TECHNOLOGY-BASED PEER REVIEW LEARNING ACTIVITIES AMONG GRADUATE STUDENTS: AN EXAMINATION OF TWO TOOLS

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ABSTRACT

Peer review learning activities have been deemed an effective way to improve writing quality among graduate students. However, there was a paucity of extant literature that examined technology-based peer review learning activities. To address this gap, the present study investigated how technology tool usage affected the instructional design of peer review learning activities. A qualitative action research design was used to examine the use of two different technology tools. Data were analyzed with content analysis techniques and three themes were identified. Following a discussion of the findings, the implications for instructors who are interested in using technology-based peer review learning activities are delineated.

Keywords: graduate students, online learning, peer review, writing

INTRODUCTION

Writing is an essential component of graduate-level postsecondary education. Instructors affiliated with graduate programs use writing as the primary mechanism to determine how students "assimilate knowledge and integrate that knowledge into new ideas" (Ondrusek, 2012, p. 179). Additionally, graduate students are expected to employ advanced writing mechanics and scholarly writing skills within their discipline. Writing tasks at the graduate-level of postsecondary education typically extend beyond reporting and summarizing (Nelson, Range, & Ross, 2012) and demand the use of more complex thinking skills, such as analysis, evaluation, and synthesis (Granello, 2001; Lavelle & Bushrow, 2007). Graduate-level writing tasks often require students to consult, reference, and cite multiple sources to produce written products for academic purposes (Badenhorst, 2019; Huerta, Goodson, Beigi, & Chlup, 2017). Despite these expectations, graduate students often struggle to demonstrate sufficient writing skills (Badenhorst, 2019; Durchardt, Furr, Horton, 2016; Huerta et al., 2017; Nelson et al., 2012; Ondrusek, 2012).

In order to promote critical thinking and improved writing among graduate students, instructors must develop learning activities that blend together individual and social processes. One such learning activity, peer review, provides graduate students with the opportunity "to review each other's professional processes and/or products with the goal of improving such processes or products" (Woolf & Quinn, 2001, p. 22). Participating in carefully designed peer review learning activities compels graduate students to examine their own writing more critically (Hyland & Hyland, 2006; Lundstrom & Baker, 2009), thereby promoting their use of complex thinking skills and improved writing performance (Crossman & Kite, 2012; Landry, Jacobs, & Newton, 2015).

As online learning continues to experience growth at the graduate level (Seaman, Allen, & Seaman, 2018), instructors have a myriad of technology tools available to facilitate peer review learning activities with writing. At the time of the present study, the researchers located a moderate amount of extant literature that

examined technology tool usage during peer review learning activities in online learning environments. However, the majority of these studies focused on undergraduate students (Cheng, Liang, & Tsai, 2015; Jensen, 2016; Yang, 2010) and second-language learners (Hsieh & Liou, 2008; Hung & Young, 2015; Tai, Lin, & Yang, 2015). The goal of the present study was to address this gap in available literature and explore more holistically technology tool usage during peer review learning activities among graduate students. The researchers implemented peer review learning activities in two different sections of an online graduate course using two different technology tools: Eli Review, a web-based peer-review platform, and word processing software tools available through Microsoft Word and Google Docs. The following research questions guided this investigation:

1. How does technology tool usage affect the instructional design of peer review learning activities?
2. How does technology tool usage affect the helpfulness of feedback provided during peer review learning activities?

REVIEW OF LITERATURE

At the graduate-level of education, peer review learning activities have been identified as an effective way for graduate students to improve their writing (Crossman & Kite, 2012; Landry et al., 2015). During a peer review learning activity, graduate students exchange writing drafts and give each other feedback using predetermined criteria (Landry et al., 2015). Graduate students then review the feedback they received from peers on their own writing drafts and use it to guide subsequent revisions and edits. Although the overarching goal is to improve the quality of writing (Crossman & Kite, 2012; Landry et al., 2015), graduate students who participated in peer review learning activities reported increases in their analytical and critical thinking skills (Landry et al., 2015), an enhanced ability to self-evaluate their own writing (Crossman & Kite, 2012), and deeper levels of understanding with course content (Gikandi & Morrow, 2016).

