EFFECTS OF A MIXED-MODE PEER RESPONSE ON STUDENT RESPONSE BEHAVIOR AND WRITING PERFORMANCE

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ABSTRACT

The study proposed a mix-mode peer response, the E-Peer Response (EPR), to overcome the bias of a single mode, and examined how students with different levels of ability react to the EPR. Two classes participated in this study. One was the experimental group (EG) with the EPR; the other was the control group (CG) with a teacher-centered writing approach. Composition posttest scores were applied to evaluate participants' writing performance while the number of feedback was employed to evaluate students' peer response behavior. The results revealed that students in the EG performed better than those in the CG. This was due to the fact that the EPR provided a convenient online writing environment, a complete writing practice, and a sharable mechanism. High-ability students not only benefited more from the EPR than the low-ability students, but also high-ability students significantly outperformed low-ability students in giving suggestions on content features.

INTRODUCTION

Writing, originally, plays the function of information preservation, but nowadays serves more functions, such as communication and meaning making (Kellogg, 1999). Accordingly, it has become a critical competence for students' success at schools and in careers (National Commission on Writing, 2004). Therefore, it is essential to help students develop their writing abilities to express themselves and clearly transfer their intended thoughts into texts. By doing so, the communication between each individual can be successfully achieved.

However, such communication cannot be easily achieved by a teacher-centered writing class. This is due to the fact that students in such a class can only receive general comments from their teachers, who primarily focus on mechanics, such as spelling, punctuation, and grammar, instead of content aspects (Liu & Hansen, 2002). In other words, students cannot receive sufficient feedback to improve their writing (Cho & Schunn, 2007). Therefore, there is a need to discover an approach to provide helpful feedback to enhance students' writing ability (Nelson & Schunn, 2009), but with limited workload for a teacher. To address this issue, researchers proposed several approaches, among which peer response (Elbow, 1973) is considered as a possible solution because it allows peers share drafts and then share efforts to enrich ideas and clarify meanings of texts.

To this end, this article begins by discussing the benefits and drawbacks of peer response, followed by comparing two popular peer response approaches, that is, face-to-face (FTF) mode and computer-mediated communication (CMC) mode. Because these two approaches have different advantages and disadvantages, we propose a mixed-mode peer response, which combines the advantages of the FTF mode and CMC mode. However, the mixed-mode peer response approach, which delivers feedback via multiple information sources, may not, thus, suit all learners. Accordingly, it then goes on to discuss the impacts of individual differences, among which students' learning abilities are particularly essential. Consequently, it is necessary to investigate how students' learning abilities affect their reactions to the proposed mixed-mode peer response. In brief, the aims of this study are twofold: (a) to compare the writing performance of students with the mixed-mode peer response with those with a teacher-centered writing approach; and (b) to compare high- and low-ability students' reactions to such a mixed-mode approach.

BENEFITS AND DRAWBACKS OF PEER RESPONSE

A lot of researchers investigated the effects of peer response. According to such research, the benefits provided by peer response can be classified into four aspects: social, cognitive, affective, and linguistic (Min, 2006; Rollinson, 2005). Regarding the social aspect, Mendonça and Johnson (1994) investigated the effectiveness of negotiations delivered in the process of peer response. They found such negotiations enhanced students' communication and collaboration skills.

Regarding the cognitive aspect, Stoddard and MacArthur (1993) attempted to use peer responses to help learning-disabled students, and they found peer response facilitated students in developing critical and analytical skills for writing. Moreover, Lockhart and Ng (1993) explored the beneficial aspects of peer response on student writing, and they found peer response helped students develop a greater awareness of audience. In addition, Boscolo and Ascorti (2004) attempted to apply peer response to assist children to improve the clarity of their narrative writing. They found peer response fostered students' abilities to detect information gaps or inconsistencies in writing.

Regarding the affective aspect, Leki (1990a) investigated the affective issues of peer written comments on writing and found that peer response helped students reduce apprehension and increase confidence in writing. Furthermore, Tsui and Ng (2000) compared the effects of peer and teacher comments on the revisions of ESL student writing and found students with peer response developed a greater sense of text ownership. Regarding the linguistic aspect, the study of benefits of peer response by Lockhart and Ng (1993) also found peer response helped students gain more new ideas and different points of view while they clarified and elaborated ideas with their classmates. Moreover, Sims (2001) intended to use peer comments to improve children's expressive writing and found peer response enhanced students' writing fluency. Tuzi (2004) also investigated the impacts of electronic peer feedback on the revisions of academic writing. He found electronic peer feedback assisted students in understanding how to structure an essay. Additionally, Cho and Schunn (2007) compared the impact of peer and teacher comments and found peer feedback had more significant effects on the improvement of students' writing quality.

