

# Understanding how embedded peer comments affect student quiz scores, academic writing and lecture note-taking accuracy

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## Abstract

**Purpose** – This study aims to better understand the relationship between peer feedback in the context of online collaborative note-taking and how comments impacted student performance and understanding.

**Design/methodology/approach** – This one sample investigation was of graduate students participating in an academic writing class working collaboratively online. Data was gathered on student feedback during note-taking activity to test for its effects on student performance and understanding.

**Findings** – The use of peer comments in online note-taking was found to impact student quiz scores and academic writing skills positively. However, no significance was found between comments and the completeness of their notes taken, suggesting its limits to promote deeper understanding.

**Research limitations/implications** – The level and detail about the comments made and how accurately they recall the important details from the video lectures is not known. The average number of comments made weekly by each group was also low.

**Practical implications** – Designers and teachers using online collaborative activities could benefit by understanding the nature in which peer comments can enhance student learning, bearing in mind the need for explicit guidance in how to comment and at what level of knowledge their comments should target.

**Social implications** – Online collaboration, peer editing and commenting is widely used by educators and the public. A better understanding of how these elements operate might improve the quality of knowledge artefacts such as academic writing and research notes.

**Originality/value** – Existing literature focuses mainly on peer feedback on writing or other artefacts; this paper seeks to find out more about the impact of comments in particular on collaborative note-taking.

**Keywords** Lectures, E-Learning, Communication technologies, Learning analytics

**Paper type** Research paper



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## Introduction

In the field of education, much has been said about the importance of feedback and how it relates to student performance and understanding (Hattie and Clarke, 2018; Hattie and Timperley, 2007; Havnes *et al.*, 2012). Feedback can be described as actions or information given by an agent in response to the presentation of someone's understanding, knowledge or performance (Hattie and Timperley, 2007). Feedback can come from a variety of sources such as a teacher, parent, coach, or peer. In addition to being from different sources, feedback can come from a variety of different directions such as teacher to learner, learner to teacher, learner to learner (peer feedback), and also internally from the learner to themselves (Hattie and Clarke, 2018). Traditionally, feedback comes in verbal or written form. Verbal feedback comes more immediately at the time of learning while written feedback is more often asynchronous, giving the receiver reaction time to look it over in more detail (Huisman *et al.*, 2018).

Current pedagogical thought suggests that learner-to-learner interaction and collaboration are of great benefit to construct knowledge in a socially dynamic way, particularly for filling potential gaps in existing knowledge (Burden and Kearney, 2017; Retnowati *et al.*, 2018). Online collaborative learning has seen a surge in recent times, and the importance of learner to learner interaction and how feedback operates within that interaction has also grown (McNeill, 2011; Meng *et al.*, 2020; Rolf *et al.*, 2014; Zhou, 2017). The study of learner-to-learner feedback as it operates in this social constructivist paradigm is important in the field of online education (Altmay, 2017; Kanala *et al.*, 2013; Yücel and Usluel, 2016). Understanding how learner-to-learner feedback helps students create online learning artefacts, such as collaborative notes on lectures, can be valuable for teachers and designers seeking effective ways to improve student learning, recall and connectedness (Qiu *et al.*, 2012). Because writing has long been considered a valuable and reliable way to access and assess learner understanding and knowledge (Ferretti and Graham, 2019), ways to improve student writing through peer feedback and collaborative notes are relevant in online learning contexts.

Existing evidence supports the claim that collaborative learning artefacts can help support student learning (DeChurch and Mesmer-Magnus, 2010). However, how the constituent parts of these learning artefacts interact to support student recall, and retention, and student learning is understudied. Because note-taking has long been understood to assist student recall (Jansen *et al.*, 2017), it is valuable to investigate how peer comments acting as a form of feedback may operate with similar potential benefits. The aim of the present study is to explore how learner feedback operates in the form of comments on collaborative notes and how it may affect student performance in the form of quiz scores, their ability to identify key concepts from video lectures (completeness), and their individual academic writing ability overall.

