills. Thus, the networked peer support strategy should be adopted to improve the reading comprehension skills of students with a site-dependent cognitive style.

### Analysis based on thinking style

Based on the scores of the thinking style scale for elementary school students, we divided the students into three groups: legislative, executive, and judicial. The results of the networked peer learning activities revealed that networked peer support exerted a negative influence on the reading comprehension skills of the students with judicial thinking style but a positive impact on the reading comprehension skills of the students with legislative and executive thinking styles. In particular, as shown in [Table 5](#), the students with an executive thinking style presented significant differences in their pre-test and post-test scores. In contrast, the networked peer assessment activities displayed different results; the reading comprehension skills of the students with a legislative thinking style worsened, whereas those of the students with executive and judicial thinking styles improved. Thus, networked peer support should be adopted to enhance the reading comprehension skills of students with an executive thinking style, while networked peer assessment is more suitable for students with a judicial thinking style.

**Table 5.** Paired samples t-test results between the pre and post within thinking style within each group

Category		Control Group			t	Experimental group			t
		N	M	SD		N	M	SD	
Legislative thinking style	pre	5	22.00	7.246	1.319	3	16.33	6.506	-.658
	post	5	20.00	9.083		3	17.67	3.055	
Executive thinking style	pre	14	17.43	5.049	-.647	19	18.11	6.235	-3.694**
	post	14	18.29	5.441		19	20.84	5.871	
judicial thinking style	pre	4	16.25	4.856	-1.698	4	17.75	6.397	1.359
	post	4	19.75	8.770		4	15.75	8.421	

\*\*p&lt;.005

## DISCUSSION AND CONCLUSION

The networked peer support strategy helps improve the reading comprehension skills of fifth graders. Analysis of the pre-test and post-test results revealed that the influence of networked peer support is significant and that networked peer support is superior to networked peer assessment in improving the reading comprehension skills of students. The networked peer support strategy improved reading comprehension skills all around but significantly enhanced the reading comprehension skills of students with a moderate level of reading comprehension skills. The students with a low level of reading comprehension skills also showed greater improvement. Thus, adopting the networked peer support strategy can strengthen the reading comprehension skills of students with a moderate and low level of reading comprehension skills.

Besides, students with a site-independent cognitive style are superior to students with a site-dependent cognitive style in terms of reading behaviour, reading level, and reading comprehension skills. Thus, it is more important to enhance the reading comprehension skills of students with a site-dependent cognitive style. The results of this study indicate that employing the networked peer support strategy can significantly enhance the reading comprehension skills of students with a site-dependent cognitive style. In contrast, the influence of networked peer assessment is poorer. This means that the networked peer support strategy is more desirable when the cognitive styles of the students are unclear. This evidence is similar to the one found by Becker-Cottrill, et.al. (Becker-Cottrill, B., McFarland, J., & Anderson, V., 2003).

Moreover, the results of this study show that networked peer support has a more positive impact on the reading comprehension skills of students with an executive thinking style than on those of students with legislative and judicial thinking styles. The networked peer support group and the networked peer assessment group displayed different outcomes. In the former group, students with an executive thinking style exhibited more improvement than students with a legislative thinking style, whereas the reading comprehension skills of students with a judicial thinking style worsened. In the latter group, students with a judicial

thinking style exhibited more improvement than students with an executive thinking style, whereas the reading comprehension skills of students with a legislative thinking style worsened. This result is similar to the one that elementary school students learning achievement and students' thinking styles have significant correlation; students could have higher academic achievement with an executive thinking style (Cano-Garcia, & Hughes, 2000).

### SUGGESTIONS FOR TEACHING APPLICATIONS

The networked peer support strategy can be applied to various domains of learning, excepting those with standard answers. Sharing, discussion, and positive encouragement can promote mutual learning and growth and prevent adverse influences on motivation and participation due to excessive criticism.

Adopting the networked peer support strategy and promoting sharing and discussion among the students do not absolve teachers of their teaching responsibility. Teachers must participate throughout the entire activity and offer assistance and guidance when needed. Furthermore, as the discussions are conducted openly, teachers should monitor them for cyberbullying and improper comments so that students can learn and interact without worry.

During networked peer support activities, sharing and discussion are crucial processes. Not all students may be able to type quickly. They may need time to decide on how to respond, and they are facing more than one of their peers. Thus, teachers must provide students with adequate time to give feedback to each of their peers and have discussions on the platform.

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