On the other hand, some research also found several drawbacks of peer response. Similarly, the drawbacks can also be divided into four aspects: social, cognitive, affective, and linguistic. Regarding the social aspect, Carson and Nelson (1996) investigated students' perceptions of peer response groups and noted that some students were reluctant to critically respond to peers' writing because they were not used to criticizing people. In addition, Liang (2010) conducted an analysis on the discourse of online peer response in writing classes and found that the majority of interaction among students was not revision-related, which implied students did not communicate and collaborate for the purpose of helping each other improve writing. Regarding the cognitive aspect, Jacobs, Curtis, Braine, and Huang (1998) investigated the employment of peer response and found writers might feel confused about how to choose correct comments for revision from diverse comments. On the other hand, Gedera (2012) reported that audience might also not be sure whether writers really made mistakes in compositions, and they might not give appropriate feedback to writers.

Regarding the affective aspect, Mangelsdorf (1992) studied how students perceived peer response in the composition classroom and found some students might think their peers unable to provide useful advice to writers. Furthermore,

Mendonça and Johnson (1994) studied the negotiations of peer response and found writers might not adopt peers' comments for revision because they did not trust their peers' feedback. Regarding the linguistic aspect, Flynn (1982) studied the effects of peer response on freshmen's laboratory report writing and found peers' comments might be unhelpful and unfocused. Moreover, Leki (1990b) also noted students might pay more attention to surface errors instead of meaningful problems when delivering peer responses in ESL writing classrooms.

As suggested by the abovementioned studies, the effects of peer response in educational context are not as effective as we expected before. Additionally, we found that most of these studies implemented a single-mode peer response, either a FTF mode or a CMC mode. This may explain why their peer response approaches are not so effective, because either the FTF mode or the CMC mode has some advantages as well as some disadvantages.

ADVANTAGES AND DISADVANTAGES OF FTF AND CMC MODES

In the past, peer responses might have been majorly delivered by written feedback via paper and pencils where there was no face-to-face interaction (e.g., Leki, 1990a). Recently, most of the peer response activities have been conducted with oral feedback by direct face-to-face interaction (e.g., Carson & Nelson, 1996), although paper and pencils may be applied to support face-to-face interaction.

There are some advantages in a FTF mode. Firstly, this mode allows peers to directly negotiate and clarify meanings and get timely feedback through face-to-face communication with more visual cues, such as gestures, facial expressions, and tones of voice (Tiene, 2000). Furthermore, the FTF mode is easily implemented, in terms of the cost of implementation and the complexity of environment (Peckham, 1996). However, such a FTF mode can suffer from some disadvantages. One is that this mode usually costs a lot of effort for the preparation of peer response, such as providing each student with a photocopy of their peers' writing (DiPardo & Freedman, 1988). The other disadvantage is face-to-face peer response may make learners feel uncomfortable and then hinder their participation in oral feedback, especially for those who are shy (Beauvois, 1998) or have insufficient communication skills (Liu & Hansen, 2002). This may be because learners feel more psychological pressure while responding in face-to-face situations (Ho & Savignon, 2007).

On the other hand, the CMC mode uses the computer network to facilitate the distribution of writing works and feedback among peers. Several advantages of the CMC mode are suggested in previous studies. Firstly, it can reduce the cost of text distribution and extend the scale of peer response from a single class to multiple classes or even to multiple schools (Peckham, 1996). Secondly, the CMC mode can provide students with a less threatening environment, which can

not only avoid students' embarrassment during peer response sessions (Guardado & Shi, 2007) but also encourage students' participation in peer response activities (Ciftci & Kocoglu, 2012). Additionally, the CMC mode allows learners to have more equal opportunities to participate in responding activities without being dominated by others (Palloff & Pratt, 2007). Moreover, the interaction of peer response in the CMC mode can be stored, printed, and monitored by students and teachers (Yang, 2011). However, the CMC mode also has some disadvantages. One is that peers' feedback may be too vague (Lin, Liu, & Yuan, 2001) or feedback comments are complicated and hard to be explained clearly in computer-mediated communication (Ho & Savignon, 2007). Secondly, the CMC mode, primarily text-based, may cause some misunderstandings because of the lack of visual cues (Liang, 2010).

As mentioned above, either the FTF mode or the CMC mode has the advantages and disadvantages but they can be complementary to each other. Therefore, a mixed-mode peer response approach, combining the advantages of the FTF and CMC modes, may have stronger potential to effectively support peer response activities and enhance students' writing abilities. However, students may also experience more cognitive overload in such a mixed mode because it delivers feedback via multiple information sources, which may distract students' attention and interfere with their learning (Fried, 2008). On the other hand, the teacher-centered writing approach provides feedback via a single channel. In other words, the mixed-mode peer response approach is very different from the teacher-centered writing approach. Therefore, it is necessary to investigate how students react to the mixed-mode peer response approach and the teacher-centered writing approach.

INDIVIDUAL DIFFERENCES IN ABILITIES

Investigating students' reactions to the mixed-mode peer response approach and the teacher-centered writing approach needs to consider students' individual differences. This is due to the fact that a peer response group usually consists of several learners. Among these learners, individual differences do exist, such as culture (Nelson, 1997), prior experience (Min, 2006), or learning abilities (Cheng, Lam, & Chan, 2008). Among such individual differences, the diversity in learning abilities plays an essential role to affect students' perceptions (Cheng et al., 2008), which in turn will influence their learning outcomes. For example, low-ability learners may receive more assistance from more capable peers (Johnson & Johnson, 1989) and enjoy group learning (Ghaith, 2001). On the other hand, high-ability learners may be reluctant to work with low-ability learners in the same group because they may need to spend extra efforts on helping low-ability learners, which may slow their own learning progress (Fuchs, Fuchs, Mathes, & Simmons, 1997). Thus, such ability differences may affect how students react to such a mixed mode so that they may give various responses to

each other's draft. Therefore, there is a need to examine the impacts of students' abilities on their reactions to the proposed mixed mode.