The success of peer review learning activities among graduate students depends largely on the helpfulness of feedback that is given and received. With respect to the feedback that is given, graduate students should give peers helpful feedback that prompts modifications to their writing drafts (Landry et al., 2015; Liu & Lee, 2013). With respect to the feedback that is received, graduate students must appraise the accuracy of feedback given and determine its helpfulness (Liu & Lee, 2013). Strijbos, Narciss, and Dünnebier (2010) affirmed that the competence level of graduate students and the provision of elaborate feedback were not factors that impacted the helpfulness of feedback, so long as peer review learning activities delineated clear instructions and assessment criteria.

Due to the rapid expansion of online learning environments at the graduate level (Seaman et al., 2018), instructors must identify technology tools to facilitate peer review learning activities. Although limited, the available literature described the utilization of peer review learning activities among graduate students through asynchronous learning management system (LMS) tools (Gikandi & Morrow, 2016; Pritchard & Morrow, 2017), computer-supported collaborative learning systems (Yang, 2016; Yeh, 2015), and web-based services (Chew, Snee, & Price, 2016; Murray & Boyd, 2015). Our goal with the present study was to add to the limited available literature and examine how the use of two different technology tools (i.e., Eli Review and word processing software tools) affect the instructional design of peer review learning activities and the helpfulness of feedback that is given and received.

METHODS

Context

This qualitative research study was conducted at a midsized regional university located in the South Central United States. At the time of present study, the university's education department offered five different master's degree programs in a fully online format through the Blackboard Learn 9.1 LMS. Due to the online format of these program offerings, graduate students were located in different geographic areas. The researchers (i.e., Chanel and Laurie) elected to conduct the present study in a core graduate course entitled Education Research, which all degree-seeking graduate students are required to complete successfully. The Education Research course focuses on acquiring and applying quantitative, qualitative, and mixed methods research techniques. As graduate

students progressed through the course, they engage with course content and learn activities that prepare them for the culminating activity. For the culminating activity, graduate students self-selected an educational issue and develop a research proposal written in American Psychological Association (APA) style that describes and substantiates the need to study the identified issue. In their research proposal, graduate students also delineate a systematic way to study the issue using a specific research methodology. Completed research proposals addressed the following sections: Introduction, Review of Literature, and Methodology. As primary instructors for this course, Chanel and Laurie frequently collaborated on the design of the course, established the same set of learning objectives, and adopted the same required course text. Additionally, Chanel and Laurie were both qualified to teach this course (i.e., earned the doctorate degree in the teaching discipline), had experience teaching online graduate courses, and supported their postsecondary teaching practices with research-based writing pedagogies.

For the present study, Chanel and Laurie incorporated peer review learning activities with writing that required use of the Describe-Evaluate-Suggest feedback model. Developed by Eli Review (2016), this feedback model provides graduate students with a framework for giving helpful feedback. For the Describe aspect, helpful feedback explains what the reader sees in a particular text excerpt. For the Evaluate aspect, helpful feedback elucidates how a text excerpt does or does not meet the assessment criteria. For the Suggest aspect, helpful feedback gives specific advice on how a text excerpt may be improved.

Chanel and Laurie deployed peer review learning activities in their course sections using two different technology tools. Chanel used Eli Review, a web-based peer-review platform. After experiencing frustration with the technology tools available in the Blackboard Learn 9.1 LMS, Chanel began using Eli Review the semester prior to the commencement of the present study. During this time, Chanel participated in customized training with Eli Review's professional development coordinator and familiarized herself with Eli Review training resources accessible from the website. Chanel's training focused on incorporating Eli Review into the instructional design of the course (e.g., restructuring the syllabus to include multiple peer review learning activities) and the instructional design of peer review learning activities (e.g., analyzing data to inform instruction, coaching students to leave more helpful feedback and grouping students). Graduate students enrolled in Chanel's courses were required to purchase a six-month subscription for Eli Review for $25.

