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EFFECTS OF RECIPROCAL PEER-QUESTIONING INSTRUCTION ON EFL COLLEGE STUDENTS' ENGLISH READING COMPREHENSION

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ABSTRACT

*This study investigated the effects of reciprocal peer-questioning instruction to enhance the English reading comprehension of English as a foreign language (EFL) college students by comparison with the conventional lecture instruction. We employed a pretest-posttest quasi-experimental comparison group design in college English reading courses in a complete semester. A total of 78 EFL college students enrolled in compulsory English reading courses participated in this study; 38 participants were in the experimental group and 40 were in the comparison group. The experimental group received reciprocal peer-questioning instruction, whereas the comparison group received conventional lecture instruction. The data were analyzed by mean, standard deviation, *t* tests, and one-way ANCOVA. The findings indicate statistically significant differences in favor of reciprocal peer-questioning instruction on English reading comprehension, particularly among high- and medium-proficiency students. Compared with conventional lecture instruction, reciprocal peer-questioning instruction created a more positive attitude toward learning English reading. In conclusion, we strongly recommend EFL instructors use reciprocal peer-questioning instruction in college English reading classrooms.*

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Keywords: Reciprocal peer-questioning, English reading comprehension, Learning attitude, EFL instruction, College English reading, English reading instruction.

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Contribution/ Originality

This study is one of few studies which have conducted the questioning strategies in English reading course for EFL college students. This study adopted a sound experimental design to generate firmer evidence to prove the effects of questioning strategy on English reading courses.

1. INTRODUCTION

When facing globalization and international competition, good English ability has always been crucial for college students in Taiwan (Pan and Wu, 2013). Reading is regarded as the most fundamental and convenient approach to learning English, particularly for English as a foreign language (EFL) learners (Carrell, 1984; Shang and Chang-Chien, 2010). English reading is considered a complex process and difficult to acquire, but scholars believe that reading proficiency can be trained by conducting extensive instruction and practice (Gunn, 2008).

Recent studies have indicated that Taiwanese college students exhibit low proficiency and lack comprehension monitoring engagement in English reading. The reason is that English reading instruction emphasizes teacher-centered lectures and knowledge transmission but rarely encourages students to engage their study actively for improving their reading comprehension (Tsao, 2004; Hsieh, 2013; Pan and Wu, 2013).

Evidence has suggested that the active engagement of students in reading is a key driver for their academic success (Kuh, 2003). However, students seldom activate the material they read autonomously to connect with their prior knowledge, and only if they are provoked (Pressley *et al.*, 1992). Previous studies have shown that guiding students toward asking and answering questions on reading texts offers them incentive to manage complex reading demands effectively, improve their understanding, promote their self-efficacy in reading, and become active learners (Foote, 1998; Dunlap, 2006; National Reading Panel, 2006; Summerlee and Murray, 2010). Whitehouse (2008) believed cooperative learning to be the most effective approach to implementing a questioning strategy in reading. Reciprocal peer-questioning (RPQ) is a strategy combining cooperation and questioning for training students to generate questions and provide focused discussions in small groups to refine the reading comprehension of students (King, 2002).

King (1991) validated RPQ as a successful learning strategy for teaching college students approaches to learning from classroom lectures and reading expository material. Although follow-up research has proven that RPQ benefitted the reading comprehension of learners, some indicated no difference in effect size when results between reciprocal questioning and conventional approaches were compared (Rosenshine *et al.*, 1996). In addition, whether RPQ benefits all students or is limited to certain reading ability groups of learners remains uncertain (Janssen, 2002). Most studies on questioning strategies examine reading comprehension in the native language, either Chinese or English. However, reading comprehension in EFL certainly differs from that in the native language. Thus far, only limited studies on whether a questioning strategy could enhance EFL reading comprehension have been conducted.

RPQ seems an effective strategy to solve Taiwanese college students' passive learning of English reading, but only few instructors apply it in college English reading classes and its effects still demand evidence to prove. Therefore, in this study, we applied RPQ instruction in our college English reading courses to train the EFL students to be active learners and examined the effectiveness of RPQ instruction in EFL reading and determined whether it benefits students of all reading proficiency levels by comparing it with conventional lecture instruction.

2. RESEARCH QUESTIONS

This study sought to determine the relative advantages of RPQ instruction and conventional lectures for the English reading performance of EFL college students. Three research questions were formulated:

- (a) Is there a significant difference in English reading comprehension performance between the students in the RPQ class and the conventional lecture class?
- (b) Are there significant differences in English reading comprehension performance between the different reading proficiency levels of students in the RPQ class and the conventional lecture class?
- (c) What are the perceptions toward RPQ instruction of the EFL students?

3. LITERATURE REVIEW

Reading comprehension is defined as intentional thinking during which meaning is constructed through interactions between text and readers (National Reading Panel, 2006). Reading comprehension occurs when readers actively relate the ideas represented in text to their own knowledge and experience and construct mental representations in memory. The reading comprehension of learners can be enhanced by teaching them to use specific strategies. Question-generation is one of the most effective strategies (National Reading Panel, 2006).