## Literature review

### *Feedback*

Feedback is defined by Hattie and Timperley (2007) as actions or information provided by a teacher or instructor that delivers details about performance or understanding to a student. Feedback can be considered as information or knowledge that is designed to fill a gap between what is currently understood or what is being performed, toward a desired level of understanding or performance (Hattie and Clarke, 2018). Students therefore have to compare and assess their current level of understanding with the goal state of understanding and then take appropriate steps to close the gap through interpreting the feedback (Carless and Boud, 2018; Sadler, 1989).

Only by effectively helping students solve problems and closing this gap can we consider feedback to be valuable (Havnes *et al.*, 2012).

#### *Learner-to-learner feedback*

There are numerous proven benefits in collaborating with others to enhance or deepen learning (Nicol and Selvaretnam, 2020; Seymour *et al.*, 2004). Collaboration involves seeking help, listening to others, offering guidance, discussing content, and working on strategies for learning (Hattie and Clarke, 2018). These interactions can be loosely defined as feedback about learners' work and learning. Kluger and DeNisi (1996) pointed out that when students receive feedback from their peers, they can do one of four things: change behavior, change the goal, abandon the goal or reject the feedback. Therefore, feedback only supports the learning process when the receiver accepts the feedback and takes action to close the gap (Hattie and Clarke, 2018). Interaction and feedback during collaboration can deepen learning as students begin to realize what they know and what they do not in relation to the content through their interaction with other learners. The point at which the most effective learner-to-learner feedback can be applied is after students have some knowledge beyond the surface level (Hattie and Clarke, 2018). In this way students are exploring the ideas together and discussion is focused on the connections between ideas as they seek to extend their learning (Adam and Nel, 2009; Nicol and McCallum, 2020).

Peer feedback may act as a type of formative assessment that does not interrupt learning, but rather adds to the learning process (Arts *et al.*, 2016; Frunza, 2014). It is based on communication in which feedback is essential to activate the cognitive and metacognitive development of students. Hattie and Donoghue (2016) found that peer feedback is an important strategy for supporting student learning when students play the role of teacher and learn from each other. This positively affects student levels of regulation, monitoring, anticipating and metacognitive strategies overall.

#### *Comments as a type of feedback*

Comments can be small short sentences in the margin of students' written work, or be more detailed, thorough responses. In electronic online documents such as Google docs, these types of comments on the text are called embedded comments. Comments in the context of academic writing may be simple corrections of content, may be related to syntax, sentence structure, and writing style, or may provide more elaborate and detailed input at the concept level (Petrović *et al.*, 2017). Research into feedback has revealed that comments as a type of feedback can support students' learning process by identifying their strengths and weaknesses during the revision process (Stracke and Kumar, 2010). When delivering feedback as comments, it is essential that they relate to the material and how improvements can be made of the current piece as opposed to vague suggestions about possible future work (Hattie and Clarke, 2018).

Comments as a type of feedback will be ineffective if they are not well considered, organized and adequately implemented by students during their learning process (Ferris, 2006). Arts *et al.* (2016) suggest that if feedback is insufficient or improperly distributed, it will fail to help students learn. Therefore, written comments need to be direct and clear and must be able to be understood independently of the writer; otherwise, the receiver may not understand them, can feel lost, and in some cases reject the feedback (Arts *et al.*, 2016; Hattie and Clarke, 2018). It is also suggested that written comments need to be followed up with discussion as a way to supplement the feedback and that this kind of collaboration needs explicit guidance from the teacher (Arts *et al.*, 2016; Hattie and Clarke, 2018).

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### *Effects of comments on quiz scores*

Research conducted by [Havnes et al. \(2012\)](#) showed that improving learning through formative assessment depends on several key factors, one of which is that students recognize that evaluation has a significant impact on their learning and guides them to better understand how to improve. Students who received immediate corrective comments achieved impressively high quiz scores in the corresponding summative assessment as opposed to students who received none ([Chen et al., 2018](#); [Panadero et al., 2019](#); [Yang, 2011](#)). A study by [Petrović et al. \(2017\)](#) looked at the effects of different types of feedback on student quiz scores. When comparing two types of feedback, knowledge of the correct response (giving students the correct answer when they were incorrect) and more detailed elaborate feedback on their incorrect answers both had a similar impact value on their overall scores. If the learning content is more complex, students who receive well-designed feedback will spend more time on their writing and achieve significantly higher quiz scores ([Petrović et al., 2017](#)). The difference however can be a time cost, as students need to spend more time reading and weighing up elaborate feedback before proceeding.