Laurie used word processing software tools available through Microsoft Word and Google Docs. These tools included the commenting features available in Google Docs and Microsoft Word. There were no fees associated with these software tools, so long as the graduate students enrolled in Laurie's courses had either an active Google account or a version of Microsoft Word software installed on their computers. Laurie provided graduate students in her courses with the option to use either software tool.

Research Design

Chanel and Laurie used a qualitative action research design to achieve the goal of the present study. Action research is a systematic way to use research to improve teaching and learning practices (Tripp, 2005). Action research uses recognized, discipline-specific research techniques to investigate measures taken to improve the quality of professional practices. Action research has been deemed "a valued research method" to research pedagogical practices, staff development, and student engagement in postsecondary education (Gibbs et al., 2017, p. 14). With this in mind, Chanel and Laurie felt this type of research design was the most appropriate way to address the research questions for the present study and explore technology tool usage during peer review learning activities through the lived experiences of graduate students and themselves.

Participants

Chanel and Laurie used convenience and purposive sampling techniques to elicit participation among graduate students in the present study. At the beginning of each long semester (i.e., fall and spring), Chanel and Laurie sent a recruitment email to all graduate students enrolled in the sections of the Education Research course that they were scheduled to teach. Graduate students who elected to participate provided consent and were informed that they would complete an online questionnaire

related to their experiences with the peer review learning activities. These sampling techniques resulted in a research sample of 77 participants (i.e., 30 participants in Chanel's courses and 47 participants in Laurie's courses) who came from a variety of age groups, educational backgrounds, and career fields.

Procedures

In Chanel's course sections, graduate students participated in peer review learning activities beginning with the fourth week of the semester and continuing on through the fourteenth week. Prior to the deployment of the first peer review learning activity, Chanel introduced her graduate students to the Describe-Evaluate-Suggest feedback model with an instructor-created video and examples of mentor texts for research proposals. After graduate students completed the first peer review learning activity, Chanel created and shared a video that highlighted examples of helpful feedback and demonstrated how to improve unhelpful feedback. During peer review learning activities, graduate students followed a sequence of actions designed to support the composition of their research proposal section-by-section:

1. Read the textbook chapter that corresponded to the research proposal section under study.
2. Watch the instructor-created video that modeled how to compose the section under study using the corresponding instructor-created self-assessment checklist.
3. Compose a writing draft for the research proposal section under study and upload it to the Eli Review website.
4. In the Eli Review platform, use the instructor-created self-assessment checklist to provide feedback on the writing drafts of two to three peers following the Describe-Evaluate-Suggest feedback model.
5. In the Eli Review platform, review the feedback received from peers and revise and edit the writing draft to create a more polished version of the research proposal section under study.

In Laurie's course sections, graduate students completed lesson modules where they engaged with course text readings, online lectures, small group learning activities, and writing tasks beginning with the second week of the semester and continuing on through the thirteenth week. During each lesson module, graduate students completed the following tasks:

1. Read the required course text readings that corresponded to the research proposal section under study.
2. View the online lecture.
3. In the LMS, brainstorm writing ideas related to the topic under study with a small group of five to seven peers.
4. Complete the writing task for the lesson (i.e., a writing draft for a specific section of the research proposal).

For each submitted writing task, Laurie provided each graduate student with helpful feedback using the Describe-Evaluate-Suggest feedback model. During the fourteenth week of the semester, graduate students reviewed all instructor feedback provided on their research proposal sections and created a written draft of their entire research proposal. The following week, graduate students were assigned a peer partner from their small group and completed a peer review learning activity. Each pair selected their preferred technology tool (i.e., Microsoft Word or Google Docs) and exchanged research proposal drafts. Graduate students were instructed to provide their peer partner with helpful feedback using the Describe-Evaluate-Suggest feedback model. Graduate students then reviewed the peer feedback they received to revise and edit their research proposal into a final version.