3.1. Questioning Strategies on Reading

Questioning is a process that learners use to understand texts by asking questions before, during, and after reading. Questioning strategies involve a set of steps that guide learners toward asking questions while reading and searching for answers. The strategies help learners independently acquire vital knowledge from texts (Gunn, 2007) and develop deeper understanding of texts through applying selective attention, inferring critical messages, constructing concepts, and combining prior knowledge (Wong, 1985).

Rosenshine *et al.* (1996) and Wong (1985) have defined three theoretical perspectives underlying questioning strategy, namely active processing, meta-cognitive, and schema theories. Active processing theory assumes learners need to process texts actively by asking and answering questions while reading. Meta-cognitive theory indicates that using questioning can assist learners in monitoring how well they have comprehended the texts by identifying crucial information in texts and regulating strategies in facing difficulties (King, 1989). Schema theory presumes questioning during reading activates the prior knowledge of learners for interpreting incoming information and restructuring their schemata.

Ample research has proven that questioning instruction increases the involvement of learners in texts and causes them to become actively engaged with the texts (Janssen, 2002; Gelmini-Hornsby *et al.*, 2011). Asking questions forces learners to identify relevant ideas, elaborate on them, and think about how those ideas relate to their prior knowledge (King, 1991). Responding questions helps learners deepen and broaden their comprehension (King, 1990; 1991). In addition, questioning

functions as a form of self-testing to solicit and cultivate the meta-cognitive and self-regulatory skills of learners (Feldt and Feldt, 2001; Gunn, 2007). The more questions learners generate, the more information is elicited to enhance their reading comprehension, causing more comprehensive understanding (Wong, 1985).

3.2. Reciprocal Peer-Questioning Strategy

In small group reading processes, the learner is simultaneously an active constructor of knowledge and a collaborator with peers in a shared construction of meaning through discussions (King and Rosenshine, 1993). Learning through peer-group interaction usually results in more cognitive benefits for learners than an individual working independently (King and Rosenshine, 1993; Barkley *et al.*, 2005; Pan and Wu, 2013). However, simply placing students into peer groups and asking them to collaborate does not necessarily lead to interactive discussions (Gelmini-Hornsby *et al.*, 2011). RPQ combining questioning strategy with peer cooperation has been believed to be a productive approach to help learners engage in interactive discussion. RPQ teaches learners to ask their own thought-provoking questions, stimulates their critical thinking, and motivates students to participate in discussion actively (King, 2002).

RPQ includes three steps. The first step is the self-questioning in which students work independently and use generic questions as guides to generate their own task-specific questions that may be answered by themselves. The second step is the peer-questioning in which students work in small cooperative groups and take turns posing their questions to each other and answering each other's questions. Finally, the teacher brings the class together to share and to clarify any misunderstandings the students might have (King, 1991).

King (1990; 1991) conducted empirical research and successfully validated the utility of the RPQ approach with college students in lecture and lesson comprehension settings. King proposed that learning benefits resulted from the active involvement of students and the high-level cognitive processing required for generating and responding to questions (King, 1990; 1993; 2002). Although a substantial body of research has indicated the merits of King's approach (Gunn, 2007), Foote (1998) emulated the research of King and determined that the traditional skill-based instructional approaches and RPQ approach yielded similar reading comprehension.

3.3. Relevant Research

Most studies involving questioning have concluded that questioning instruction was an effective approach to improving the textual comprehension and learning performance of students (Rosenshine *et al.*, 1996; Janssen, 2002; 2009; Gunn, 2007; Shang and Chang-Chien, 2010). Previous meta-analysis research has indicated that two factors were associated with the high effect sizes: program duration and the type of procedural prompts used. Questioning involving prompts appeared to be more successful than that involving no prompts (Rosenshine *et al.*, 1996; Janssen, 2002). Studies involving nine or more training sessions reported more satisfactory reading comprehension than did studies involving a short program (Westera and Moore, 1995; Janssen, 2002). However,

these studies determined that different instructional approaches to questioning revealed no differences in effect size between multiple-strategy and single-strategy instruction, reciprocal and conventional teaching, peer-assisted and teacher-assisted procedures, and cooperative learning and cross-age tutoring (Janssen, 2002; 2009). Previous research has indicated that the effect of questioning strategy use is limited for high meta-comprehension and low mental development learners (Wong and Jones, 1982; Miciano, 2003; Shang and Chang-Chien, 2010).

In Taiwan, most studies on questioning have been conducted with elementary and junior high school students to investigate the effects of self-questioning strategy instruction on Chinese reading comprehension. Some researchers have observed that the questioning training improved the understanding and recall of texts by students (Shih, 2000; Chen, 2008; Lay, 2008), but others did not (Chiang, 2008; Huang, 2011; Tsai, 2011). In addition, several researchers have reported that students exhibited positive attitudes and high satisfaction towards the questioning learning experience (Chen, 2008; Shang and Chang-Chien, 2010).