### *How comments might affect students' individual writing*

Feedback can be regarded as the input from the reader to the writer, which provides the writer with information for revision ([Keh, 1990](#); [Tuzi, 2004](#)). It can help the writer understand where they misled or confused readers due to insufficient information, irrational structure, lack of thought development, inappropriate word selections or incorrect tenses and syntax ([Hyland and Hyland, 2006](#)). Students who give feedback can improve their own problem-solving skills and metacognitive strategies through the process and in some cases improve their problem-solving skills more than the receivers of feedback ([Çevik, 2015](#)). Writers receive more audience awareness through having peer readers. This process can also improve readers' writing ability by critically reading other peers' articles ([Clynes and Raftery, 2008](#)). Both receivers and providers of peer feedback may benefit from this interaction. [Huisman et al. \(2018\)](#) revealed that writers generally improved their writing skills from their first draft to final draft with the help of feedback, and the respondents also improved their writing style, content and structure.

Although previous studies found that conducting peer feedback can promote students' writing skills, conflicting results have been stated in other research ([Anker-Hansen and Andrée, 2019](#)). Some students have negative emotions when they receive comments from peer reviewers. For instance, students will be frustrated when they receive general comments without any supporting evidence or specific area to improve, mitigating any potential benefits from this type of collaboration ([Majumder, 2016](#)).

### *How comments might affect completeness of notes*

For the purposes of this study, completeness is taken to mean the degree to which the writing captures the overall concept of the source material or lecture ([Luo et al., 2016](#)). Writing that is considered to have a high degree of completeness, accurately represents and summarizes the concepts being covered. In a study on student summative writing ability and different types of feedback, [Sung et al. \(2016\)](#) found that where the feedback was focused at the conceptual level, students were able to improve their quality of work. Feedback at the concept level was shown to be more beneficial than feedback that focused on semantic details or superficial knowledge. Additionally, students who received concept feedback showed increased skill with fewer revisions than those without concept feedback. Depending on the level of knowledge the feedback targets, students may not be able to apply

the feedback to the conceptual level and improve the overall completeness of their writing (Hattie and Clarke, 2018).

### The present study

The aim of present study is to explore the impact of peer comments in online collaborative note-taking and their effects on the quality of student performance (quiz scores and academic writing) and student notes (completeness). In order to achieve this, the present study investigates group-work from three different perspectives in the context of collaborative note-taking. The first perspective evaluated by this study is the average level of students' retention of learning content within groups, which is evaluated from students' online quiz scores based on the lecture video content. Individual quiz scores were collated to give the group a total score for each of the quizzes. Since quizzes can help to guide students' study as well as motivate them to internalize concepts, quiz scores are important measures of students' understanding (Herold *et al.*, 2012). Therefore, calculating the average of the quiz scores of each student during the week is relevant when exploring the retention of content for the group overall. The second perspective that was assessed in this present research was the writing performance of students. To do so, the overall personal writing scores were used as a representative of personal learning in research. These writing scores were students' individual scores that were marked against a rubric used to assess the quality of a piece of academic writing.

The third of these perspectives is the quality of the learning artifacts (collaborative notes from lectures) built by the group, which is measured by the completeness of the notes taken. Completeness refers to the level and accuracy of the notes taken by the group from each video lecture. This study attempts to clarify comments as a type of peer feedback that may improve student learning performance by testing the impact of comments made by students during the collaborative writing within groups. Derived from these perspectives, there are three main hypotheses of this present study:

- H1. Groups with more comments will perform better on quizzes.
- H2. In groups with more comments, students will perform better on their individual writing scores.
- H3. In groups with more comments, there will be a higher level of note taking completeness.

### Methods

#### *Learning context*

The current study explores the learning circumstances and experience of 149 students studying at a Korean university who were taking seven different classes of a graduate-level scientific writing course. The 149 students joined small groups (34 groups in total, 1 group of 3 students, 19 groups of 4 and 14 groups of 5 students, with an average group size of 4.38). Their demographics can be seen in Table 1. The sample population were majoring in STEM courses (science, technology, engineering, and mathematics).

