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Peer-supported Writing in Graduate Research Courses: A Mixed Methods Assessment

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Peer review enhances student knowledge acquisition and the ability to meaningfully apply that knowledge. Formative assessment is the source of much of the positive effect of the peer review process. This evaluation investigated the affective experiences of graduate students as they navigated the writing of their research proposals. The authors created a mixed-methods, quasi-experimental, pre-test/posttest, comparison and control group evaluation of a peer review process in a graduate research methods class. Students writing a research proposal reviewed each other's proposals while receiving both formative and summative feedback from their professor. Pretest/posttest findings showed that students experiencing the peer review process reported reduced anxiety and improved scores on an assessment of their experience of the research process. Qualitative findings suggest that the peer review process helped with content mastery and created peer support that reduced assignment-related anxiety. Peer review is recommended as a tool that reduces research anxiety and helps students feel more confident in their abilities, even if they are not enthusiastic about research methods as a topic or a skill.

Perhaps unsurprisingly, many graduate students experience considerable stress when required to produce essential pieces of writing to be evaluated in their university coursework (Stewart, Seifert, & Rolheiser, 2015), particularly in a research methods course. This stress has been observed to be experienced unevenly across gender, socio-economic, and racial groups, with groups identified as diverse, female, and with a low socio-economic status reporting higher levels of stress than other groups (Davis, 2003). At the same time, suggesting a more sustainable approach to providing feedback, Boud and Molloy (2013) recommended the utilization of peer review that not only provides more feedback, but also enhances a student's ability to critically review his or her own writing and thus lessening the need for constant feedback from professors. To better support students, increase equity among different student populations, to improve writing, and to alleviate the stress students experience in research writing, we have developed a peer review writing approach in research courses in both a Master of Social Work program and a Reading Master's program. The purpose of this paper is to examine the implementation of a peer review writing approach in terms of student stress and student focus on the essential concepts underlying the research process.

In this study, we have adopted a definition of peer review that describes it as "an arrangement in which individuals consider the amount, level, value, worth, quality, or success of the products or outcomes of learning of peers of similar status" (Topping, 1998, p. 250). This means that, for the purposes of this study, the learning outcome (the research paper) is valued among all participating students who are invested in creating strong papers. It also means that the peers generally see each other as equals in status.

While the value of providing students with experiences in designing and conducting research has been established in the constructivist traditions of Dewey (Cobb & Kallus, 2011), this work stems from the social constructivist theory of Vygotsky (1978) and the social cognitive theory described by Bandura (1986). These theories suggest that learning is ultimately a social experience and that the influence of peers scaffolds greater learning than learning done in isolation. In particular, the notion that peer support can increase a learner's perception of self-efficacy (Bandura, 1997) as researcher-practitioners underlies the approach taken in this study.

There are many established benefits for using peer review to support students as writers. Initially, students typically feel reluctant to have their writing reviewed or to review the work of others. They cite discomfort in having someone other than the instructor evaluate their work, particularly in respect to receiving grades. Yet, after experiencing the peer review process, students regard the process as satisfactory and positive (Planas Llado et al. 2014; Vu & Dall'Alba, 2007). Interestingly, this satisfaction is stronger for students who have had work experience in their field of study (Gatfield, 1999).

Considering the differences between feedback offered by a professor versus feedback offered by a peer, Falchikov and Goldfinch (2000) found evidence suggesting that for the more global measures of writing, peer feedback is mostly in agreement with professor feedback. However, when feedback is more focused on practice or professionalism such as in a practicum setting, there are greater differences between peers and professors. In measuring the reliability and validity between peer assessments and instructor assessments, it has been found that there is a high degree of both reliability and validity. That is to say, when given clear

assessment parameters and protocols, peers have been observed to assess a paper similarly to the professor (Cho, Schunn, & Wilson, 2006; Topping, Smith, Swanson, & Elliot 2000) even when the assessment is facilitated through a software program (Paré & Joordens, 2008).