Comparatively, little questioning research has been conducted on the EFL reading comprehension of college students, except for Shang and Chang-Chien (2010) and Hsieh (2013). Shang and Chang-Chien examined the effectiveness of the self-questioning strategy on the English reading comprehension of college students and determined that the reading comprehension of students was enhanced substantially, particularly for low-achievers. Hsieh investigated the effects of reciprocal questioning on the English reading comprehension of remedial college students in computer-supported collaborative learning. Both studies have adopted the one-group pretest-posttest design that had some methodological weaknesses. Because the research on the effects of questioning training on the English reading comprehension of college students is meager, and the effects of the more rigorous questioning strategy, RPQ, have not yet been experimentally tested, we were motivated to conduct the current study.

4. METHOD

4.1. Participants

The participants were 78 freshmen from two departments at Tzu Chi University in Taiwan. The participants from the Child Development and Family Education department were assigned as the experimental group ($N = 38$), and the participants from the Life Science department was assigned as the comparison group ($N = 40$). Most of the participants received formal English instruction for approximately 8 years before entering Tzu Chi University.

4.2. Design

A pretest-posttest quasi-experimental comparison group design was employed in the college English reading course, which was a two-credit course, in which 100-min instruction is presented per week each semester. The experimental group received RPQ instruction, and the comparison group received conventional lecture instruction. The experimental period lasted for a complete semester and involved one pretest session, one posttest session, 12 unit lessons, one midterm session, and

one final exam session. In each 100-min lesson, one article selected from *The New York Times* was taught and tested. Both groups had the same learning materials, tests, and instructor; the only difference was the instructional method.

The Intermediate Reading Comprehension Test of the General English Proficiency Test (GEPT) was administered as a pretest for measuring the English reading proficiency levels of the participants. In addition, the pretest scores were used to divide the participants into high-, medium-, and low-proficiency groups. Furthermore, 10 unit quizzes were developed for examining the students' reading comprehension of the articles for the practice sessions. The English Learning Perception Questionnaire (ELPQ) was administered at the end of the semester to ascertain the perceptions of the students toward the courses. Table 1 shows the experimental design used for this study.

Table-1. Experimental Design used for this study

Groups	Instructional Methods	Pretest	Treatments	Posttest
Experimental group	Reciprocal peer-questioning instruction	O ₁	X ₁	O ₃
Comparison group	Conventional lecture instruction	O ₂	X ₂	O ₄

X₁: The experimental group received reciprocal peer-questioning instruction

X₂: The comparison group received conventional lecture instruction

O₁, O₂: The pretest was the intermediate GEPT Reading Comprehension Test

O₃, O₄: The posttests were 10-unit English reading comprehension quizzes and the English Learning Perception Questionnaire.

4.3. Treatments

4.3.1. Reciprocal Peer-Questioning Instruction

The experimental group received 12 RPQ instruction sessions; 2 for training and 10 for practice. During the first training session, students were divided into small, heterogeneous groups of three to four members based on their GEPT pretest scores. The teacher provided an overview of the rationale and activities for using RPQ while reading English articles. The teacher then introduced a list of open-ended questions, as generic prompts, to formulate specific questions, such as factual, comprehensive, and inferential questions. The teacher then presented an article and demonstrated how to skim the article and sample and combine textual information to generate appropriate questions to extract ideas from the article. In the second training session, students were presented with another article and encouraged to read and generate their own questions individually; however, they were not required to answer all of the questions by themselves. After the self question generating phase, the peer-questioning discussion was conducted. Students took turns posing their questions and answering each other's questions. They evaluated the answers, reconciled differences among their peer predictions of the answers, and corrected their thinking. Finally, each group recorded the best answers for three questions and submitted them.

After the training sessions, the teacher assigned an article and asked students to use generic questions as a guide to generate two or three questions before class each week. The students brought

the questions they formulated to the class and took turns posing their questions to group members, and then discussed the article by using student-generated questions as a guide. At the end of the peer-questioning phase, each group submitted a sheet comprising three questions and their answers. The teacher then convened the class to clarify problems that the students encountered. Finally, the students were individually administered a reading comprehension quiz for evaluating their comprehension of the article.

4.3.2. Conventional Lecture Instruction

The comparison group received conventional lecture instruction. During the first 2 weeks of the experiment, some crucial English reading strategies were reviewed, except for the questioning strategies. In conventional lecture classrooms, students were asked to preview the article each week before class, and the teacher instructed the entire class by explaining the article paragraph by paragraph and focusing on English syntax and semantics. The teacher would occasionally interact with students by asking questions, but no small group discussions were conducted. After completing each unit, the students were individually tested on the article.

4.4. Materials

The reading materials consisted of 2 training articles and 10 practice articles, presented in Table 2. The articles were selected from *The New York Times*. According to the Flesch–Kincaid Grade level index, the reading difficulties of the 12 articles were approximately at the 8th to 12th grade levels, at an average grade level of 10.3. The length of the articles ranged from approximately 800 to 1,100 words.

The topics of these articles included environmental protection, medicine, economics, politics, history, and art. Various topics were used to broaden the horizons of the students and to reduce the effect of their prior knowledge on their reading comprehension outcome. After the experiment, 73% of the students expressed interest in the articles. In addition, 45% of the students reported that the difficulty levels of the articles were acceptable, and 36% of the students reported that the articles were difficult to read.