Data Collection and Analysis

In order to ascertain a richer and more balanced understanding of peer review learning activities, Chanel and Laurie collected data from multiple sources (Elliott & Timulak, 2005). First, they collected responses from a 20-item questionnaire that participants completed at the conclusion of the course. The questionnaire included:

a. (a) five demographic questions to ascertain information about the background of participants;
b. four closed-ended questions to ascertain participants' perceptions for ease of use, level of proficiency, level of helpfulness, and level of confidence with the peer review technology tool; and
c. 11 open-ended questions to elicit more comprehensive understandings about participants' experiences with peer review learning activities.

Second, Chanel and Laurie collected all feedback that participants provided to their peers during the peer review learning activities. This data source consisted of over 500 comments provided by participants who used Microsoft Word or Google Docs and over 1,000 comments provided by participants who used Eli Review. Third, Chanel and Laurie were active participant observers in the present study. Therefore, they kept written logs that documented notes concerning the instructional design of the course and peer review learning activities.

Chanel and Laurie analyzed data using a conventional content analysis technique to employ a systematic process of coding text data that identified patterns and themes (Hsieh & Shannon, 2005). They uploaded all text data into Dedoose, a web-based application for research involving qualitative analyses (www.dedoose.com). During data analysis, Chanel and Laurie used two cycles of coding with each data source to investigate patterns that emerged across and within data from both groups (Saldaña, 2016). In the first cycle, they used NVivo coding to record initial codes that preserved the voice of participants. For example, the NVivo codes assigned to words and phrases in questionnaire responses were Feedback not Given on Time, Challenge of Completing Peer Reviews, Confidence Level, Trait or Criteria, Formatting in Eli Review, and Fear.

In the second cycle, Chanel and Laurie used focused coding to seek out recurrent and significant codes and develop relevant categories across all data sources. Some example categories established during focused coding were Describe-Evaluate-Suggest Feedback Model; Specific Revision Suggestions; Synthesize; and Spelling. As Chanel and Laurie assigned codes during the first and second coding cycles, they used the memo feature in Dedoose to write analytic memos that recorded their thoughts, connections and comparisons, questions, and possible directions to pursue (Charmaz, 2014). These analytic memos assisted them with deconstructing codes and data and discovering deeper meanings.

Lastly, Chanel and Laurie created "categories of categories," known as themes, by reducing and rearranging the categories they created in the second coding cycle (Saldaña, 2016, p. 278). Chanel and Laurie organized categories and subcategories in a nonhierarchical manner so that categories were weighted equally. For example, the category Characteristics of Scholarly Writing included the subcategories APA Format and APA Structure. Afterward, they reviewed the code co-occurrence chart generated by the Dedoose, the relationships among categories, and their analytic memos as guides to construct themes and a key assertion for the present study.

RESULTS

Based on analysis of data, the key assertion for the present study is that instructors who use peer review learning activities among graduate students in online learning environments must be aware of instructional design considerations and the influence that instructional design has on teaching and learning. Data analysis also uncovered the following three themes:

- Technology-Based Peer Review Learning Activities Have an Impact on the Instructor,
- Technology-Based Peer Review Learning Activities Have an Impact on Graduate Students, and
- Instructors' and Graduate Students' Viewpoints for Technology-Based Peer Review Learning Activities.

A description of each theme is provided below.

Technology-Based Peer Review Learning Activities Have an Impact on the Instructor

A noteworthy finding in the present study was related to the impact that technology tool usage for peer review learning activities had on the researchers' allocation of time with instructional design. By using Eli Review, Chanel spent a great amount of time in training to familiarize herself

with the technology tool. She also identified and shared resources with graduate students that developed their familiarity with Eli Review. Laurie also spent an extensive amount of time in planning for each peer review learning activity, such as creating a self-assessment checklist and video that modeled writing for each research proposal section, entering due dates and assignments into Eli Review, and creating the video after the initial peer review session that addressed helpful and unhelpful feedback. After each peer review learning activity concluded, Chanel spent a moderate amount of time evaluating the quality of feedback that graduate students provided each other. Chanel assigned participation grades for each peer review session using the following assessment criteria: graduate students who provided helpful feedback that followed the Describe-Suggest-Evaluate feedback model received full credit, whereas graduate students who provided less helpful feedback earned partial credit. Thus, Chanel spent the greatest amount of time designing the peer feedback activities, assessing the feedback, and coaching students on how to provide more helpful feedback. Correspondingly, she spent a much smaller amount of time evaluating the research drafts.