A number of studies provide evidence that peer review can positively affect both the knowledge gained in the learning experience and the ability to meaningfully apply that knowledge. One important source of these positive impacts appears to be the formative assessment that is inherent in the peer review process: a type of assessment that, while becoming more popular, is lacking or misunderstood in many higher education settings (Torrance, 2012; Vu & Dall'Alba, 2007). Students reported that formative peer review helped them to deepen their understandings of the content being taught, in addition to enhancing their understanding of the varied topics being investigated by their peers (Paré & Joordens, 2008). It also helped students gain confidence in both their independent learning as well as in group discussions held in class. Specifically, students reported that peer assessment helped them to read journal articles more successfully as well as to understand how to reference those articles (Vickerman, 2009). Additionally, peer review helps to "inform the learner's judgments for learning beyond the immediate task" (Boud, 2009, p. 704), suggesting benefits that extend beyond the writing assignment. Boud and Molloy (2013) suggested the peer review process helped students learn to avail themselves of available resources and to create products that better approximate both the process and product expected in their fields of study. Topping (1998) reported that peer assessment promotes active over passive learning. It also promoted the development of verbal skills such as negotiation and diplomacy (Riley, 1995). Peer assessment can also help students learn to give and to receive criticism and constructive suggestions, and it appears to promote skills that are transferable to employment (Marcoulidis & Simkin, 1991) and to real-world scientific discourse (Hanrahan & Isaacs, 2001; Paré & Joordens, 2008; Prins, Sluijsmans, Kirschner, & Strijbos, 2005). On a very pragmatic level, peer review provides both quantitative and qualitative feedback in a timelier manner than the typical turn-around of graded papers (Paré & Joordens, 2008).

Previous research has also found many benefits from peer review in helping students develop as writers, especially as they experience the stress of writing research proposals (Onwuegbuzie, 1997). Although students reported that the peer review process was time consuming and unwieldy, ultimately students felt that it improved their writing (Topping et al., 2000). Topping (1998) notes that peer review helped writers to have a better sense of what constitutes quality writing. Vu & Dall'Alba (2007) found that peer review helped students understand the writing process itself. Along those lines, students engaged in peer assessment were able to self-evaluate their own writing in relation to the writing of their peers (Vickerman, 2009). This means that they are able to evaluate their own writing and to avoid overestimation and underestimation of the quality of their work. Topping (1998) notes that peer assessment has been shown to provide more feedback to students in a timelier manner, allowing greater opportunity to improve writing. In measuring the quality of papers written by students who experienced peer review, Richer (1992) found that such papers were better than the papers of students who did not have peer review.

Research Question

Evidence suggests that a student's attitudes, beliefs, and emotional response can effect a student's experience in writing (Daly & Wilson, 1983; Onwuegbuzie, 1997). Recognizing the intense writing demands on graduate students, we seek to understand the particular affective experiences as they navigate writing their research proposals. Put simply, how does peer review impact the writing experiences in a research class for graduate-level students? Does peer review reduce the negative affective responses to writing?