RESEARCH QUESTIONS

To address the problems of existing research, four research questions are examined in this study:

1. How did students in the experimental group perform differently from students in the control group in terms of writing quality and written expression?
2. How did high-ability students in the experimental group and those in the control group perform differently in terms of writing quality and written expression?
3. How did low-ability students in the experimental group and those in the control group perform differently in terms of writing quality and written expression?
4. How did high- and low-ability students in the experimental group perform differently in peer response behavior?

The answers to these research questions can contribute to developing a potential model that can enhance the understandings of how to develop peer response that can accommodate students' individual differences. By doing so, both high- and low-ability students can benefit from peer response.

RESEARCH DESIGN

To find answers for the research questions, an empirical study was conducted in an elementary school. This study was implemented over one academic year with two semesters. The details are described in this section, including the implementation of a mixed-mode peer response, participants, a pretest and a posttest, pedagogical activities, measurement, and data analysis.

The Implementation of Mixed-Mode Peer Response

As mentioned before, both modes have different advantages and disadvantages. Thus, a mixed-mode peer response, called the E-Peer Response (EPR), was implemented by incorporating the FTF and CMC modes so that the problems of each mode can be overcome.

The major problems of the FTF mode lie within two aspects: (a) effort required to prepare hard copies of student writing, and (b) psychological stress on students who are afraid of providing feedback in a face-to-face situation. To solve these two problems, two mechanisms were implemented in the CMC mode. More specifically, an online collaborative access mechanism is applied to address the

former. The online collaborative access mechanism provides students with their own writing workspace where students can not only compose and revise their own drafts but also access their peers' writing workspace to read their works and then share feedback with each other (Figure 1). Accordingly, every student can also read feedback delivered by their peers in the writing workspace. Thus, the preparation of hard copies is not necessary. On the other hand, the latter can be addressed by providing a Web-based responding interface (Figure 2) with which students can give and edit their comments so that the fear of facing their classmates can be alleviated.

Conversely, the CMC mode also has some disadvantages. One is that the meanings of online feedback may be too vague to be understood while the other is that some misunderstandings may exist between writers and responders. Therefore, the FTF mode was applied to help group members deepen their understandings by face-to-face discussion, clarification, and negotiation of meanings. In brief, the EPR was established by making the best use of the advantages of the FTF and CMC modes.

Participants

A total of 54 third-grade students from an elementary school in Taiwan participated in this study. They were recruited from two classes, one of which was the experimental group (EG) and the other served as a control group (CG). The EPR was implemented in the former while a teacher-centered writing approach was applied in the latter. Apart from such a difference, these two groups were
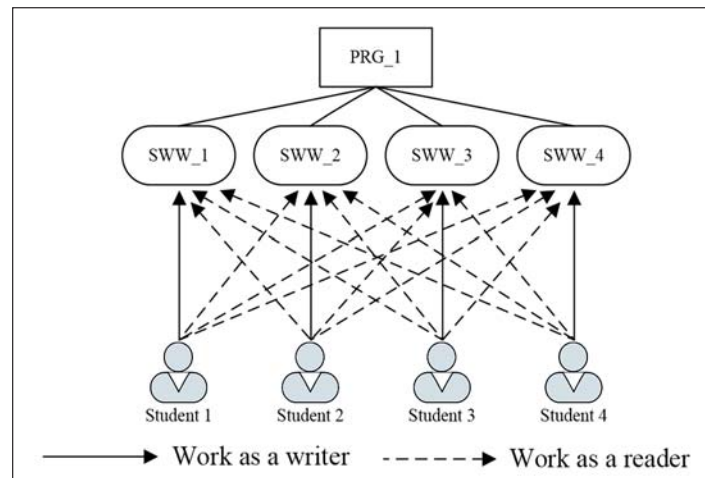

Figure 1. Online collaborative access mechanism of the EPR.

Figure 2. A snapshot of the Web-based responding interface of the EPR.

received same treatments. More specifically, they were taught by a same teacher, who used the same curriculum, gave the same writing assignments and instruction. Furthermore, these two groups were compatible in terms of age, gender, and the number of students (Table 1).

Pre- and Posttests

To evaluate students' writing performance, both groups needed to take a pretest and posttest at the beginning and the end of the experiment, respectively. More specifically, the pretest was applied to examine students' prior writing abilities while the posttest was employed to assess their writing performance after taking the writing course. The pretest and posttest were represented as a composition test where participants were given a theme-based topic and required to complete a narrative composition within an 80-minute period.