#### *Procedure*

The scientific writing course was designed to instruct students at the graduate level on how they might publish in peer-reviewed scientific journals. The lectures were conducted using an online video format that the students could stream directly from the university's online

learning management system (Fanguy *et al.*, 2021). There were 56 videos for the entire semester that were divided up over the 10-week course. Each week there were between four and eight video lectures which varied in length from 4:56 to 24:50 (averaging 12 minutes). In their groups, students were encouraged to take notes collaboratively online. Students were able to self-select their groups, but it was suggested to keep the group to 4 or 5. Each section of the course consisted of 8–25 students.

A Google Document was created by the course instructor for every group for each instructional week. Students were tasked to take notes collaboratively using the Google Doc, and these were monitored by the instructor. Each group collaborated on a total of 10 documents that related to the 10 weeks of the course. Students were able to access video lectures through the learning management system, pausing, rewatching, rewinding or fast forwarding at their convenience. During this process, they were also able to take notes in the shared Google Doc. After each week, students completed an online quiz that related to the concepts and material covered in the video lecture for that specific week. They were also encouraged to use their collaborative notes associated with the video lecture while taking the quiz. Questions from the quiz covered a variety of content including conventions of academic writing, ethical considerations of scientific communication, and how to manage the submission process once a manuscript was completed. The collaborative notes that were produced by each group were then analyzed to understand how groups approached the collaborative note-taking process. Notes were analyzed according to completeness, i.e. the level of concepts they were able to identify as they related to each lecture. An example of the type of collaborative notes that were taken during this study can be seen in the screen capture in Figure 1. Students could use any tool in Google Docs to take online notes according to their habits and note-taking methods. The content in the sidebar was the asynchronous peer feedback provided by other students on this online note.

### Measures

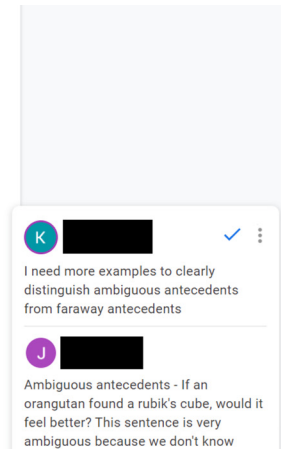
*Comments.* Written comments from peers can be used to develop critical thinking, improve structure, and add new ideas and different perspectives (Sung *et al.*, 2016). Comments in this study referred to any type of written feedback from a peer on the notes that were taken collaboratively on the assigned Google document using the comment function. Comments appear in a small frame in the margin of the work as embedded comments (Figure 1). The text in the document is then highlighted to show what the comment refers to. The writer of the comment is identified in each embedded comment. The comment can be used to formatively assess the work across a range of levels, including superficial levels, such as syntax and structure, to the much deeper levels of concepts, ideas, and knowledge connection (Luo *et al.*, 2016; Strijbos and Wichmann, 2018; Sung *et al.*, 2016). Comments can also be questions that promote a discussion thread with the text frame. For the purpose of

Gender	Male 111	Female 38		
Nationality	Korean 126	Foreign 23		
Degree	Masters 102	Ph.D 47		
Age	Min 22	Max 46	Avg 26.56	SD 4.605

**Table 1.**  
The demographic  
variables for the  
participants ( $N = 149$ )

**Figure 1.**  
Sample collaborative  
notes taken online  
using Google Docs

- A antecedent (referring noun) : a pronoun refers
- Three common pronoun-antecedent problems:
  - Missing or faraway antecedents
    - Antecedents that are missing(where is) or very far(which noun) from their corresponding pronouns
    - Breathe in through your nose, hold it for a few seconds, and then breathe out through your mouth.
      - It -> your breath
  - Anticipatory reference
    - Putting pronouns before the antecedent
  - Ambiguous antecedents
    - Confusion from having several antecedents for the pronoun
    - Maybe the nearest antecedent
    - There are a number of reasons to buy a microwave. For example, it will cut your food preparation time in half. Many people think that it is useful in today's hectic home environment.
      - A microwave or cutting food preparation time in half?
      - It -> this device / this suppliance



this study, the amount of comments and student replies within a set of notes act as the “comments” variable.