Methodology

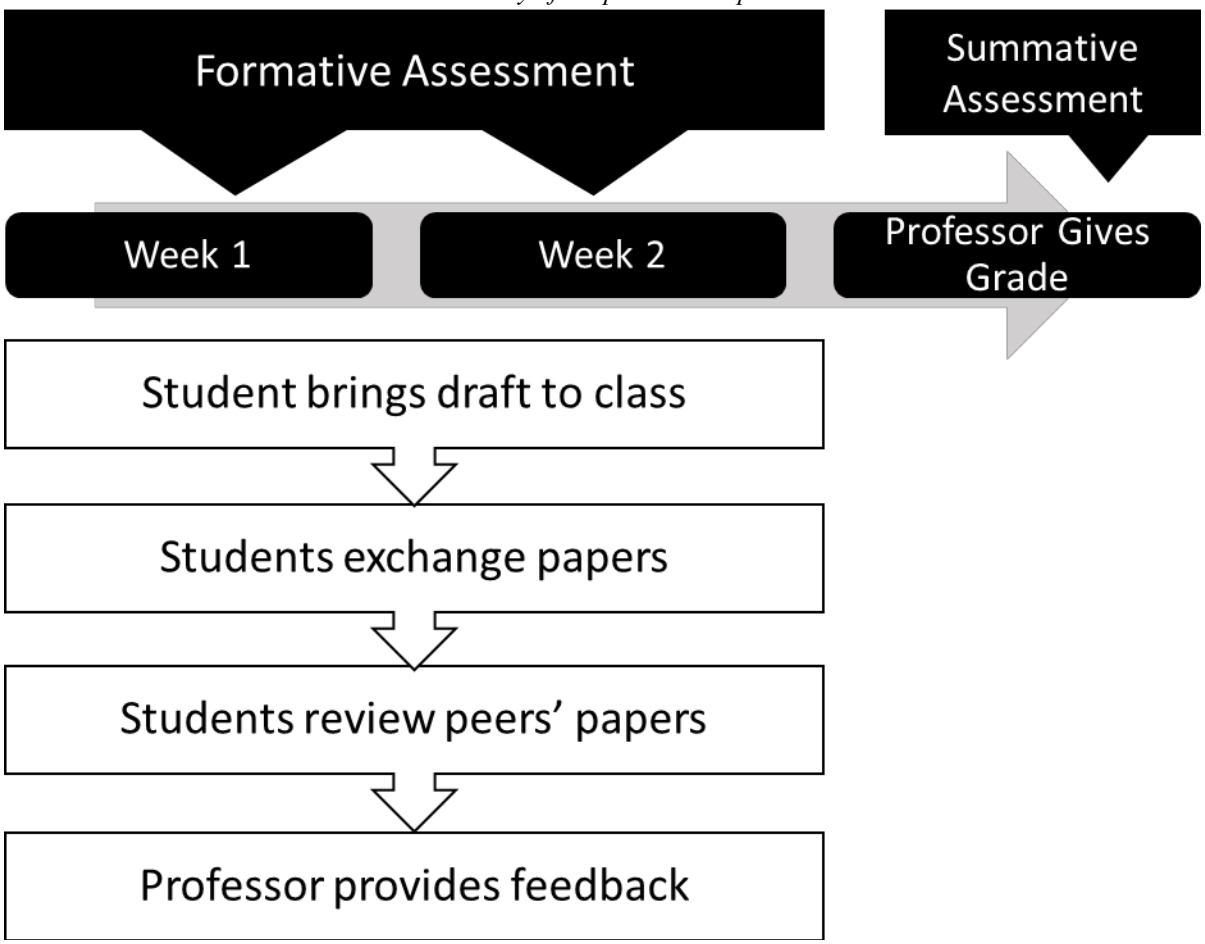
Sample

The sample for this research included full-time and part-time students enrolled in a full 60-credit Master of Social Work (MSW) degree program at two small state-funded universities in the eastern United States. Students in this program are required to take a 15-week course, meeting once a week for nearly three hours, that teaches research methodology and culminates in writing a research proposal. These two universities share the program and faculty, and they often share the same students, thus the academic abilities of the two groups were assumed to be somewhat similar. The experimental group at one university and consisted of 21 students, with three males and 18 females. Two students were African Americans, one was Latino, and another was Native American, while the rest were White. The control group at the other university consisted of 22 students, three of whom were males and 19 were females. One student identified as Latino, and one identified as Native American, while the rest were White. Thus, based on these few demographic characteristics, both groups appear to be fairly similar.

Intervention

Students in the experimental group participated in a small group peer review process that was supplemented by

Figure 1
Summary of the peer-review process



formative assessment from the professor. During the first class sessions of the 15-week semester, small groups of two to four students were formed to collaborate on the activities related to developing research questions and hypotheses, developing and assessing measurement instruments, assessing the research literature; and evaluating prospective research designs. This laid the foundation for the culminating assignment in the class: a formal research proposal complete with an introduction, literature review, and methodology. Both the peer review and formative feedback from the professor came into play in this research proposal assignment.

The last eight weeks of the course were divided into four two-week sections focused on the three "chapters" of the research proposal and the final draft of the completed proposal. During these weeks, the first half of the two-hour class was spent in traditional lecture or small group activities focused on research-specific content, such as sampling, data analysis, and single-case evaluation. The second half of the class was devoted entirely to peer review and formative evaluation, where the small peer groups met to read and provide feedback on each other's' drafts (see Figure 1.). During this time the professor also circulated through the class and attempted to read each student's paper and provide formative feedback. During the peer review exercise students were encouraged to not only focus on grammar, formatting, and writing skills, but to look more deeply at their peers' proposal in terms of research design and appropriate application of research concepts. After two sessions of peer review and formative assessment each proposal section was submitted to the professor for a grade (summative evaluation). At no point in this peer review process did students provide a summative evaluation such as a grade; rather, they simply provided formative feedback to their peers with the goal of improving the completed written assignment.

