

Post-Reading Question-Generation Activities and Cooperative Learning in EFL Reading

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The study aims to investigate the effect of post-reading question-generation activities on Korean middle school students' English reading abilities with respect to cooperative learning. Two groups of students read the same reading materials; however, one group as an experimental group generated questions of three types, literal, inferential, and evaluative questions, while the other group as a control group answered comprehension questions. Each group was further divided into two sub-groups by cooperative and individual learning. A statistical analysis of the recall test scores reveals a positive effect of post-reading question-generation activities and cooperative learning on English reading abilities. The reading test scores by the three question types further illustrated variations across the question types: the experimental group outperformed the control group in the inferential and evaluative questions and individual learning was detected to be more effective than cooperative learning in the evaluative questions. Interactional effects were observed between post-reading activities and cooperative learning in the literal and evaluative questions. The findings suggest question-generation activities as a beneficial post-reading task, though their effectiveness can vary by question types and learning context.

Key words: post-reading activity, question-generation, cooperative learning, EFL reading, L2 reading

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1. INTRODUCTION

Within the three-phase procedure of reading tasks, the post-reading stage serves as a stage for language learners to deeply internalize what they read and heighten their reading comprehension abilities. Learner-generated questioning as a post-reading activity fulfills such a purpose by requiring the learners to play an active, initiating role in the reading process (Collins, Brown, & Newman, 1990; King, 1994; Palincsar & Brown, 1984; Singer, 1978). When learners generate questions while or after reading, they can enhance not only factual understanding but also inferential understanding and critical thinking, which leads to the long retention of the text by interacting with the text (Singer, 1978); they can also stop to assess if the information being read is significant and monitor the state of their own reading comprehension (Wong, 1985). In formulating questions, they can activate their schema, thereby connecting the new information from the text with the pre-existing knowledge (Carrell & Eisterhold, 1983). As in L1 research, the general consensus derived from the existing studies in L2 context has indicated the alleged beneficial effects of question-generation in terms of improving reading comprehension abilities and building positive attitude towards reading (Baleghizadeh, 2013; Chun, 2006; Nguyen, Janssen, Rijlaarsdam, & Admiraal, 2016; Pan, 2014; Shang & Chang-Chien, 2010). Question-generation has nonetheless captured comparatively minimal attention of L2 reading researchers; its effectiveness has seldom been examined (DuBravac & Dalle, 2002; Khansir & Dashti, 2014; Miciano, 2002), as it has not often been implemented in L2 reading classes (Kim, 2004). Since question-generation activities have the potential to enhance L2 reading comprehension abilities and engage Korean EFL learners in L2 reading (Chun, 2006; Lee & Kim, 2015), they deserve further, in-depth investigation in the context of L2 reading.

Despite the alleged effectiveness of question-generation activities in L2 reading context, previous L2 research findings have demonstrated that question-generation was perceived to be comparatively more difficult than other reading tasks (Chun, 2006). A possibility cannot be eliminated that such activities may be even more effective when utilized in a cooperative-learning context where unskillful L2 readers including EFL middle school learners interact and benefit from each other as resources for questioning and responding about the reading material (Brown & Palincsar, 1989). Such pedagogical benefits of cooperative learning have been widely recognized in prior L2 learning contexts. L2 reading research on cooperative learning has revealed that cooperative-learning groups generally outperform independent-learning groups (Kagan, 1995; Kessler, 1992; McGroarty, 1989, 1993). Despite the seemingly obvious outcome, only a limited number of studies have examined the effect of question-generation and cooperative learning in L2 context (Pan, 2014). The results of the studies nonetheless shed light on the beneficial effect of

cooperative learning on enhancing the effects of question-generation and that students may be able to benefit from peer interaction. Effective cooperative learning encompasses the elements of heterogeneous grouping, positive interdependence, individual accountability, social and collaborative skills, and group processing. Thus, a possible positive relationship between question-generation activities and cooperative learning can be hypothesized (Brown & Palincsar, 1989). Nevertheless, hardly any attempts have been made to examine such a relationship between learner-generated questioning and cooperative learning in the development of L2 reading abilities such as EFL middle school learners' reading abilities, especially by question types such as factual, inferential and evaluative questions. The main focus of the current study, therefore, remains in exploring whether post-reading question-generation activities have a connection with cooperative learning by question types in affecting L2 middle school learners' reading comprehension. The research questions are as follows:

1. What are the effects of post-reading question-generation activities on Korean EFL middle school students' reading abilities as measured by recall tests and reading comprehension tests by question types with respect to learning context (cooperative learning and individual learning)?
2. What are the participants' perceptions towards post-reading question-generation activities? Is there a difference with respect to learning context?