*Quiz scores.* Each quiz was designed to follow each instructional week, totaling 10 quizzes in all. The quiz was used to assess and examine students’ ability to recall key concepts and content found in each corresponding video lecture. Quizzes were multiple choice and varied in number of items, ranging from 8–30. Students were given one opportunity to complete the quiz, and they were timed (2 min per question). Students had until 6:00 p.m. Friday of each week of instruction week to complete each quiz. The questions were created in such a way that allowed for more than one answer, and partial marks were given if fewer than the total number of correct answers were selected. Where questions were incorrect, the entire question was marked as such, with no mark being given. In this way, the quiz discouraged random guessing if the student was inclined to guess due to lack of understanding. Each quiz was weighted equally so each student accounted for 3% of the group’s total points for that class. Quiz scores counted for 30% of the total score for each student in the course. For examples and details of the quiz items and the relationship between items and lecture focus, use the link labeled “quiz items and video list”: [https://osf.io/5t8vw/?view\\_only=3514f73b64b1497a9948e1a544d565bc](https://osf.io/5t8vw/?view_only=3514f73b64b1497a9948e1a544d565bc).

*Individual writing assignments.* The main summative assessment for the course was six individual writing assignments that corresponded to six major sections of a manuscript: 1) Introduction, 2) Methodology, 3) Results, 4) Discussion and Conclusion, 5) Abstract, and 6) References. A rubric adapted from Clabough and Clabough (2016) was used to assess the writing assignments, and they were given a mark from 0 to 10. These scores were then totaled to give an individual writing score out of 60, which gave students 60% of their possible total score for the course. These scores served as a proxy that accounted for individual learning for the purpose of this study.

*Completeness.* At the conclusion of the 10-week course and the semester, notes were assessed and measured on their quality of *completeness*. This was done by calculating the amount of meaningful concepts contained in the video lecture and checking the amount of concepts found in the notes taken. The instructor for the course created a rubric that summarized the concepts found in each lecture and were represented in sequence. Students’ notes were measured against the rubric and evaluated as either having the concept

“included” or “not included”. This work was carried out by graduate teaching assistants. The full rubric for completeness can be found in the following file named “completeness rubric”: [https://osf.io/5t8vw/?view\\_only=3514f73b64b1497a9948e1a544d565bc](https://osf.io/5t8vw/?view_only=3514f73b64b1497a9948e1a544d565bc).

*Results*

The descriptive statistics of four variables concerned in the study are shown in **Table 2**. These tables were generated using the software program IBM SPSS Statistics. Averages of the variables of interest are calculated over all ten weeks. **Table 2** lists the number of comments contributed by each group per week, the average writing score of the group member each week, the number of concepts mentioned in each group weekly, as well as the average quiz score of each group per week. For instance, some students made no comments during a week, and the highest number of comments a student made was 38. Interestingly, the minimum value of completeness is 559, and the average of that is 767. Therefore, the number of concepts mentioned in the notes of group members is considerable, as students took very complete notes.

To evaluate *H1* to *H3*, this study carried out a correlation analysis of the experimental results. Through analysis, the average results of 34 groups were calculated weekly. For instance, for the first week, the average individual writing score of each of the 34 groups was calculated, which constitutes a vector of 34 elements. After that, a calculation was carried out for the average individual writing score for the 2, 3, 4, 5, 6, 7, 8, 9 and 10 weeks and combined into a larger 34 by 10 vector (340 elements in total). To probe *H1* to *H3*, a correlation matrix was generated. All Pearson correlation coefficients are derived from the group mean of the whole 10 weeks, and the total number is 340 (34 groups across the entire 10 weeks). The bold values that require special attention have been studied, and after that, **Table 3** was drawn below.