By using word processing software tools available through Microsoft Word and Google Docs, Laurie did not require any training, though she provided graduate students with web links containing information for using these technology tools as resources. However, the majority of graduate students indicated that they had previous experiences with these tools. Although Laurie only deployed one peer review learning activity towards the end of her courses, she incorporated several small-group learning activities as a way for graduate students to develop a rapport with each other and generate ideas for subsequent writing tasks, which were writing drafts for each section of their research proposal. After each draft was submitted, Laurie provided helpful feedback using the Describe-Suggest-Evaluate feedback model. For the peer review learning activity, graduate students used the feedback Laurie provided for each writing draft section to compose a research proposal draft. Laurie created pairings between graduate students in each small group, and peer partners exchanged research proposal drafts to provide each other with helpful feedback using the Describe-Suggest-Evaluate feedback model. Laurie used the same assessment criteria as Chanel to evaluate the quality of feedback provided during the peer review learning activity. Thus, Laurie spent a moderate amount of time planning the small group activities, writing tasks, and the peer review learning activity, while she invested an extensive amount of time evaluating.

Technology tool usage for peer review learning activities also impacted how the researchers promoted the graduate students' ability to provide peers with helpful feedback using the Describe-Suggest-Evaluate feedback model. In Eli Review, Chanel was able to view all the feedback provided after graduate students completed a peer review session. She could then endorse their feedback comments as helpful or provide recommendations for improvement. Since graduate students in Chanel's classes completed several separate peer review learning activities during the semester, they had multiple opportunities to practice and learn how to provide helpful feedback. Rather than apply a coaching approach, Laurie relied more heavily on a modeling approach. Throughout the semester, Laurie used the Describe-Suggest-Evaluate feedback model to provide her graduate students with helpful feedback on several writing drafts. By doing so, Laurie developed the graduate students' knowledge concerning the provision of helpful feedback so that they were equipped to apply these understandings during the peer review learning activity.

Technology-Based Peer Review Learning Activities Have an Impact on Graduate Students

Analysis of the data also demonstrated the impact that technology tool usage for peer review learning activities had on learning among graduate students. Although both researchers utilized a systematic approach for providing helpful feedback (i.e., the Describe-Suggest-Evaluate feedback model), they noticed one meaningful difference in how students accessed and used supplementary resources and tools. In Chanel's classes, graduate students were able to reduce the number of supplementary resources and tools they needed to conduct peer reviews because the information was available in Eli Review. For example, these graduate students were able to view the self-assessment checklist within the same window as the writing for which they were conducting a peer review (see

Figure 1). One graduate student described how they accessed and used the supplementary resources and tools that were housed in Eli Review:

First, I would read the criteria listed to the side so I would know what I was looking for in the writing. I would read the text through once without stopping to add comments, then I would read it again and highlight or comment on areas where I noticed that revision needed to take place. I would then go back through the list of criteria [in the self-assessment checklist] and search for each item in the text, checking them off as I observed them. If I noticed that something was missing from the checklist, I would go back to the text where it should be and make a comment to let the author know why I didn't check the box.

Conversely, the graduate students in Laurie's course accessed and used a number of external supplementary resources and tools that were accessible outside of Microsoft Word or Google Docs during peer reviews. The data showed that graduate students used:

- emails (e.g., "I emailed my peer requesting her paper to be emailed to me.");
- online sources (e.g., "My peer noticed that I had left off a caption in one of my visual representations and gave me a direct link to the OWL Purdue page that addressed figures.");
- course-related items, such as lectures, previous learning activities, assessment criteria, and instructor evaluations (e.g., "I reviewed all of the course rubrics and professor comments on my work."); and
- printed texts, such as dictionaries and style manuals (e.g., "I used the dictionary several times to check on word meanings and spellings as I wrote comments.").

As a result, these graduate students were not able to view supplementary resources and tools in a simultaneous manner.