2. REVIEW OF PREVIOUS STUDIES

2.1. Post-Reading Question-Generation Activities in L2 Reading

The positive effect of questioning has well been documented in L2 reading research. Questioning has been a way for instructors to check the students' understanding of the text and for the students to be aware of their difficulties in reading and apply efficient reading strategies (Nuttall, 1996). Teacher- or text-initiated questions, however, restrict the learning content because students are likely to focus only on the text related to the proposed questions (Lee, 2001; Singer & Donlan, 1982). In recognizing the possible role played by student-initiated questions, reading researchers have attempted to investigate how student-generated questions can affect reading comprehension abilities (Andre & Anderson, 1978-1979; Chun, 2004; Singer, 1978).

Learner-generated questioning while or after reading a text has been recognized as an effective task to help L2 readers not only to enhance their reading abilities and critical thinking skills but also be more actively engaged in their reading processes (Chun, 2004;

Janssen, 2002; Miciano, 2002; Nguyen et al., 2016). In the L2 reading research field, a limited number of studies have focused on the relationship between the role of learner-generated questions and reading. Miciano's (2002) pioneering study has pinpointed educational benefits of learner-generated questions in reading, suggesting that constructing questions involves L2 student readers' decisions on what information is question-worthy, increases their attention and places responsibility for reading on them. However, the results of the study have not illustrated statistically significant effects of question-generation on the improvement of Filipino EFL learners' reading comprehension abilities due to training and time factors as well as the test type.

A more recent study, Nguyen et al. (2016), has examined the effects of question-generation on literary reading engagement of Vietnamese EFL college students. The question-generation experimental group with either group discussion or individual free-writing outperformed the control group with teacher-posed questions. The results of the study have revealed positive effects of the question-generation intervention on inferencing, variety and productivity of response, and self-perceived engagement, showing no difference between the two activity variations of the instruction. In this light, it has been indicated that learner-made questions about literary texts can be successfully combined with different types of exploration, rendering different instructional approaches to question-generation in reading equally effective (Janssen, 2002). While Nguyen et al.'s (2016) study has focused on the narrative type of text, Chun (2004, 2006) has explored the effects of question-generation on Korean EFL college learners' reading abilities in expository as well as narrative texts. The learners who created various wh-questions for main ideas and inferable ideas displayed better performance in memory and comprehension. It has been suggested that the tasks requiring greater processing time or processing capacity are found to produce better memory than less demanding tasks, as noted in Ellis, Thomas, and Rodrigues (1984), Lockhart and Craik (1990), and Hulstijn and Laufer (2001). In recognizing the significant role of explicit and direct instruction for question-generation activities, Lee and Kim (2015) have attempted to examine the effects of such activities on Korean EFL primary students' reading with the use of QAR (Question-Answer-Relationship) strategy. The experimental group who was taught the QAR strategy over five weeks through either teacher-directed individual learning or interactive cooperative learning was compared with a control group. The former outperformed the latter in both recall and comprehension tests. They were also reported to have aptly applied the QAR strategy to generating questions by creating more diverse levels of questions including high-level ones. In addition, a significant contribution made by cooperative learning was identified in relation to the generation of higher-level questions.

Prior L2 reading research has led to arriving at a great appreciation of the possible

relationship between question-generation and L2 reading ability development, though positive effects of formulating questions are not always observed. The main target students of the limited L2 studies on question-generation activities have been college learners. Since generating questions can effectively guide L2 learners to become autonomous readers, which is the ultimate goal of reading instruction, question-generation tasks should be implemented to assist L2 students of diverse school levels including secondary schools. As in Lee and Kim (2015), additionally, their effects should be explored in different learning contexts such as group or individual work to examine whether such cognitively demanding tasks can be facilitated through group interaction or collaboration or through individual active engagement and concentration.