Table-2. Reading materials used in this study

Unit	Article names	Topics	Flesch–Kincaid Grade level
Training	A class war over a cup of coffee	Economics	8.27
Training	Can exercise help prevent two cancers?	Medicine	8.62
1	An artist's catch of the day	Art	8.12
2	View of climate changes from the backyard patio	Environmental protection	9.13
3	Grandeur returns to an ancient canal	History	12.54
4	Philanthropists fight poverty with \$2-a-day jobs	Economics	13.68
5	It's who you are, not what you eat	Medicine	8.55
6	Schools are a target in Taliban's new front	Politics	10.13

Continue

7	Cheap models meet demand of India's surging car market	Economics	12.47
8	Myanmar withers as Thailand prospers	History	11.80
9	The body may age, but romance stays fresh	Humanity	10.12
10	Time to rethink the grip of AIDS	Medicine	10.17

4.5. Instrumentations

Four instruments were employed in this study.

4.5.1. Intermediate GEPT Reading Comprehension Test

The simulated intermediate GEPT Reading Comprehension Test was conducted as the pretest for assessing the English reading comprehension proficiency of both student groups. The test comprises 5 passages and 45 multiple-choice items. The Ministry of Education in Taiwan commissioned the GEPT, which provides individuals with a gauge of their English language proficiency and assists employers and educational institutions in selection and placement. The rigorous procedures of test construction and administration ensure that high quality, validity, and reliability of the GEPT are maintained (Roever and Pan, 2008).

4.5.2. English Reading Achievement Tests

A total of 10 post-quizzes were administered after completing each RPQ practice session to assess the overall reading comprehension of the article that the students studied. Each quiz contained five free-response questions; three literal questions and two inferential questions. The literal questions assessed explicitly stated information, and the answers could be located directly within the text. Inferential questions enabled ideas implied by article information to be extracted, and the answers required information from several sentences to be integrated. Furthermore, to ensure the content validity of the quizzes, another expert was invited to evaluate and validate them. All of the quizzes were scored independently by two raters. Inter-rater reliabilities of the 10 quizzes ranged from .87 to .98.

4.5.3. English Learning Perception Questionnaire

The researcher composed the ELPQ to determine whether the instructions created differences among the students in the two groups in their perceptions of teacher instruction, learning materials, and learning outcomes. The ELPQ consists of sixteen 5-point Likert-type items, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A high score indicates high satisfaction (see Appendix A). Its Cronbach's α is .91. The proportion of variance explained is 71%.

4.5.4. Interview for Reciprocal Peer-Questioning Learning Experience

At the end of the experiment, the researcher conducted a semi-structured interview for assessing the learning experience of RPQ of the experimental group students. Among the students, 13 selected focus-group interviews (four focus groups involving three to four students each), and 7 students

selected individual face-to-face interviews. The interview questions (see Appendix B) primarily focused on student experiences and opinions of the use of RPQ in English reading classes. Each interview lasted approximately 15–20 min.

4.6. Data Collection and Analysis

T tests for independent samples were conducted for determining significant differences between the pretests of the two groups. One-way analysis of covariance (ANCOVA) tests were implemented for determining the effects of treatment on reading comprehension post-quizzes, adjusted for pretest performance. In addition, a χ^2 test was employed for investigating the proportion differences in the perceptions between the two groups. All of the tests of significance were conducted at the .05 level of significance. The effect size is an objective and standardized measure of the magnitude of observed effect. According to Cohen (1988), the values of effect size, $.059 > \eta^2 > .01$, $.138 > \eta^2 > .059$, $\eta^2 > .138$, are indicative of a small, medium, and large effect, respectively.

5. RESULTS

This study investigated the effects of RPQ instruction. The results are reported by corresponding to the three research questions, the differences in English reading comprehension performance between the two groups and the three paired proficiency subgroups, and the viewpoints of the experimental student group on RPQ.

5.1. Pretest for English Reading Comprehension

An independent sample *t* test was implemented for determining significant differences between the two group pretest mean scores of the GEPT Reading Comprehension Test. Table 3 shows that the means for the two groups are 40.15 and 40.10, $t_{(76)} = .022$ ($p = .983 > .05$), indicating that both groups were at a similar level of English reading comprehension proficiency before the experiment.

Table-3. Independent sample *t* test of GEPT reading comprehension pretest scores for the experimental and comparison groups

GEPT	Experimental group			Comparison group			<i>t</i>	df	<i>p</i>
	n	M	SD	n	M	SD			
reading scores	38	40.15	10.59	40	40.10	12.22	.022	76	.983

Based on the pretest GEPT reading comprehension scores, the researcher divided each group into three subgroups: high-, medium-, and low-proficiency. Table 4 presents the mean and standard deviations of the six subgroups, and the independent sample *t* test results from comparing the three paired subgroups. The means for the two high-proficiency groups were 52.50 and 52.9, which were markedly close. The means for the two medium-proficiency groups were 39.43 and 41.6; the mean for the comparison group was slightly higher than that for the experimental group. The means for the two low-proficiency groups were 30.0 and 25.9; the mean for the experimental group was slightly higher than that for the comparison group. However, no statistically significant differences were observed among the paired high-, medium-, and low-proficiency subgroups, indicated as

follows: $t_{(23)} = -.14$ ($p = .90 > .05$), $t_{(26)} = -1.62$ ($p = .12 > .05$), $t_{(23)} = 1.75$ ($p = .10 > .05$). Thus, the three paired subgroups were similar in English reading comprehension prior to the RPQ instruction.