The two-week peer review process was repeated for each of the three sections or chapters of the

proposal: Introduction, Literature Review, and Methodology. Once the entire proposal was put together the student's peers also assessed the full proposal, and the professor provided formative evaluation of the full proposal. In other words, by the time the final proposal was turned in, each individual chapter had been read twice by the student's peers and three times by the professor, plus the complete proposal had been read twice by the student's peers and twice by the professor. The comparison group experienced similar pedagogical instructional methods and research paper expectations to those of the experimental group, without the opportunity for peer review or formative assessment from the professor.

Research Design

The general design of this research is the classic pretest-posttest quasi-experimental design with nonequivalent groups. The two groups involved in the research were students in graduate level, first-year Master in Social Work (MSW) introductory research courses. Students in both courses were part of the same MSW program, used the same introductory research text, and completed similar assignments. The primary difference between the two groups (other than the difference in instructors) was that students in the comparison group (n=22) completed the research course without the peer review exercises while those in the experimental group (n=21) completed the research course with peer review exercises. These peer review exercises were primarily used to guide the students through the process of writing a traditional research proposal, complete with an introduction, literature review, and methodology section; however, there was significant peer involvement in all aspects of the teaching, including instruction on searching, reading and referencing research literature. At each step of the proposal writing process- introduction, literature review, and methodology- students received formative feedback on two subsequent drafts of their papers from both the professor and from their peers.

Measurement Instrument

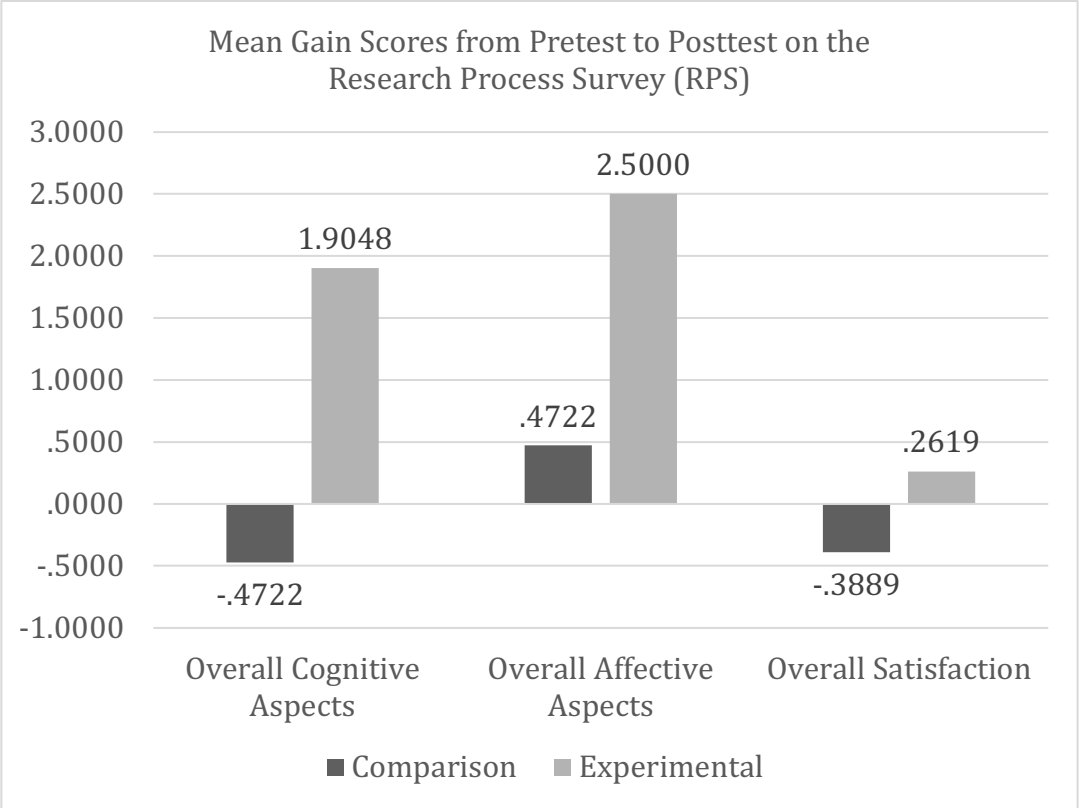
The measurement instrument used in this study was a two-part paper survey consisting of the Research Process Survey (RPS) (Kracker, 2000; Kracker & Wang, 2002) and the short-form of the Spielberger State-Trait Anxiety Inventory (STAI) (Marteau & Bekker, 1992). The first part of the RPS was based on the work of Jacqueline Kracker (Kracker, 2002; Kracker & Wang, 2002), which was inspired by the earlier work of Carol Kuhlthau, the developer of the Information Search Process Model, which describes the thoughts, feelings, tasks, and actions that are associated with the typical student's progression through the six stages of research (Kuhlthau, 2004). Kuhlthau's work (e.g., Kuhlthau, 1988; Kuhlthau, 1991; Kuhlthau, 2004) recognized that emotions such as confusion, uncertainty, anxiety, and doubt naturally play a role in the research process. The resulting instrument is called the Research Process Survey (RPS), which Kracker used (Kracker, 2002; Kracker & Wang, 2002) to investigate the cognitive and affective aspects of the research process together with the anxiety and satisfaction experienced with the research process.