Data analysis also showed striking differences with technology tool usage and the helpfulness of feedback provided during peer review learning activities. As shown in Table 1, graduate students who used Eli Review predominantly providing helpful feedback that focused on the development of content, reference citations, and clarity. On the other hand, graduate students who used word processing software tools predominantly provided

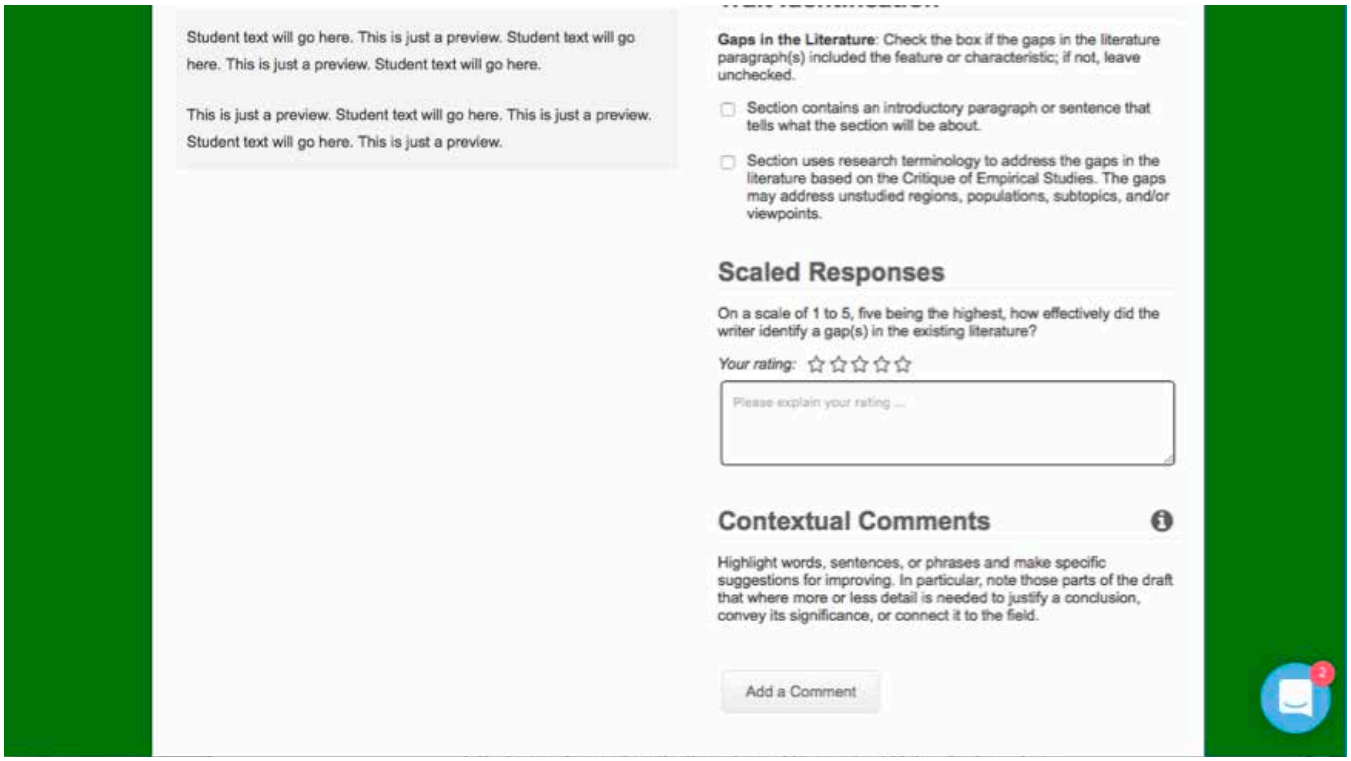

Figure 1. How self-assessment checklists were displayed in Eli Review.

helpful feedback that focused on correct usage of APA formatting and Standard English conventions, as well as indications for possible rewording. The researchers also noticed that the peer feedback given mirrored the expectations for writing performance that they each had communicated to their graduate students. Among students who used Eli Review, the majority of feedback reflected the traits on the self-assessment checklist that Chanel provided during each peer feedback session. Alternatively, the majority of feedback provided by students who used word processing tools reflected the guidelines Laurie delineated in the peer review learning activity instructions.