Pedagogical Activities

As mentioned before, the participants were assigned to either the EG or the CG. To help the EG know how to act as the providers and recipients of peer response, instructions were given to them based on two guidelines: (a) the interaction between readers and writers proposed by Elbow (1973); and (b) the guidance for peer response proposed by Hansen and Liu (2005). By doing so, the students in the EG could take part in the activity of peer response with proper attitudes and procedures. In addition, they were also introduced how to interact with the EPR to complete writing and responding tasks. For each writing task, all participants were evenly re-allocated into small peer response groups of four or five students. Each participant was equipped with a tablet laptop. After a teacher gave a brief introduction for the writing and responding tasks, students wrote drafts individually in their own writing workspace of the EPR. Then students in each group started to read an assigned groupmate's draft and posted their feedback with the EPR. After students gave their feedback via the EPR, a face-to-face discussion was conducted to clarify and negotiate meanings of written texts within each peer

Table 1. Compatibility in Age, Gender, and Number between the Two Groups

Measure	EG	CG
Age	8-9 years old	8-9 years old
Male	14	12
Female	13	15
Number	27	27

response group. Finally, students began to revise their own drafts with the EPR based on the feedback from their peers.

Regarding the CG, the teacher used a conventional writing pedagogy where students were initially given a writing topic and a brief introduction for each writing task. Then students completed a composition individually with paper and pencils and handed in their works. Subsequently, the teacher would return student compositions with some comments or suggestions for improvement so students were expected to improve their writing abilities according to the comments from the teacher.

Measurement

Writing Performance

The measurement of writing performance included two aspects: writing quality and written expression. Regarding writing quality, an assessment mechanism proposed by Yang, Ko, and Chung (2005) was adopted to assess the qualitative performance of student writing because it was designed for elementary students and then appropriated for our participants. This assessment covers five items: (a) *elegant words*, (b) *clear paragraph*, (c) *coherence*, (d) *title consistence*, and (e) *new and original ideas*. A 5-point rating scale was used for each item. Thus, the total score for a composition was between the lowest score (5 points) and the highest score (25 points). Two raters were recruited to independently evaluate the participants' writing quality so each student's final score was defined based on the mean of scores by the raters, of which the interrater reliability was found to be Kappa = 0.728 ($p < .001$). In other words, a substantial level for the measure of agreement between the raters was reached.

Regarding written expression, the length of composition and the richness of vocabulary, which were assessed in previous studies (e.g., Chanquoy, 2001), were also adopted in this study. The scores of the length of composition and the richness of vocabulary were defined as the number of words and the number of vocabulary items, respectively. In order to conduct an automatic analysis and segmentation of vocabulary items in writing, a Chinese Latent Semantic Analysis system developed by Chen, Wang, and Ko (2009) was adopted for the measurement of the richness of vocabulary. This is due to the fact that this system can help the quantitative analysis on the numbers of words and vocabulary items in Chinese writing instead of using human power.

Peer Response Behavior

A modified coding scheme, based on the types proposed by Cho, Schunn, and Charney (2006), was adopted to analyze peers' comments. The coding scheme included six types of comments: (a) *directive comments on surface features*, (b) *directive comments on content features*, (c) *praise*, (d) *criticism*,

(e) *clarification and discussion*, and (f) *off task*. More detail definitions and examples are presented in Table 2. Then two researchers of this study were independently responsible for the coding task, where all responses were firstly segmented into feedback units, defined as an integrated and meaningful message focusing on a single problem (Artemeva & Logie, 2002), and then each segmented unit was marked into one of the six types. If there was any disagreement on the coding, a discussion would be undertaken to reach a consensus.

Data Analysis

An Independent Samples *T*-test, which is suitable to test "the difference between the means of two independent groups" (Howell, 2007), was applied to examine whether significant differences exist between the EG and CG in terms of the mean scores of the writing quality and written expression. According to the mean scores of the pretest, students were classified into the high- and low-ability

Table 2. Definitions and Examples of
Comment-Coding Scheme

Type	Definition	Example
Directive comments on surface features	Suggest some surface changes related to a student's writing, such as mechanical changes in punctuation or simple word change, but without changing the meaning	The author can rewrite this sentence "then buy something to eat" into "and then we went to buy something to eat."
Directive comments on content features	Suggest some text-based changes (Faigley & Witte, 1981) to a student's writing, such as development of ideas, organization of content in one or many paragraphs	You said you were sick last month. Then could you tell me what causes you to get sick?
Praise	Express some appreciation or encouragement about some portions of an article	I think you write a good essay.
Criticism	Express nondirective or negative comments to some particular portion of an article	I feel the author's description on the school athletics meet is not clear.
Clarification and discussion	Express personal experience, which may be similar to or different from a writer's experience	You say the injection is like a bite by a mosquito, but I think it is like a hit by a hammer.
Off task	Express comments, not related to a writer's article	No comment, cheer up!

students. Thus, the Independent Samples *T*-test was also used to examine differences between the high- and low-ability students of the EG, in terms of peer response behavior. The aforementioned analyses were undertaken by using SPSS for Windows (version 16.0). The level of significance was set at $p < .05$ for all comparisons.