2.2. Effects of Cooperative Learning on L2 Reading

Cooperative language learning has been pronounced as an effective instructional approach in promoting the cognitive and linguistic development of L2 learners (Kagan, 1995; Kessler, 1992; McGroarty, 1989, 1993). Cooperative learning in L2 instruction provides maximum opportunities for meaningful input and output in a highly interactive and supportive environment (Ghaith, 2003). Such recognition of the necessity of cooperative learning has motivated studies on the effects of cooperative learning on L2 reading as well as L2 learning in general. Ghaith (2003) has investigated the effects of the cooperative learning model in two variables: improvement in Lebanese high school EFL learners' reading achievement and academic self-esteem and decrease in the degree of feelings of school alienation. The experimental group studied together according to the dynamics of the cooperative learning model, while the control group studied the same material according to procedures specified in their textbooks. The results have illustrated that cooperative learning has significantly positive effects on enhancing the reading achievement of Lebanese EFL learners. In an attempt to examine the effect of cooperative learning on Pakistan EFL learners' reading abilities in comparison to traditional learning, Khan and Ahmad (2014) have conducted a study on a technique of cooperative learning, STAD (Student Team Achievement Division), which was implemented to the experimental group studying in sixteen teams of four members each, while the control group studied the same material with traditional learning. The learners in the cooperative groups exhibited better performance in both literal level and evaluative level of reading comprehension. The outcome of the study has led to a conclusion that cooperative learning is an effective instructional approach to teaching reading.

In Korean EFL context, Suh (2009) has investigated the effects of cooperative learning on college learners' performance in L2 reading activities. The results of the study have indicated that cooperative learning can act as an aiding tool in lightening the burden on the

learners of having to perform language tasks in L2. In the study of the effect of cooperative learning on Korean EFL elementary school learners' reading abilities by different genders and L2 language proficiency levels, Kim (2009) have observed that cooperative learning is conducive to enhancing L2 reading abilities. While all the participants showed improvement, the low-level learners experienced a significant increase in L2 reading comprehension abilities. Similar findings have also been noted in another study of Korean EFL elementary school learners (Cho, 2005), in which learners of middle- and low-level achieved significant gains in reading abilities after being taught in cooperative learning context.

The findings of the aforementioned studies suggest that cooperative learning promises to be effective in enhancing reading abilities of L2 learners across school levels or proficiency levels. It engages learners in meaningful interactions in a stress-reduced environment that is conducive to improving reading achievement. Nonetheless, previous research in L2 reading indicates that hardly any attempts have been made to examine the possible relationship between learner-generated questioning and cooperative learning. A dearth of such studies has thus motivated the present study. The objective of this study is to systematically investigate the role of learner-generated questioning for L2 reading ability development in cooperative learning context.

3. RESEARCH METHOD

3.1. Participants

Participants for the study were 107 first-year middle school students of four English classes studying at a girls' middle school in Seoul. Two of the classes (53 students) were the question-generation group that underwent the post-reading question-generation activities; the other two (54 students) were the comprehension-question group that were provided with the comprehension-check questions. Within each group, the participants were randomly assigned to either the individual-learning group or cooperative-learning group (the question-generation cooperative-learning group, 27 students; the question-generation individual-learning group, 26 students; the comprehension-question cooperative-learning group, 27 students; the comprehension-question individual-learning group, 27students).

3.2. Materials

3.2.1. Pre- and Post-tests of reading

Two recall tests were devised as a pre-test and post-test of reading to measure the participants' English reading comprehension abilities prior to and after the experiment. They were constructed with four narrative texts extracted and adopted from a book of stories (Kasser & Silverman, 1994), each two of the texts for the pre- or post-test. All four passages in common hold insightful, educational lessons appropriate to the middle school level, such as loving relationship of a family or power of optimism. The texts were given careful consideration not to overlap with the reading material to be used as a treatment tool. The average readability of the reading passages measured by Flesch-Kincaid Reading Ease Formula was 3.75 for the pre-test passages (average 214 words) and 3.70 for the post-test ones (average 215.5 words). The participants were allowed to write their recall in Korean. Besides the recall test implemented for both pre- and post-tests for the score comparison, an open-ended reading comprehension test of three literal, inferential, and evaluative questions, total nine questions (total 9 points), as shown in the exemplary questions below, was designed as a post-reading test to evaluate the participants' comprehension of the reading material being read throughout the experimental procedure.

Literal question: What does the Greggs change their last name to?

Inferential question: What negotiations do the Greggs and the wild ducks come to make?

Evaluative question: Do you think what the girl did to the Greggs was a right thing to do?

It aimed to examine the participants' comprehension abilities of different levels such as literal and inferential levels of understanding since the three types of questions were used for both the question-generation and comprehension-question group.