Table-4. Independent sample *t* tests of GEPT reading comprehension pretest scores for the three subgroups between the experimental and comparison groups

	Experimental group (n=38)			Comparison group (n=40)			<i>t</i>	df	<i>p</i>
	n	M	SD	n	M	SD			
High-proficiency group	12	52.50	8.04	13	52.9	4.34	-.14	23	.90
Middle-proficiency group	14	39.43	2.85	14	41.6	4.05	-1.62	26	.12
Low-proficiency group	12	30.00	3.13	13	25.9	7.89	1.75	23	.10

5.2. Posttests for English Reading Comprehension

5.2.1. Comparisons between the Experimental and Comparison Groups

One-way ANCOVA was conducted for examining the statistical significance of two group differences in English reading comprehension performance on 10 reading comprehension quizzes. The pretest GEPT reading comprehension scores were the co-variants. Table 5 summarizes the results.

As shown in Table 5, all of the adjusted mean scores for the 10 reading comprehension quizzes of the experimental group were significantly higher than those of the comparison group, regardless of the topics and difficulty levels of the texts. The effect sizes measured using eta squared (η^2) were from .069 to .435, medium to large effects. The findings indicate that RPQ instruction enhanced and promoted the English reading comprehension performance of the experimental group students more than the conventional lecture instruction did for the comparison group students.

Table-5. One-way ANCOVA of English reading comprehension posttest scores between the experimental and comparison groups

	Experimental group			Comparison group			<i>F</i>	<i>p</i>	η^2
	n	M	Adj. M	n	M	Adj. M			
quiz 1	37	41.43	41.36	36	34.03	33.82	53.93***	.000	.435
quiz 2	38	37.63	37.60	39	31.40	31.43	13.77***	.000	.155
quiz 3	38	35.73	35.72	39	32.51	32.44	5.52*	.021	.069
quiz 4	36	43.47	43.40	38	39.87	39.94	10.28**	.002	.125
quiz 5	37	41.32	41.25	38	34.36	35.43	30.73***	.000	.296
quiz 6	38	40.71	40.67	39	36.68	36.71	7.34**	.008	.089
quiz 7	38	40.47	40.44	39	35.58	35.61	10.54**	.002	.123
quiz 8	38	40.59	40.56	39	36.13	36.16	9.30**	.003	.110
quiz 9	38	40.53	40.50	39	35.85	35.88	10.03**	.002	.118
quiz 10	38	40.56	40.53	39	36.00	36.02	9.70**	.003	.114

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

5.2.2. Comparison between Proficiency Subgroups

Tables 6, 7, and 8 present the results for the one-way ANCOVA in which the 10 reading comprehension quizzes between the three paired proficiency subgroups were compared. We found that all of the adjusted mean scores for the three experimental subgroups were higher than those of the comparison subgroups. Table 6 shows that the high-proficiency experimental group significantly outperformed the high-proficiency comparison group in 9 out of 10 adjusted mean scores for the reading comprehension quizzes. Table 7 indicates that the medium-proficiency experimental group significantly outperformed the comparison medium-proficiency group in 6 out of 10 adjusted mean scores for the reading comprehension quizzes. Table 8 shows that the low-proficiency experimental group significantly outperformed the low-proficiency comparison group in 3 out of 10 adjusted mean scores for the reading comprehension quizzes. All of the effect sizes (η^2) for all significant F values were higher than .138, indicating that all of the effects were large. According to the results, we concluded that RPQ instruction effectively enhanced English reading comprehension performance of the high- and medium-proficiency experimental groups, but was limited for the low-proficiency group.

Table-6. One-way ANCOVA of English reading comprehension posttest scores for the high-proficiency groups between the experimental and comparison groups

	Experimental group			Comparison group			F	p	η^2
	N	M	Adj. M	N	M	Adj. M			
Quiz 1	12	41.91	41.92	11	36.20	36.20	31.256***	.000	.622
Quiz 2	12	37.42	37.40	12	35.42	35.43	0.638	.433	.029
Quiz 3	12	37.00	36.98	12	32.67	32.68	4.952*	.037	.191
Quiz 4	12	45.58	45.62	12	40.75	40.71	5.355*	.031	.203
Quiz 5	12	43.58	43.61	11	38.73	38.70	9.873***	.005	.330
Quiz 6	12	44.58	44.59	12	38.13	38.12	6.052*	.023	.224
Quiz 7	12	44.08	44.08	12	36.81	36.82	5.490*	.029	.207
Quiz 8	12	44.33	44.34	12	37.47	37.47	5.792*	.025	.216
Quiz 9	12	44.20	44.21	12	37.14	37.14	5.644*	.027	.212
Quiz 10	12	44.27	44.27	12	37.30	37.30	5.719*	.026	.214

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

Table-7. One-way ANCOVA of English reading comprehension posttest scores for the medium-proficiency groups between the experimental and comparison groups