RESULTS

The results are divided into four subsections, each of which corresponds to each research question. To address the first research question, the first subsection is to present the writing performance of the EG and CG. To address the second research question, the second subsection is to describe how the high-ability students in the EG perform differently from those in the CG. To address the third research question, the third subsection is to describe how the low-ability students in the EG perform differently from those in the CG. To address the fourth research question, the peer response behavior of high- and low-ability students in the EG was depicted and was employed to explain why the aforementioned performance differences existed. The aforementioned writing performance was measured based on the pretest and posttest scores. The aforesaid peer response behavior was examined based on the number of feedback received by or provided by the EG students.

Experimental Group vs. Control Group (Macroview)

Regarding the pretest scores, no significant difference ($t(52) = -.630$, $p > .05$) existed between the scores from the EG ($M = 12.39$, $SD = 2.41$) and those from the CG ($M = 12.76$, $SD = 1.88$). This implied that both groups had a similar level of prior writing ability. Regarding the posttest scores, the EG significantly outperformed the CG, in terms of overall quality (Table 3), which covered five aspects: *elegant words*, *clear paragraph*, *coherence*, *title consistence*, and *new and original ideas*. Among them, the EG performed significantly better than the CG in terms of *elegant words* and *new and original ideas* (Table 3). These findings suggested the former were not only more capable in using appropriate words and phrases but also were better able to express thoughts in a distinctive way than the latter. In other words, the EPR was useful for students to express their intended thoughts. On the other hand, the EG did not perform significantly differently from the CG in terms of *clear paragraph*, *coherence*, and *title consistence* ($p > .05$). This might be because our participants were the third graders, that is, the young starters of writing who were shifting from single-paragraph writing tasks to multiple-paragraph writing tasks. Therefore, the effects of the EPR on organization, coherence, and consistency were not obvious enough.

Furthermore, the posttest was applied to examine participants' written expression (Table 3). Likewise, the results showed the EG performed significantly better

Table 3. EG vs. CG
(Writing Performance of the Posttest)

| | EG (*n* = 27) | | CG (*n* = 27) | | |
	M (*SD*)		*M* (*SD*)		*t*
Writing quality					
Overall	12.76	(1.69)	11.33	(1.79)	3.004**
Elegant words	2.63	(.49)	2.24	(.38)	3.261**
Clear paragraph	2.65	(.43)	2.39	(.54)	1.937
Coherence	2.26	(.40)	2.07	(.33)	1.850
Title consistency	2.81	(.37)	2.61	(.49)	1.729
New and original ideas	2.41	(.57)	2.02	(.47)	2.729**
Written expression					
Length of composition	340.30	(134.09)	199.37	(70.23)	4.838***
Richness of vocabulary	66.04	(21.16)	46.04	(10.95)	4.363***

**p < .01, ***p < .001.

than the CG in terms of the length of composition and richness of vocabulary. Consequently, these findings implied students with the EPR environment seemed more capable in converting their ideas into texts than those within a teacher-centered writing environment. However, it is still unclear who can benefit from this peer response approach. Therefore, it is needed to explore the differences between the EG and CG in a microview, which is undertaken from a perspective of student abilities.

High-Ability Students: EG vs. CG (Microview)

Regarding the pretest scores of high-ability students, there was no significant difference ($t(26) = -.044$, $p > .05$) between the scores from the EG high-ability (EG_HA) students ($M = 14.12$, $SD = 1.10$) and those from the CG high-ability (CG_HA) students ($M = 14.13$, $SD = 1.06$). This suggested that the high-ability students in both groups had a similar level of prior writing ability. Regarding the posttest scores of high-ability students, those in the EG performed significantly better than those in the CG, not only in terms of overall quality but also in terms of *elegant words* and *new and original ideas* (Table 4).

Likewise, the high-ability students in the EG achieved better performance than those of the CG in the two measurements of written expression (Table 4). All these findings are coherent with those of the macroview. Unlike the macroview, the high-ability students of the EG, however, also performed significantly better than those of the CG in the remaining aspects: *clear paragraph*, *coherence*, and *title consistence* (Table 4). In other words, the high-ability students with the EPR

Table 4. EG_HA vs. CG_HA
(Writing Performance of the Posttest)

| | EG_HA (n = 13) | | CG_HA (n = 15) | | |
	M (SD)		M (SD)		t
Writing quality					
Overall	13.58	(1.15)	11.47	(1.88)	3.504**
Elegant words	2.73	(.48)	2.27	(.42)	2.728*
Clear paragraph	2.85	(.24)	2.47	(.61)	2.098*
Coherence	2.42	(.34)	2.03	(.40)	2.743*
Title consistency	3.00	(.20)	2.63	(.44)	2.879**
New and original ideas	2.58	(.57)	2.07	(.46)	2.622*
Written expression					
Length of composition	403.46	(134.36)	213.73	(76.77)	4.668***
Richness of vocabulary	74.62	(24.26)	47.87	(11.22)	3.831**

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

demonstrated better writing performance than those with a teacher-centered writing class in all the aspects of writing performance.