3.2.2. Reading materials

A story book named *The Magic Finger* written by Roald Dahl was selected as the reading material after assessing its difficulty level by the Lexile Text Measure. Based on U.S. Common Core State Standards, the index of '500L and Below' was estimated to be the appropriate Lexile Text Measure for the participants. *The Magic Finger* is 450L. It is a 64-page book in 3724 words.

3.2.3. Post-reading worksheet and instructional materials

Two disparate types of post-reading worksheets were designed for the question-generation group and the comprehension-question group, respectively. The worksheet for the question-generation group contained directions for constructing two open-ended

questions for each of three types, literal, inferential, and evaluative questions, and answering the questions constructed. The worksheet for the comprehension-question group included open-ended reading comprehension-check questions pre-made by the researchers. They consisted of two open-ended questions for each of the three types, literal, inferential, and evaluative questions. The worksheets for both groups included the same number of questions for the three types of questions and the participants were allowed to write their answers in Korean. The question-generation group was also permitted to write their own questions in Korean to limit the possibility of language interference in generating them.

Besides the post-reading worksheet, instructional materials were constructed for the question-generation group to train them to understand three types of questions and generate them. The materials contained the main features of the three types with examples, two exercises for identifying types of questions and one sample question-generation activity worksheet.

3.2.4. Post-questionnaire

A post-experiment questionnaire was devised for the question-generation group to analyze their views towards the post-reading question-generation activities. It included 13 closed items on a 5-point Likert scale and three open-ended items. The closed items of the questionnaire appeared to have high internal consistency reliability ($\alpha = .82$). As shown in Figure 1, nine closed questions addressed utility and usefulness of, and satisfaction for, the question-generation activity; four questions were group-specific questions by learning context about satisfaction for the assigned learning-group and effects of the assigned learning-group on L2 reading comprehension abilities. The open-ended questions intended to survey the perceived benefits and difficulties of the task, and suggestions to be made of the developed post-reading question-generation activities.

FIGURE 1

Post-Questionnaire Sample Questions for the Question-generation Cooperative-learning Group

Questions	1	2	3	4	5
1. Question-generation activities helped understanding important details of the text.					
4. Question-generation activities helped improve my English reading skills.					
7. I would like to do more question-generation activities in my English reading class.					
12. Doing question-generation activities in groups helped me understand the topic of the text.					
14. What did you like about doing the post-reading question-generation activities in groups?					
16. Are there any changes to be made to the 'group' post-reading question-generation activities?					

3.3. Treatment

The participants of the study had six 90-minute sessions of reading instructions for four weeks. One extra session was employed only for the question-generation group as an orientation. This instructional treatment aimed at providing information on question-generation activities with the main features of three question types and training the question-generation group to reduce potential interfering effects due to the uneasiness with question-generation, which was observed in Chun (2006). The orientation session was designed in a way that corresponded to the four principles of question-generation instruction (Raphael, 1986); the session was carried out in step-by-step mini lessons with scaffolded worksheets building from shorter to longer texts, guiding students from group to independent activities, and transitioning from easier tasks such as simply circling the question types for each question to more difficult tasks of generating questions and responses.

Each of the six main-experimental sessions were composed of three phases: pre-reading, while-reading, and post-reading. The same content of the pre-reading phase was employed for both the question-generation group and the comprehension-question group to introduce words and expressions of the reading material that might be of difficulty to the participants. During the while-reading phase, the question-generation group and the comprehension-question group read the same reading material. However, the post-reading phase was conducted differently as the question-generation group completed the post-reading question-generation worksheet and the comprehension-question group completed the post-reading comprehension-check questions worksheet. From the while-reading phase to the post-reading phase, the question-generation group and the comprehension-question group participants read the reading texts and performed the post-reading activities either individually or cooperatively according to their assorted learning-groups.

3.4. Data Collection Procedures and Analysis

After a pre-test and two post-tests, a post-questionnaire, post-reading worksheet and instructional materials, and reading materials were constructed or selected, the pre-test was administered to the participants, whose homogeneity was statistically analyzed by one-way ANOVA. No statistically significant difference was found from the pre-test scores of all the four groups (question-generation cooperative-learning; question-generation individual-learning; comprehension-question cooperative-learning; and comprehension-question individual-learning) ($F = 1.940$; $p = .128$). In completing the pre-test, the participants were asked to read the reading passages for the assigned time and then write what they comprehended without referring to the texts. After the recall pre-test, the question-

generation group and the comprehension-question group had six sessions of reading instruction with one orientation session for the former; one of the researchers, a middle school teacher, was the teacher for all the groups. Then, the groups took the two post-tests: a recall test and an open-ended reading comprehension test by question types. The sequence and method of the recall test administration were the same as the pre-test. A post-questionnaire was administered to the question-generation group.