Word), and Laurie provided graduate students with another no-cost option via Google Docs. In her instructional design, Laurie spent much time creating a safe environment for receiving feedback. Based on her previous teaching experiences, Laurie was cognizant that receiving feedback can be an intimidating experience for graduate students. In this same manner, Laurie was mindful that graduate students required assistance with giving helpful feedback. Therefore, she provided graduate students with the helpful feedback that they needed to improve their own writing, while also modeling what helpful feedback looked like.

Although Chanel and Laurie addressed the instructional design of their courses and peer review learning activities differently, data analysis showed that all graduate students in the present study developed understandings with education research concepts and techniques. No matter the technology tool, graduate students used phrases and terminology that were presented in lesson modules within their feedback comments. For instance, one feedback comment described how to become "a more credible researcher" by consulting and referencing peer-reviewed sources. Chanel and Laurie also noticed a significant shift in the writing tone of their graduate students. At the beginning of the semester, Chanel and Laurie often saw an explanatory writing style that frequently used a first-person, reflective tone. However, by the end of the semester Chanel and Laurie observed tremendous growth among all graduate students in their ability to produce academic writing in APA style with a more scholarly tone. Data analysis in the present study also revealed the viewpoints of graduate students towards technology tool usage

Table 1. Feedback Focus, Description, and Number of Occurrences

Feedback Focus	Description	Number of Occurrences
Development of Content	A comment concerning how a specific area of writing may be elaborated upon.	
Eli Review		435
Word Processing Tools		91
Reference Citations	A comment concerning formatting or the need for a reference citation.	
Eli Review		319
Word Processing Tools		45
Clarity	A comment explaining how an excerpt of text was not clear to the reader.	
Eli Review		302
Word Processing Tools		62
Positive Recognition	A comment praising an aspect of the writing that was well received by the reader.	
Eli Review		282
Word Processing Tools		99
APA Formatting	A comment concerning stylistic guidelines for writing in APA style.	
Eli Review		264
Word Processing Tools		171
Standard English Conventions	A comment concerning the conventions of Standard English, such as spelling.	
Eli Review		206
Word Processing Tools		220
Rewording	A comment that indicated possible rewording for a specific word used.	
Eli Review		153
Word Processing Tools		132

to facilitate peer review learning activities. With respect to levels of confidence, Chanel and Laurie found that after participating in the peer review learning activities:

- 38 graduate students indicated that they had moderate levels of confidence (e.g., "I felt pretty confident in giving feedback on my partners' paper");
- 27 graduate students indicated that they had high levels of confidence (e.g., "I found myself to be very confident in giving helpful feedback as I made it my responsibility to focus on the writer's work and respond as I would want someone to respond to my work"); and
- 12 graduate students indicated that they had low levels of confidence (e.g., "My confidence level was really low because I kept questioning whether or not I was doing it correctly).

Graduate students also requested further instruction on how to use the Describe-Suggest-Evaluate feedback model; how to format appendices; and how to cite multiple authors. Chanel and Laurie both felt that they designed their courses and peer review learning activities to scaffold graduate students' ability to provide feedback, so they were very surprised that over 65% of graduate students reported low or moderate levels of confidence. Interestingly, the findings in the present study showed that graduate students provided accurate peer feedback. Of the 2,399 peer feedback comments that were analyzed, there were only two instances of inaccurate peer feedback:

- "References are all great and diverse. You did a good job adding several types of references, not just research journals, which can sometimes be redundant." (Eli Review peer feedback comment).
- "Several of your citations have author's middle initials. Example, Paulson, L. H. and Kelly, K. L. should be Paulson, L. and Kelly, K." (Word processing tools peer feedback comment).

Contrary to their personal assumptions, graduate students demonstrated that they were capable of giving accurate peer feedback.