Low-Ability Students: EG vs. CG (Microview)

Regarding the pretest scores of low-ability students, no significant difference ($t(24) = -.370$, $p > .05$) was found between the scores taken by the EG low-ability (EG_LA) students (M = 10.79, SD = 2.17) and those by the CG low-ability (CG_LA) students (M = 11.04, SD = 1.08), implying the low-ability students in both groups had a similar level of prior writing ability. Regarding the posttest scores of low-ability students, those in the EG did not perform significantly better than those in the CG (Table 5) regardless of the overall score or the score of each individual item ($p > .05$). However, it is interesting to see that the low-ability students in the EG significantly outperformed those in the CG in terms of written expression, including the length of composition and richness of vocabulary (Table 5). These findings implied that this peer response approach was not so helpful to low-ability students, who majorly benefited from the aspects of the expansion of their thoughts and the expression of plentiful ideas.

The Impacts of the EPR: High-Ability Students
vs. Low-Ability Students

In addition to the results of the macro- and microviews presented in the previous three subsections, the peer response behavior of the EG high- and low-ability

Table 5. EG_LA vs. CG_LA
(Writing Performance of the Posttest)

	EG_LA (n = 14) M (SD)		CG_LA (n = 12) M (SD)		t
Writing quality					
Overall	12.00	(1.80)	11.17	(1.74)	1.197
Elegant words	2.54	(.50)	2.21	(.33)	1.930
Clear paragraph	2.46	(.50)	2.29	(.45)	.920
Coherence	2.11	(.40)	2.13	(.23)	−.137
Title consistency	2.64	(.41)	2.58	(.56)	.312
New and original ideas	2.25	(.55)	1.96	(.50)	1.413
Written expression					
Length of composition	281.64	(107.70)	181.42	(59.37)	2.867**
Richness of vocabulary	58.07	(14.49)	43.75	(10.61)	2.832**

**$p < .01$.

students was also analyzed. The analysis was undertaken by counting the number of comments received by and provided by students. Regarding the number of received comments for each type, a significant difference was only found between the number of off-task comments received by the EG high-ability students and the EG low-ability students (Table 6). This might be because the partners of high-ability students felt they could not provide more suggestions to help high-ability students revise their compositions so the partners provided trivial comments, which were not related to revision tasks. Regarding the number of provided comments, two significant differences were found. One is the number of total comments provided while the other is the number of directive comments given for content features (Table 7). Regarding the number of total comments provided, the EG high-ability students significantly gave more comments than the EG low-ability students. Regarding the number of directive comments given for content features, the high-ability students performed significantly better on giving directive comments on content features. One possible reason is that the high-ability students were more capable of expressing their intended thoughts and identifying the strengths and weaknesses of student writing than the low-ability students. Consequently, the former were more capable of providing feedback to their partners for the improvement of idea development and organization than the latter.

In addition to the aforementioned significant differences, some differences were also found between high- and low-ability students, though such differences do not reach a significant level. For example, low-ability students received more comments for criticism than high-ability students.

Table 6. EG_HA vs. EG_LA
(the Number of Received Comments for Each Type)

Type	EG_HA (n = 13) M (SD)	EG_LA (n = 14) M (SD)	t
Total	73.62 (21.82)	68.29 (19.41)	.671
Directive comments on surface features	13.62 (7.73)	16.93 (7.59)	−1.123
Directive comments on content features	38.00 (18.27)	31.36 (17.35)	.969
Praise	8.62 (3.84)	7.43 (5.56)	.641
Criticism	6.23 (3.59)	9.29 (4.23)	−2.015
Clarification and discussion	3.46 (5.19)	1.86 (2.14)	1.064
Off task	3.69 (3.28)	1.43 (1.99)	2.189*

*$p < .05$.

DISCUSSIONS

Experimental Group vs. Control Group

The results presented in the previous section suggest that students with the EPR did perform better than those with the teacher-centered writing approach, regardless of writing quality or written expression. Such superiority may be caused by three aspects. Firstly, the EPR provided students with a convenient online writing environment so that students were motivated to express more ideas in writing. As indicated by Goldberg, Russell, and Cook (2003), computers have positive effects on student writing. Accordingly, students with the EPR could more easily compose, edit, and store texts with computers than those with paper and pencils. On the other hand, students in the paper-and-pencil environment may be afraid of the load of composition because the more they write, the more they need to duplicate or edit for revision, which may prevent students from expressing more ideas during the practice of writing.

Secondly, the EPR provided a complete writing practice so that students were provided opportunities to do revision. Instead of relying on teachers' feedback solely, the EPR used peer response to provide a wider range of feedback to help students improve their writing. Conversely, students in a teacher-centered writing

Table 7. EG_HA vs. EG_LA
(the Number of Provided Comments for Each Type)

Type	EG_HA (*n* = 13) M (SD)	EG_LA (*n* = 14) M (SD)	*t*
Total	92.85 (32.71)	52.93 (31.87)	3.211**
Directive comments on surface features	19.00 (11.66)	11.43 (9.80)	1.831
Directive comments on content features	48.46 (26.96)	23.79 (18.18)	2.807*
Praise	10.00 (8.24)	6.07 (2.92)	1.677
Criticism	9.54 (5.43)	6.36 (5.88)	1.458
Clarification and discussion	3.38 (4.35)	2.50 (5.45)	.462
Off task	2.46 (2.87)	2.79 (3.09)	−.284

*p < .05, **p < .01.

class usually just composed their drafts, turned in their compositions, and later received scores and some general comments from their teachers. In other words, they received insufficient feedback, so their writing quality was not as good as that of those with the EPR.