The pre- and post-tests were scored by two middle school teachers including one of the researchers. For scoring the recall tests, the idea units for the pre- and post-test reading passages were analyzed based on the method employed in the previous studies (Chun, 2006; Lee, 2013; Son, 2016); their number per passage was counted. The topic-related words and phrases were given the score of one, while minor factors such as recalling exact numerical details or omitting simple adjectives or adverbs were overlooked as they did not seem to impede conveying important meanings. The two raters identified the idea units together and solved a disagreement through discussion; appropriate adjustment was made to reach consensus. The post-test of the reading comprehension was scored with a scoring scale adapted from the study by Carrell, Pharis, and Liberto (1989) and Chun (2006). The answers were scored within a 3-point scale based on how well the answers demonstrated comprehension of the reading passage. For scoring the recall tests, the two raters scored the open-ended reading comprehension test together and finalized their scores through discussion.

As for the post-questionnaire, the responses to the closed items were coded by scale, one to five. The descriptive statistics was conducted with the quantified responses. The responses to the open-ended questions were categorized according to the content and their frequency by category was counted.

The recall test scores were statistically analyzed by conducting paired sample t-tests to compare the pre- and post-test scores and a two-way ANOVA with the pre- and post-test score differences to explore the possible interaction effect of the two independent variables (post-reading activity and learning context). MANOVA was also carried out to investigate the effect of the two independent variables on the scores of the reading comprehension test by question types. It was also employed in analyzing the responses for the post-questionnaire with respect to learning context (cooperative and individual learning).

4. RESULTS AND DISCUSSION

4.1. Analysis of Recall Tests

The mean differences between the pre- and post-test scores of the recall test were

analyzed to examine the effect of the post-reading activities and learning context, as shown in Table 1. The two-way ANOVA results reveal statistically significant mean differences between the question-generation group and the comprehension-question group ($F = 25.433$, $p = .000$) and between the cooperative-learning and individual-learning group ($F = 4.660$, $p = .033$), but no interactional effects ($F = .015$, $p = .903$). The t -test results also illustrate that the question-generation group ($MD = 5.81$; $t = 3.46$) made a significant progress in their post-test of recall and outperformed the comprehension-question group ($MD = -4.98$; $t = -3.62$), which illustrates statistically lower post-test scores (see Table 1). This coincides with the findings of Chun (2004) in which the post-reading question-generation activities were conclusively effective for EFL Korean learners to recall the text content better. King (1992) also reasoned that when learners think about and elaborate on the reading material to generate questions, they construct extensive cognitive networks connecting the new ideas together and linking them to what they already know; this in turn facilitates understanding and provides cues for easier recall. The cooperative-learning group ($MD = 2.72$; $t = 1.79$) outperformed the individual-learning group ($MD = -2.03$; $t = -1.12$). Other studies in an EFL setting have produced the positive effects of learning in cooperative groups on L2 reading (Ghaith, 2003; Khan & Ahmad, 2014; Son, 2016). It is assumed that L2 learners can provide guided support to their peers during collaborative second language interactions and that collective scaffolding occurs when learners work together on language learning tasks (Donato, 1994). This further implies that the cooperative-learning participants develop the ability to recall the content of the reading to a better extent through the practice of sharing answers, exchanging meanings, and explaining to each other.

TABLE 1
***t*-Test Results of the Pre- and Post-test Scores of Recall**

	Group	Pre-Test		Post-Test		<i>MD</i>	<i>t</i>	<i>p</i>
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Question-generation	Cooperative learning	57.12	15.61	65.35	15.55	8.23	4.01	.000
	Individual learning	48.03	19.64	51.32	19.53	3.29	1.25	.221
	Total	52.66	18.12	58.47	18.83	5.81	3.46	.001
Comprehension-question	Cooperative learning	52.80	13.81	50.00	14.78	-2.80	-1.65	.110
	Individual learning	57.74	16.93	50.58	17.65	-7.16	-3.38	.002
	Total	55.27	15.50	50.29	16.13	-4.98	-3.62	.001
Total	Cooperative learning	54.96	14.76	57.67	16.91	2.72	1.79	.080
	Individual learning	52.98	18.78	50.94	18.42	-2.03	-1.12	.268