Graduate students also disclosed the challenges that they encountered while engaged in peer review learning activities. These challenges included time restraints, challenging course content, peers not completing tasks on time, lack of familiarity with the technology tool, and lack of understanding with the expectations for performance. Additionally, graduate students expressed frustration concerning peers who provided unhelpful feedback because it was not useful when they attempted to revise their writing.

DISCUSSION

The goal for the present study was to add fresh insights and new understandings to an under-researched area concerning technology tool usage during peer review learning activities among graduate students. To achieve this goal, the researchers implemented peer review learning activities in two different sections of an online graduate course using two different technology tools: Eli Review, a web-based subscription service, and word processing software tools available through Microsoft Word and Google Docs. Using a qualitative action research design, the researchers examined how technology tool usage affected the instructional design of peer review learning activities and the helpfulness of feedback that was given and received. During analysis of data, three themes emerged that have suggested two implications for instructors interested in using peer review learning activities among graduate students within online learning environments.

First, a wide range of technology tools are available to facilitate peer review learning activities among graduate students in online learning environments, such as asynchronous LMS tools (Gikandi & Morrow, 2016; Pritchard & Morrow, 2017), computer-supported collaborative learning systems (Yang, 2016; Yeh, 2015), and web-based services (Chew et al., 2016; Murray & Boyd, 2015). When choosing a technology tool, instructors should first consider the accessibility of potential technology tools and levels of familiarity with their functionality. With respect to accessibility, instructors should inform graduate students upfront of any associated costs for the selected technology tool and consider providing alternative options for instances where costs present a financial hardship. With respect to familiarity, instructors should first ensure that they themselves are proficient with

functionality of the selected technology tool and complete any needed training prior to its use. Once instructors attain a desired level of proficiency, they should then query graduate students concerning their levels of proficiency with the technology tool and provide access to any needed training resources, such as instructional videos, informative documents, and tutorials. Instructors should also consider course length and rigor during technology tool selection. Courses that are delivered in condensed formats or are intellectually demanding may not be conducive for the inclusion of technology tools for which instructors and graduate students possess low levels of familiarity.

Second, instructors must design peer review learning activities for graduate students that provide clear and explicit instructions, guidelines, and assessment criteria. This implication was further substantiated in the available literature. While designing technology-based peer review learning activities, instructors should ensure that they provide an appropriate amount of time for graduate students to compose sufficient writing drafts, conduct satisfactory peer reviews with which to give helpful feedback, appraise feedback received, and use helpful feedback to guide any revisions and edits they make to their writing drafts (Gikandi & Morrow, 2016; Murray & Boyd, 2015). Additionally, instructors should ensure graduate students are adequately prepared to participate in peer review learning activities. In the present study, the researchers required graduate students to use the Describe-Evaluate-Suggest feedback model but incorporated different preparatory activities (e.g., instructor-modeled helpful feedback and demonstrations of how to improve unhelpful feedback) to promote graduate students' ability to give helpful feedback. Such efforts create alignment between peer feedback and subsequent instructor feedback, establish trust within the online learning environment, and foster "a level of comfort and proficiency" with assignment and assessment criteria among all graduate students (Landry et al., 2015, p. 49).

LIMITATIONS AND AREAS FOR FUTURE RESEARCH

Although Chanel and Laurie included a triangulation of large amounts of data in the present study, one limitation may affect the transferability of reported findings. Chanel and Laurie used convenience sampling techniques to obtain the research sample. Due to the nature of postsecondary graduate course enrollment, random course assignment was not possible. Also, participation was entirely voluntary, so they ended up with an uneven number of participants in each group.

As an under-researched area, more studies are needed that examine use of technology-based peer review learning activities among graduate students. Specifically, researchers should investigate how confidence levels and the helpfulness of feedback evolve over time. By investigating the processes that graduate students use to give peers helpful feedback, instructors may better understand how to design preparation resources and trainings for peer review learning activities. In addition, researchers should investigate how graduate students appraise and apply helpful feedback given on a writing draft to subsequent revisions and edits. Information from these research efforts may inform instructors on more effective ways to support how graduate students evaluate the helpfulness of feedback received and use it to improve the quality of their writing.

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