	Experimental group			Comparison group			F	p	η^2
	N	M	Adj. M	N	M	Adj. M			
Quiz 1	13	41.46	41.59	12	33.50	33.56	15.264**	.001	.410
Quiz 2	14	38.14	37.70	14	31.36	31.80	3.770	.064	.131
Quiz 3	14	35.57	35.79	14	33.00	32.78	1.493	.233	.056
Quiz 4	14	44.29	43.86	13	41.46	41.92	3.173	.088	.117
Quiz 5	13	41.08	41.11	14	34.07	34.04	14.097**	.001	.370
Quiz 6	14	41.21	41.70	14	36.29	35.81	5.969*	.022	.193
Quiz 7	14	39.68	40.18	14	35.18	34.68	3.882	.060	.134

Continue

Quiz 8	14	40.45	40.94	14	35.73	35.24	5.050*	.034	.168
Quiz 9	14	40.06	40.56	14	35.46	34.96	4.468*	.045	.152
Quiz 10	14	40.25	40.75	14	35.59	35.10	4.763*	.039	.160

*p<.05 **p<.01

Table-8. One-way ANCOVA of English reading comprehension posttest scores for the low-proficiency groups between the experimental and comparison groups

	Experimental group			Comparison group			F	p	η^2
	N	M	Adj. M	N	M	Adj. M			
Quiz 1	12	40.92	40.24	13	32.23	32.85	10.119**	.004	.315
Quiz 2	12	37.25	36.72	13	27.46	27.95	6.297*	.020	.223
Quiz 3	12	34.67	34.65	13	30.69	30.71	1.521	.230	.065
Quiz 4	10	39.80	39.94	13	37.00	36.90	1.535	.230	.071
Quiz 5	12	39.33	39.50	13	33.54	33.38	7.784*	.011	.261
Quiz 6	12	36.25	36.40	13	35.26	35.14	0.185	.671	.008
Quiz 7	12	37.79	37.95	13	34.40	34.26	2.777	.110	.112
Quiz 8	12	37.02	37.17	13	34.83	34.70	0.974	.334	.042
Quiz 9	12	37.40	37.56	13	34.62	34.48	1.732	.202	.073
Quiz 10	12	37.21	37.37	13	34.73	34.59	1.318	.263	.057

*p<.05 **p<.01

5.3. Perceptions of the Course of Both Student Groups

To elicit the perceptions of both student groups toward the course, the ELPQ was conducted for investigating their viewpoints regarding teacher instruction, reading materials, learning effects, and study time.

5.3.1. Student Perceptions of Teacher's Instruction

As shown in Table 9, both student groups had high appraisals of teacher instruction. The mean scores were 4.20 and 4.28 (out of 5 points), and no statistical difference between both groups was observed ($t_{(60)} = 0.456$, $p = .65 > .05$). The result indicated that the perceived efforts and work attitude of the teacher were similar in both groups.

Table-9. Perceptions toward teacher instruction of the two student groups

Satisfaction of instruction	Experimental group			Comparison group			t	df	p
	n	M	SD	N	M	SD			
	23	4.20	0.82	39	4.28	0.56	0.456	60	.65

5.3.2. Student Perceptions of Reading Materials

As shown in Table 10, both student groups reported that the articles were meaningful to them ($M = 3.79$; $M = 3.75$) and could broaden their horizons ($M = 3.89$; $M = 3.85$). No significant differences were observed between the two groups. However, the experimental student group reported that the articles were difficult for them to read ($t_{(76)} = 2.897$, $p = .005 > .05$), but interested them much more than they did the comparison student group ($t_{(76)} = 5.767$, $p = .000 > .05$).

Table-10. Perceptions toward reading materials of the two student groups

items	Experimental group			Comparison group			<i>t</i>	df	<i>p</i>
	n	M	SD	N	M	SD			
articles are meaningful	38	3.79	.704	40	3.75	.588	0.269	76	.788
articles are difficult	38	3.42	.683	40	2.95	.749	2.897**	76	.005
articles are interesting	38	4.32	.574	40	3.55	.597	5.767***	76	.000
articles broaden horizons	38	3.89	.689	40	3.85	.700	0.284	76	.777

p*<.01 *p*<.001

5.3.3. Student Perceptions of Learning Effects

Based on Table 11, both student groups reported that the course enhanced their English reading comprehension, increased their vocabulary quantity, and improved their English reading ability. We found no significant differences between their perceptions toward the acquisition of English reading comprehension. Nevertheless, the experimental student group liked the course significantly more than the comparison group did ($t_{(76)} = 4.903$, $p = .000 > .05$).

Table-11. Perceptions of English reading comprehension of the two student groups

items	Experimental group			Comparison group			<i>t</i>	df	<i>p</i>
	n	M	SD	N	M	SD			
enhance my English reading comprehension	38	3.82	.766	40	3.80	.758	0.091	76	.927
increase my vocabulary quantity	38	3.61	.887	40	3.75	.707	-0.799	76	.427
improve my English reading ability	38	3.68	.662	40	3.53	.751	0.992	76	.325
I like the course	38	4.32	.574	40	3.65	.622	4.903***	76	.000

****p*<.001

5.3.4. Time Spent on English Reading Study

Table 12 shows that 29% of the experimental group spent more than 4 hr/wk studying for this course, but only 3% of the comparison group did. In addition, 53% of the experimental group spent more than 2 hr/wk studying for this course, but only 36% of the comparison group did. The time spent studying by the experimental group is statistically more than that by the comparison group ($\chi^2 = 11.975$, $df = 4$, $p = .018 < .05$).