The results of the correlation analysis are as follows:

Variable	Minimum	Maximum	M	SD	Descriptor
Comments	0.00	38.00	1.78	5.65	Total number of peer comments contributed by the group each week
Individual writing	37.00	59.00	48.60	5.19	Average writing score by the member each week
Completeness	559.00	890.00	767.39	80.66	Total number of concepts represented by the group each week
Quiz scores	7.97	26.73	20.14	3.15	Average quiz score by the member each week

**Table 2.**  
Descriptive statistics  
for measures of  
collaborative note-  
taking

Variable	Comments	Completeness	Quiz scores	Individual writing
Comments	1	0.1	0.168*	0.240**
Completeness		1	0.216**	0.117
Quiz scores			1	0.443**
Individual writing				1

**Notes:** \*Correlation is significant at the 0.05 level (two-tailed). \*\*Correlation is significant at the 0.01 level (two-tailed)

**Table 3.**  
Correlation matrix  
for all four variables



- *H1*. In groups with more comments, students will perform better on quizzes. As expected.
- *H2*. In groups with more comments, students will perform better on their individual writing. As expected.
- *H3*. In groups with more comments, there will be a higher level of note-taking completeness. No correlation.

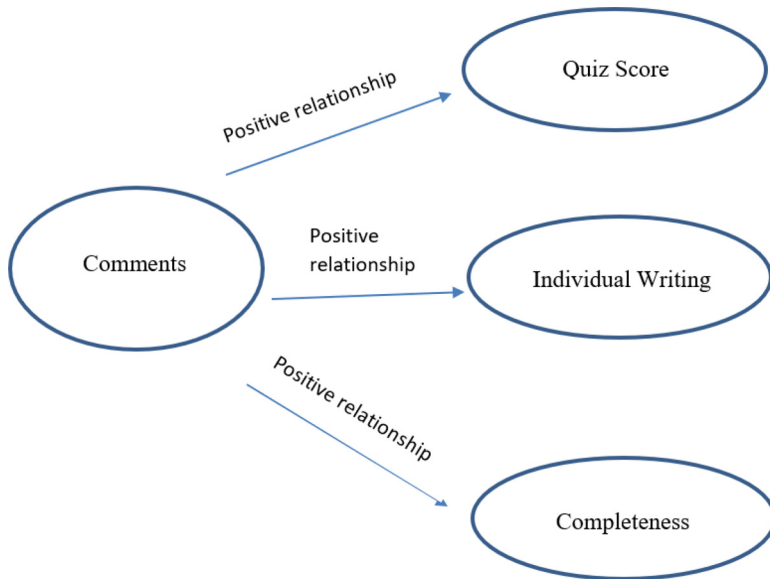
The results of this research are shown in [Figure 2](#).

The above summary of each hypothesis shows that the data supports two hypotheses in this article. Specifically, groups whose members tend to provide more peer feedback are more likely to get higher quiz scores as well as improve their writing performance. However, there is no statistically significant relationship between the students' comments and the completeness of their notes.

*Discussion*

The results of this research showed the performance of students' quiz scores and individual writing had a significant positive correlation with the comments in groups. Note-taking completeness, on the other hand, had no correlation with comments.

The present study found students' quiz scores are related to the comments made in collaborative note-taking. As group members provided more comments during collaborative learning, their quiz scores increased, supporting *H1*. This finding echoes previous literature that revealed that peer comments can help students achieve better results in final exams ([Yang, 2011](#)). In class, students can benefit from comments by their learning partners, who regularly make changes to their work; thus, students are able to improve their learning. The exchange of ideas in the classroom is a key feature of social constructivist learning, and students are activated as learning resources for each other ([Harrington et al., 2014](#)).



**Figure 2.**  
Hypothesized  
relationship between  
comments and  
dependent variables

According to a study by [Butler \(1988\)](#) in which students were given either a) grades, b) comments only, or c) grades and comments, it was found that the group who received comments only had better progress (measured by test results) than the other two groups. Through interviews with students, it was found that they had such a strong desire to get higher grades, they ignored comments that potentially had a positive evaluation of their performance, which conflicted with the finding of this present research. One possible interpretation of this study is that students focused on the aspiration of higher quiz scores, but ignored the reflection and summary of the feedback made by their peers. Butler's experiment showed that students generally choose to ignore comments that have a positive effect on improving their own performance. Students often regard positive comments as a way for teachers or peers to cheer them up. This encouragement will make them more self-confident, but will not help them to devote themselves to learning. Scores of tests are usually the symbol of the end of the work phase. However, the present study found that comments as a kind of peer feedback are a well-developed learning strategy in the classroom, and peer comments can be regarded as an effective learning resource for students to improve their quiz scores. Therefore, it is wise not to confuse scores with feedback in class.