Furthermore, the EPR provided a sharable mechanism so that students could exchange drafts and feedback and clarify meanings with each other. By doing so, students could observe how others expressed ideas with different language skills, identify writing problems through different points of view, learn the knowledge of writing criteria, and reflect on their own works with the criteria to improve writing. However, those in the teacher-centered writing classroom did not receive such treatment so they did not demonstrate good writing performance.

High Ability vs. Low Ability

Our findings suggest that the EPR is beneficial for the high-ability students not only in writing quality but also in written expression. This may be due to the fact that the high-ability students were more active and capable of giving feedback than the low-ability students. In particular, the former significantly outperformed the latter in giving directive comments on content features. In other words, the

high-ability students were more capable of evaluating the strengths and weaknesses of a writing work, including the aspects of writing quality and written expression, and were good at providing their suggestions for peer writers to improve their works. Additionally, they could reflect themselves to apply such suggestions to improve their own writing. This might be the reason why the high-ability students benefited more from the EPR than the low-ability students.

In contrast, the EPR had no significant impacts on the writing quality of low-ability students. However, it is still beneficial for them in written expression. As mentioned before, low-ability students received more comments for criticism than high-ability students, though such a difference is not statistically significant. This difference may be able to explain why the EPR could help low-ability students to improve written expression. More specifically, such critical comments not only helped the low-ability students to identify the weaknesses in their writing, but also cultivated their ability of critical thinking, which can be applied in improving their written expression. In other words, the written expression of low-ability students could be significantly improved via the EPR. Accordingly, it could be concluded that the EPR can help both of the high-ability students and the low-ability students.

Implication for System Design

The EPR is useful to both of the high-ability students and the low-ability students, but there is a need for further improvement to enhance the writing performance of low-ability students. To achieve this enhancement, three approaches are proposed. The first approach is to provide low-ability students with chances for explanations of their writing problems and discussions of potential solutions to address their problems. Currently, students are requested to give their feedback intuitively. Thus, there is a lack of structural suggestions so low-ability learners might feel it difficult to understand the nature of the problems and to improve their writing. To address this issue, a 4-step procedure proposed by Min (2005) is recommended to be incorporated into the EPR in the future. More specifically, Min suggested that giving feedback should consist of four steps, that is, *clarifying writers' intentions*, *identify problems*, *explaining the nature of problems*, and *making specific suggestions*. Such a 4-step procedure can nurture respondents' abilities for giving feedback in a more systematic way so that writers, especially low-ability students, can obtain more details about the explanations of writing problems and have a chance to discuss how to do revisions for improving writing.

The second approach is to help the low-ability students to gain the knowledge of how to provide feedback. This is because they are less capable of giving feedback than the high-ability students. To address this issue, correct models or incorrect models can be applied to guide them on how they should give the feedback and how they should not give the feedback. More specifically, such

correct models or incorrect models work as evaluation criteria, which provide students with concrete guidance to deliver feedback to their peers in terms of surface and content features. By doing so, they can give more useful suggestions to help their peers improve writing and turn it into the ability of self-evaluation to improve their own writing.

The third approach is to establish iterative peer responses for low-ability students. The current peer response approach will be terminated at the end of the single cycle of writing-evaluation-rewriting (i.e., drafting-peer responding-revising) of the EPR. However, it may not be easy for low-ability students to solve all writing problems and fulfill the requirements of written expression and writing quality within only one cycle. To address this issue, the process of writing-evaluation-rewriting should be iteratively conducted. Thus, the inter-action and discussion in a peer response group can be conducted in a successive cycle so that the low-ability learners can continually improve their works until such works reach a reasonable quality. By doing so, the EPR can be really helpful to both of the high-ability students and the low-ability students.

CONCLUSIONS

We proposed a mixed-mode peer response approach to improve students' writing ability and examined how students with such a mixed-mode approach performed differently from those with a teacher-centered approach. Thus, there were two groups. Students with the mixed-mode approach were considered as the experimental group (EG) while those with the teacher-centered approach were regarded as the control group (CG). In addition to comparing the writing quality and written expression of the EG and CG, we also investigated how students with different levels of ability react to the mixed mode. In brief, four research questions were examined in this study.

Regarding the first research question, *How did students in the experimental group differ from students in the control group in terms of writing quality and written expression?* the results revealed that the experimental group significantly outperformed the control group in terms of both writing quality and written expression. Regarding writing quality, the former outperformed the latter in two aspects: *elegant words* and *new and original ideas*. Regarding written expression, the experimental group also performed significantly better than the control group in terms of the length of composition and richness of vocabulary.