Table-12. Average time spent preparing and studying for the course per week

Time	Experimental group (N=38)					Comparison group (N=39)				
	Over 6 hrs	4-6 hrs	2-4 hrs	1-2 hrs	Under 1 hr	Over 6 hrs	4-6 hrs	2-4 hrs	1-2 hrs	Under 1 hr
frequency	3	8	9	13	5	0	1	13	22	3
(%)	8%	21%	24%	34%	13%	0%	3%	33%	56%	8%
Accumulation of %	8%	29%	53%	87%	100%	0%	3%	36%	92%	100%

 $\chi^2=11.975^*$ df=4 *p*=.018

To sum up, compared with the comparison group, the experimental group had a more positive attitude toward this course. The reading materials seemed more difficult for the experimental group students, but interested them more. According to interviews with the experimental group students, some of the students reported that the reason for them willingly and actively spending more time studying was partially due to their fondness of the articles on interesting topics. As expected, to ask and answer questions while reading, the experimental group students had to spend more time elaborating the text, which enhanced their reading comprehension and performance on English reading comprehension quizzes. Overall, the experimental student group enjoyed this course more than the comparison group did. The result confirmed that of Summerlee and Murray (2010) in that increased engagement would lead to high academic performance and satisfaction with the educational experience.

5.4. Experimental Group Student Perceptions of Reciprocal Peer-Questioning

After completing the RPQ instruction experiment, the 20 students were interviewed by two trained teachers' assistants. According to an analysis of the interview data, 19 out of the 20 students reported that RPQ was helpful to their English reading comprehension. Seventeen out of the 20 students stated that generating questions prior to the class made them actively preview the English reading text each week and caused them to conduct an in-depth study. In addition, 15 out of the 20 students reported that generating questions primarily helped them determine the key points of each article and helped them focus on specific points. By synthesizing the key points, they could identify the main idea of an article and increase their comprehension of the entire article.

Thirteen out of the 20 students reported that the reasons for their fondness of RPQ were that during peer-questioning and group discussion, they could hear different viewpoints from others, clarify confusion, determine the correct answers to questions together, and receive help from peers when encountering trouble. This can explain their improved performance on the reading comprehension quizzes.

In addition, 12 out of the 20 students reported that when the contents of the articles were unfamiliar and difficult to understand, the RPQ strategy helped. Nine out of the 20 students reported that some of the questions they posed were similar to the teacher's questions in the quizzes, which helped them receive high scores on the quizzes. Overall, most students agreed that the RPQ strategy could improve their reading comprehension competence and was worth recommending to new incoming freshmen.

Eight out of the 20 students mentioned that the disadvantages of the RPQ strategy were that it was time-consuming and inefficient for their study. Six out of the 20 students indicated the intolerable situation in processing RPQ was that their partners did not study the article or prepare helpful questions prior to class. They reported that it wasted their valuable time in class and eliminated their advantages.

In summary, most of the experimental group students liked RPQ, although it required more preparation time before classes. They approved the RPQ strategy as helpful in improving their

English reading comprehension, particularly when reading difficult articles or articles on unfamiliar topics.

6. DISCUSSION AND CONCLUSION

This study investigated the effects of RPQ instruction on the English reading comprehension of EFL college students. We found that EFL college students trained in RPQ instruction performed significantly higher on English reading comprehension measures than the students who received lecture instruction only. The finding indicates that the English reading comprehension of EFL college students can be effectively promoted through RPQ instruction, which supports the findings of previous studies conducted on EFL reading comprehension and question generation (Shang and Chang-Chien, 2010; Hsieh, 2013).

Regarding the different proficiency levels of groups, the high- and medium-proficiency students benefited more in English reading comprehension from RPQ instruction than did those who received conventional lecture instruction, but only limited effects were observed for low-proficiency students. This finding differs from previous research findings that indicated that question-generation training was particularly effective for low-verbal or learning disabled students, but redundant for good English learners (Andre and Anderson, 1979; Wong and Jones, 1982; Davey and McBride, 1986; Shang and Chang-Chien, 2010).

Compared with conventional lecture instruction, RPQ instruction generated more positive attitudes toward learning English reading among the experimental group students, which is consistent with the findings of most previous studies involving questioning strategies in the EFL classroom (Shang and Chang-Chien, 2010; Hsieh, 2013).

This study revealed that RPQ instruction was more effective than conventional lecture instruction in enhancing the English reading comprehension of EFL college students. The researcher inferred from the process of RPQ to explain this result. First, RPQ instruction required students to conduct self-questioning prior to classes, which motivated them to spend more time actively previewing the text. During the self-questioning phase, to generate their own questions and receive answers, students had to extend additional efforts to read the article, identify key ideas and relationships among the ideas, and integrate them into their prior knowledge. Such cognitive processes facilitated their understanding of the text effectively. The result is consistent with the findings of previous studies (King, 1991; 1994; Taylor *et al.*, 2002; Gelmini-Hornsby *et al.*, 2011).