Although no interaction effect was found between the post-reading activity and learning context, the question-generation cooperative-learning group had a significant mean difference with a high increase of scores in the post-test ($MD = 8.23$, $t = 4.01$), while the comprehension-question individual-learning group displayed statistically noticeable lower

post-test scores ($MD = -7.16, t = -3.38$). The superiority of the former is in line with the findings from Korean EFL primary school students in Lee and Kim (2015). It appears that cooperative learning enables the middle school learners to emulate the high-level questions created by their peers and there by reread the text more carefully to be able to provide answers to those high-level questions. Studies of L2 learners that examined the effects of question-generation interventions for EFL students have also indicated that question-generation have beneficial effects, especially when the learners could benefit from peer interaction (Baleghizadeh, 2013; Pan, 2014).

4.2. Analysis of Reading Comprehension Test by Question types

The post-test scores of reading comprehension by question types were analyzed by MANOVA (see Tables 2 and 3). The MANOVA results reveal statistically significant effects of post-reading activity (Wilks' Lambda value = .630, $p = .000$) and learning context (Wilks' Lambda value = .889, $p = .009$). Significant differences were observed between the question-generation group and the comprehension-question group in inferential ($F = 12.555, p = .001$) and evaluative questions ($F = 45.561, p = .000$), while those were noted between the cooperative-learning group and individual-learning group in evaluative questions ($F = 11.135, p = .001$).

TABLE 2
Descriptive Statistics of the Post-test Scores of Reading Comprehension by Question Types

Group	Literal Questions		Inferential Questions		Evaluative Questions		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Question-generation	Cooperative learning	3.59	.89	6.07	2.07	6.93	1.59
	Individual learning	3.27	1.08	6.00	1.90	7.08	1.87
	Total	3.43	.99	6.04	1.97	7.00	1.72
Comprehension-question	Cooperative learning	3.04	.98	4.33	1.90	3.59	1.85
	Individual learning	3.63	1.18	5.00	2.25	5.70	2.30
	Total	3.33	1.12	4.67	2.09	4.65	2.32
Total	Cooperative learning	3.31	.97	5.20	2.16	5.26	2.40
	Individual learning	3.45	1.14	5.49	2.13	6.38	2.19

The question-generation group outperformed the comprehension-question group in all three types of questions, as observed in L2 studies (Lee & Kim, 2015). They performed statistically better in higher-level questions, which suggests question generation leads L2 learners to be engaged in processing information more deeply and develop inferential and evaluative thinking skills (Andre & Anderson, 1978-1979; Frase & Schwartz, 1975). In other words, it extends such high-level thinking as L2 learners process the ideas more thoroughly and construct extensive cognitive networks connecting the new ideas together

and linking them to what they already know (King, 1992; Mayer, 1984).

TABLE 3
MANOVA Results of the Post-test Scores of Reading Comprehension by Question Types

Source	Dependent Variable	Type III Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>p</i>
Post-reading activity	Literal questions	.200	1	.200	.194	.661
	Inferential questions	48.709	1	48.709	12.555	.001
	Evaluative questions	143.801	1	143.801	45.561	.000
Learning context	Literal questions	.474	1	.474	.459	.500
	Inferential questions	2.737	1	2.737	.705	.403
	Evaluative questions	35.146	1	35.146	11.135	.001
Post-reading Activity *	Literal questions	5.657	1	5.657	5.475	.021
	Inferential questions	4.152	1	4.152	1.070	.303
Learning context	Evaluative questions	26.789	1	26.789	8.488	.004

The findings that the individual-learning group performed better than the cooperative-learning group albeit to a marginal degree because of the former in the comprehension-question group are in contrast with previous studies of L2 reading where the learners in cooperative groups showed better performance in higher level of reading comprehension than those in traditional learning situation (Khan & Ahmad, 2014; Lee & Kim, 2015). In the comprehension-question group of the present study, the individual-learning students outperformed the cooperative-learning students, while the score differences were not noticeable between the individual-learning and cooperative-learning students in the question-generation group; the substantially higher scores of the former individual learning group led to a statistically significant result between the two learning context groups. It is thus assumed that this discrepant outcome is due to the possibility of the participants of the present study being more adept at studying alone than in groups, especially in answering comprehension questions after reading, since such activities are typically conducted as individual work in Korean EFL reading classes; an attempt to learn new critical thinking skills such as evaluative thinking in cooperative groups could thus interfere with their learning (King, 1989). It is further plausible that critical reading in groups would not be more beneficial than doing it individually because such reading elicits individual judgment on the contents of the reading material and thus doing such reading individually with a high level of concentration on one's own thinking might bring more positive effects than doing critical reading in group.