Groups with more comments from students are more likely to improve their writing skills than those with fewer comments (*H2* was supported). The present results support existing evidence to show that comments as a type of peer feedback can help the author understand their writing structure, thought development, word choice, tense, and syntax, so as to make further adjustments to their writings and improve it overall ([Hyland and Hyland, 2006](#); [Petrović et al., 2017](#)). The results illustrated that peer feedback can promote the improvement of student writing performance. Accepting peer feedback from different perspectives as well as self-reflection on the comments promoted students' understanding of their writing style and article structure ([Huisman et al., 2018](#); [Petrović et al., 2017](#); [Yan, 2020](#)).

It is suggested by the results of the current study that more comments in groups did not drive higher levels of completeness (*H3* was not supported). Interestingly, the average comments provided by students per semester are only 1.78, which shows that students are not good at providing large volumes of peer feedback during collaborative learning. The present research found that there is no interconnection between the comments that the group members wrote and the completeness level of that group. This contrasts with previous literature where peer feedback coincided with an improvement in conceptual writing where the comments were related to conceptual meaning ([Yang, 2011](#)). It could be the case that because students are not guided to direct specific comments about the writing concept, they are unable to improve note completeness. Comments could remain superficial, and volume of feedback will not necessitate quality or conceptual accuracy, implying students may not be engaging with the writing at this deeper level ([Miyatsu et al., 2018](#)). Students may need explicit guidance on how to deliver feedback and make comments about conceptual meaning in order to improve writing.

## Conclusion

The purpose of this research was to explore the impact of peer comments on students' academic performance and understanding. Since previous research focused on exploring other collaborative note-taking behaviors, such as volume, edits of others, evenness, and so on, this research fills the gap in the knowledge about collaborative note-taking through showing that comments as a type of peer feedback are beneficial to students' learning by improving their quiz scores and individual writing performance.

Interestingly, the average number of comments provided by the students in this research is not high and shows some limitations of potential benefits if students provided more

comments. This could be partially due to students feeling unsure about the social implication of giving feedback and resistance to any potential conflict. Teachers should encourage students to provide peer feedback during collaborative learning to overcome any such inhibition, and they also need to give guidance before students conduct peer feedback. For example, before conducting group cooperative learning, teachers can use examples to show students what good peer feedback is, what types of feedback can improve students' enthusiasm, and how feedback can help them improve their writing skills. The present study also points out that the comments between group members have no effect on completeness, which is inconsistent with the previous literature. This may be due to the fact that students pay more attention to the quiz scores and ignore the reflection on the feedback content and the revision of personal articles. It is also not known at what level of knowledge peer comments were targeting, i.e. if the feedback was at a superficial level or more detailed at the conceptual or idea level. This factor poses some limitations on the current study. For students to focus their comments and feedback at the conceptual level, it is possible they need direct guidance from the teacher in order for it to be effective. Alternatively, teachers should assign collaborative note-taking activities only after students have some existing knowledge about the subject beyond the superficial level. An additional limitation of the present study is that subjects were allowed to self-select into groups rather than groups being randomly assigned. It is possible that more capable or knowledgeable students may have clustered in groups or, conversely, that lower level students might have chosen to work together. Therefore, future research could account for this by randomly assigning students to groups to prevent this type of distribution. The current research did not use a pretest posttest design, thus limiting the validity of our results. Future research could include such design as a way to increase validity and generalizability. Furthermore, the study could look into these effects from the perspective of the temporal relationship as the students give feedback to one another over time. The issue of a temporal relationship is not only a limitation of the present study but also an area that may be fruitful for future research. Finally, since this research regarded the frequency as the main standard of comments, more comprehensive research could pay attention to both the quantity and quality of comments in the future.

Although a growing body of research has probed the effect of peer feedback on students' academic performance and writing skills, more efforts are needed to investigate the long-term impact of peer feedback to maximize its potential teaching value for students' text revision and writing development. Considering comments as a type of peer feedback could play an increasingly important role in cooperative learning. It is necessary to explore the influences of peer feedback in the classroom, such as how students can effectively deliver and receive feedback, to what extent peer feedback can be accommodated in the classroom and teachers' perceptions on the value of using peer feedback.

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