During the peer-questioning phase, peer collaboration of RPQ provided a platform for students to question each others' ideas, propose alternatives, and request explanations (Gelmini-Hornsby *et al.*, 2011). On the platform, students might confront the conflicting viewpoints and different understandings of the text by others. To resolve these cognitive conflicts, they had to understand each others' perspectives, clarify ideas, make explanations to defend their own ideas and persuade their peers, modify their own thinking to achieve an agreement, and construct a shared understanding of the text (King, 1991). In this phase, cooperating with peers to engage in productive discussion

enabled students to work on reading materials more deeply and broadly with the help of other group members. In addition, they obtained encouragement, support, and achievement, which enhanced their learning motivation (Pan and Wu, 2013). Furthermore, some social pressures from peers also forced them to propose suitable questions and provide elaborate answers. According to theories of the social construction of knowledge (Bearison, 1982), such conceptual restructuring procedures promote the development of accurate and effective representations of the text, leading to enhanced comprehension and improving reading performance.

To summarize, RPQ improving the English reading comprehension of EFL college students is primarily attributable to self-questioning, which ensures that students actively engaging with the texts, and peer-questioning, which provides them with opportunities to cooperate with others to elaborate on the texts and achieve enhanced comprehension.

Regarding the English reading comprehension performance among students of different proficiencies, RPQ seemed to be more effective on the high-proficiency students, but offered only limited effects on the low-proficiency students.

The students in the experimental group were divided into small, heterogeneous groups. Each group comprised high-, medium-, and low-proficiency students. Based on researcher observation in the RPQ classroom, the high-proficiency students were often the predominant people in the groups and led the discussions as well as provided more explanations that afforded them additional chances to reorganize their ideas and reconstruct their knowledge network. According to previous research, students providing elaborate explanations of concepts were one of the principal reasons for them understanding material comprehensively, learning the most, and excelling on tests (Webb, 1989; Pressley *et al.*, 1992; King, 1999). This may explain why the high-proficiency students improved their English reading comprehension more in RPQ instruction, compared with the low-proficiency students.

However, some of the low-proficiency students complained that some articles were exceptionally difficult to read and understand, even when working with peers. The researcher found that the three articles, in which the low-proficiency students trained in RPQ outperformed the comparison group students, were the easier articles (difficulty levels below the 9th grade). Therefore, we inferred that when the low-proficiency students did not comprehensively understand the texts, they might have had difficulty generating appropriate questions and responding correctly to questions. Furthermore, during peer-questioning discussions, they might lack confidence to explain and defend their opinions. Therefore, RPQ processing improved their English reading performance to a limited degree. This finding indicates that the appropriate difficulty levels of texts are the key for effective RPQ instruction; therefore, we suggest the future researchers should carefully select reading texts and might include the effects of material difficulty levels in their studies on RPQ instruction.

This study confirms that RPQ instruction is an effective method for promoting EFL college students' English reading comprehension and learning interests. Therefore, we highly recommend that EFL instructors apply RPQ in their college English reading courses. In future research, a

desirable extension to this study will be to explore how the difficulty of reading materials and the quality of questions that students generate may affect the benefits of RPQ instruction.

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Appendix A: English Learning Perception Questionnaire

Directions: Please indicate the extent to which you agree or disagree with each statement by encircling a number.

(5 = strongly agree 4 = agree 3 = somewhat agree 2 = disagree 1 = strongly disagree)

Learning material

1. Most of the articles are meaningful to me. 5 4 3 2 1
2. Most of the articles are interesting to me. 5 4 3 2 1
3. Most of the articles are difficult for me to read. 5 4 3 2 1
4. Studying these articles broadens my horizons. 5 4 3 2 1

Reading comprehension

5. This course enhances my English reading comprehension. 5 4 3 2 1
6. This course increases my vocabulary quantity. 5 4 3 2 1
7. Overall, the course improves my English reading ability. 5 4 3 2 1
8. I like the course. 5 4 3 2 1

Teacher's instruction

9. The teacher's attitude to instruction is serious and responsible.5 4 3 2 1
10. The teacher prepares the teaching content well.5 4 3 2 1
11. The teacher's lectures are clear and understandable.5 4 3 2 1
12. The teacher makes full use of class time for teaching.5 4 3 2 1
13. The teacher adjusts teaching tempos based on student learning progress. .5 4 3 2 1
14. The assessments of this course are reasonable and fair.5 4 3 2 1
15. Overall, I feel satisfied with the teacher's instruction.5 4 3 2 1

Time Spent

16. The average time I spent on preparing and studying the course per week was approximately:
(a) Less than 1 hr (b) 1 - 2 hr (c) 2 - 4 hr (d) 4 - 6 hr (e) More than 6 hr

Appendix B: Interview Outline

1. Is RPQ helpful to your English reading comprehension?
2. If not, why?
3. If yes, why?
4. How does RPQ help your English reading comprehension?
5. Do you like to pose the questions and engage in peer discussion? Why?
6. When does RPQ help you most?
7. What are your opinions or suggestions toward RPQ instruction?

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