Interactional effects of post-reading activity and learning context were found (Wilks' Lambda value = .907, $p = .024$). Such effects were noted in literal and evaluative questions (see Table 3). As for the literal questions, the question-generation cooperative-learning group outperformed the individual-learning students, while the comprehension-question individual-learning group surpassed the cooperative-learning students. This indicates that

generating questions is beneficial in developing factual understanding when such an activity is conducted in groups, whereas answering comprehension questions enhances literal understanding when L2 learners practice answering them by themselves. The participants' scores of the evaluative questions, however, exhibit a rather different outcome. The individual-learning group slightly performed better than the cooperative-learning group in both the question-generation group and comprehension-question group, as discussed above. The question-generation group outperformed the comprehension-question group, regardless of learning context; however, the score differences were larger in cooperative learning. Answering evaluative questions requires readers' personal connections to the text and their own judgment; doing a post-reading activity individually regardless of activity types appears helpful in developing such reading abilities. Nonetheless, formulating and answering questions in group seems to be more beneficial for developing evaluative thinking skills than answering comprehension questions in group.

4.3. Analysis of the Participants' Perception on Post-reading Question-generation

The results of the post-questionnaire responses present that the question-generation group, except for a few individual-learning students, displayed positive attitudes towards the reading class and post-reading question generation activities (see Table 4), as shown in other L2 reading research on question generation (Nguyen et al., 2016). To examine the effect of cooperative learning, MANOVA was conducted. A significant effect of learning context was found (Wilks' Lambda value = .362, $p = .000$). Significantly positive responses were observed from the cooperative-learning participants in the responses for the three questionnaire topics: satisfaction for question-generation activity ($F = 12.687$, $p = .001$); satisfaction for the assigned learning-group ($F = 27.550$, $p = .000$); and effects of the assigned learning-group on L2 reading ($F = 24.742$, $p = .000$).

TABLE 4
Responses of the Post-Questionnaire by Learning Context Groups of
the Question-generation Group

Question Topics	Cooperative Learning		Individual Learning	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Utility of the question-generation activity	3.79	.78	3.74	.66
Satisfaction for the question-generation activity	3.74	.60	2.97	.95
Usefulness of the question-generation activity	3.87	.51	3.69	.65
Satisfaction for the assigned learning-group	3.74	.70	2.63	.81
Effects of the assigned learning-group on L2 reading	3.89	.73	3.00	.57

The cooperative-learning participants' perceived benefits of learning in cooperative

groups correlate with the resultant high scores of their post-tests. Compared to the cooperative-learning students, the individual-learning group displayed less satisfaction with post-reading question-generation activities; the negative view seems to be due to the burden of having to work individually, and not necessarily because of the type of the activity, which is supported by their positive responses for the utility and necessity of question-generation activities like the cooperative-learning group.

The question-generation group responses to the open-ended items of the post-questionnaire were further investigated to probe into their perceptions to post-reading question-generation activities (see Table 5). The majority of the participants mentioned that post-reading question-generation activities were interesting enough to motivate them to be engaged in the task.

TABLE 5
Responses of the Open-ended Questions by Learning Context Groups
of the Question-generation Group

Questions	Responses	Cooperative Learning	Individual Learning
Benefits	I could understand the main idea and details of the text more easily.	14	12
	The activity was interesting enough for me that I tried my best.	20	15
	I think my reading skills improved.	3	6
	I have built interest in reading in English.	6	4
Difficulties	I had difficulty understanding exactly how to make the three types of questions.	8	11
	I had difficulty reading and understanding the text.	3	11
	I didn't have enough time to read and make the questions.	6	3
Suggestions	I think the activity would work better for me if I were in a different learning-group.	5	11
	I would like to read and make questions of the reading of my choice according to my English proficiency level and my interest.	11	12
	It would be better for me to be allowed to take the reading home.	4	3
	I would like to have more practice in making the three different types of questions.	3	5

The cooperative-learning group stated that they could exchange ideas with others and get feedback from them and expressed joy in getting to know others' questions and having an opportunity to expand the capacity of their ideas. On the contrary, the individual-learning group indicated that although having to complete the activity on their own seemed burdensome at first, it gradually acted as an encouraging impetus; it indirectly forced them to concentrate on the reading until they were eventually able to comprehend the text. Such

is consistent with the findings of L1 reading research that learners who use question-generation are expected to feel more in control of their learning (King, 1989).