Regarding the second research question, *How did high-ability students in the experimental group and those in the control group perform differently in terms of writing quality and written expression?* the results suggested that the high-ability students in the experimental group demonstrated better writing performance than those in the control group in all the aspects of writing quality and written expression. Regarding the third research question, *How did low-ability students in the experimental group and those in the control group perform differently in*
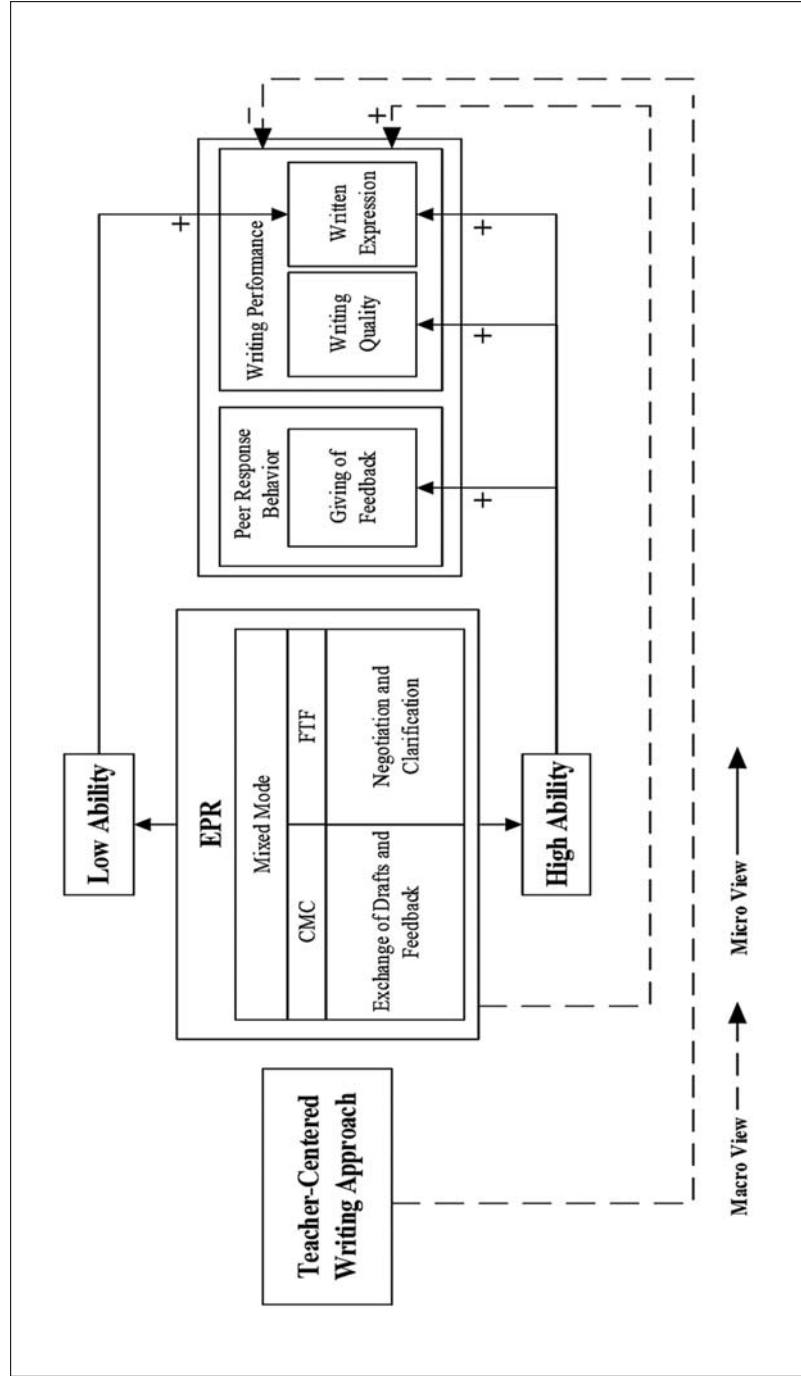
Figure 3. A summary of the answers to the four research questions.

terms of writing quality and written expression? the results indicated that the low-ability students in the experimental group significantly outperformed those in the control group in written expression but not in writing quality. Regarding the fourth research question, *How did high- and low-ability students in the experimental group perform differently in peer response behavior?* the results showed that the high-ability students performed significantly better on giving comments than the low-ability students, especially in giving directive comments on content features.

The aforementioned answers are illustrated in Figure 3, which covers a macroview and a microview. The macroview depicts how students with the EPR approach performed differently from those with the teacher-centered writing approach in terms of writing performance. The microview deepens the understanding of how to implement the mixed-mode peer response with the EPR and depicts how high- and low-ability students react differently to this mixed mode. The aforementioned results are fruitful, but this study only incorporates a small-scale sample. Therefore, further work needs to be undertaken with a larger-scale sample to provide additional evidence. Additionally, the proposed EPR still has some weaknesses, especially for low-ability students, so three approaches are proposed to improve these weaknesses. Accordingly, it is necessary to conduct further studies to verify the effectiveness of the proposed three approaches. Furthermore, this study focused on the effects of the EPR, so future research can take into account other instructional variables, such as curriculum design and teacher beliefs.

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