The most frequently exhibited negative attitude toward post-reading question-generation activities, especially from the individual-learning students, was in the difficulty in understanding precisely how to create the different types of questions; creating inferential and evaluative questions was deemed problematic as the participants were accustomed to the questions that entail exact answers from the text. A similar argument was addressed as having difficulty in not being told right or wrong during the process of question-generation. These remarks highlight one of the benefits of the question-generation activities recognized by the cooperative-learning students, which is sharing their questions and ideas with the assurance that their opinions would be accepted and not criticized as right or wrong. Other than the few alterations to be made, the suggestions provided in the questionnaire nevertheless shed light on the optimistic upcoming practice of post-reading question-generation activities as the participants demonstrated favor to further practice and application of the activities to their L2 reading.

5. CONCLUSION AND IMPLICATIONS

Post-reading question-generation activities are found to have a generally positive effect on L2 learners' reading ability development and affective domains based on the outcomes of the question-generation group participants' increase in reading scores, excelling in all three types of reading questions, and the overall positive responses. The superiority of the question-generation cooperative-learning group in the post-test score further seems to demonstrate a positive relationship between cooperative learning and post-reading question-generation activities. However, despite the predicted beneficial effect of cooperative context on increasing the effect of question-generation (Lee & Kim, 2015), no interaction was found of the two variables. The limitations of the current study, therefore, need to be addressed here. As the experiment was carried out only by approximately 100 female participants, it leaves possibility for both insufficient sample size and biased results. In either scenario, the sample might not have represented the general population of L2 learners. In the same line of logic, the experimental time of four weeks and the time span between each session might have been problematic to sufficiently validate the results of the study. This is even more so when the participants did not yet fully internalize the skill of question-generation and are not accustomed to cooperative-learning. Thus, more empirical studies conducted on participants of a larger sample over a longer period of time would seem necessary in order to clarify whether, and how, the two variables of post-reading question-generation activities and cooperative learning might have direct and indirect

effects on L2 learners' reading development.

The current study provides a valuable pedagogical insight into the implementation of post-reading question-generation activities in L2 reading instruction, especially for EFL middle school learners. When designing a reading instruction with question-generation activities, reading instructors should pay attention to spending enough time on providing explicit, detailed instructions for how to generate good, thought-provoking questions. In addition, L2 reading instructors are advised to expose learners to cooperative learning and allow them to experience the fundamental benefits of cooperative learning in classroom learning, such as doing reading activities that have been implemented as individual tasks. As for the type of reading questions the instructors should employ in question-generation activities, the results of the post-test of reading comprehension test by question types suggest that both lower-level and higher-level thinking questions are to be included to accurately assess the readers' comprehension abilities and activate cogitative abilities. Nonetheless, the finding that generating questions is not found to be more effective for literal understanding than answering comprehension questions indicates that it is not necessary to utilize question generation across all levels of reading; Korean EFL middle school students would not have benefits from generating questions for literal understanding but for inferential understanding and critical reading. The positive effects noted from the literal and inferential questions in cooperative learning and the evaluative questions in individual learning make a suggestion that post-reading generating questions should be implemented in different learning contexts by question types or the nature of reading processes triggered by questions. Lastly, the question-generation group's remarks on adherence to the 'one correct answer' demonstrates their unfamiliarity with critical thinking, which allows for various possible answers. As such, thinking critically about a text may be a new experience for some L2 learners who have been educated in systems where they were not expected or encouraged to criticize or question the ideas of a published authority (Aebersold & Field, 1997). However, helping learners to develop good analysis and evaluation skills is becoming a major concern of secondary and postsecondary educators throughout the world. Post-reading question-generation activities can therefore be implemented as a key solution in which the reading instructor helps L2 learners to ask the right questions, to pay attention to information in the text (and how it is presented), and to express their own opinions about the text in ways that are balanced, objective, and grounded in a thorough understanding of the text (Yu, 2006).

Given the pronounced effects on L2 readers' comprehension abilities and affective domains, post-reading question-generation activities appear, at the very least, to be effective applicants for further research. Although English reading instruction in Korean classrooms is predicted to face difficulties in implementing question-generation activities due to the passive role the majority of the learners have become accustomed to play in

classroom learning, the elements of cooperative learning can contribute in maximizing the effectiveness of post-reading question-generation activities.

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