The RPS is a two-part survey with quantitative and qualitative sections. The quantitative sections consist of 18 pairs of statements which participants respond to using a five-point Likert-type scale ranging from "Strongly Disagree" to "Strongly Agree" with a midpoint of "Sometimes". One statement in each pair is written so that high scores (i.e., Strongly Agree) are an indicator of high awareness or a high satisfaction level, while the second is worded to reflect the inverse or reverse of the other statement in the pair. During the data coding process the reverse/inverse items are recoded so that the subjects' indication of a high level of awareness or satisfaction results in a high score. Scores from each pair of statements are averaged to obtain subvariable scores, and subvariable scores are summed to obtain a measure for each variable. The subvariables include eight measures of awareness of the cognitive aspect of the research process and eight measures of the affective aspects of the research process. There are also two subvariables dealing with the perceived satisfaction with the research process. Kracker (2002) demonstrated a high degree of reliability and validity for the RPS.

The qualitative section of the RPS asks subjects to recall a recent research assignment and describe their thoughts and feelings as they worked through that project. In the pretest version, students consider their most recent research experience prior to completing the survey; the posttest asks them to look back on the research proposal writing from the current semester. To gather additional qualitative data, we added a question to the post-test asking participants to list the pros and cons of participating in peer review.

The second part of the research instrument is a brief anxiety scale developed by Marteau and Bekker (1992). This scale is a six-item short-form of the Spielberger State-Trait Anxiety Inventory (STAI-6) which is a 40-item scale originally developed in various forms during the 1970s and 1980s. The STAI-6 is a reliable and sensitive measure of anxiety that is frequently used in applied psychology research. The abbreviated version used in this research has "acceptable reliability" and produces results similar to the full form of the STAI (p. 305). This shorter version also has the advantage of maximizing response rates and reducing response errors, including unanswered items. Obviously, a shorter survey also reduces the time to take the survey and score the results.

Figure 2
Mean gain scores from pretest to posttest on the Research Process Survey (RPS)



Data Collection

Prior to collecting data from the students involved in this research, all research protocols and documentation were approved by the Institutional Review Board at the authors' institution. During the week before the initiation of the peer review exercises—around the mid-term of the course—students in both the comparison and experimental groups were given the pretest version of the RPS and short-form STAI. Paper versions of the surveys were distributed in class by the instructor. Before completing the surveys students were asked to sign an informed consent form, which was removed from the survey prior to data entry and analysis. The posttest procedures followed the same process in both classrooms during the last week of the semester when all of the peer-review exercises had been completed. The resulting data set included both the pretest and posttest surveys from both the comparison and experimental groups.

Data Analysis

The quantitative data collected using the RPS and short-form STAI produces four distinct variables for analysis that relate to the research process: Overall Cognitive Aspects, Overall Affective Aspects, Overall Satisfaction, and Anxiety. For each of these four variables, pretest to posttest gain scores were calculated by subtracting the pretest values from the posttest values. These gain scores of the comparison and experimental groups were then compared using an independent samples t-test to test for a statistically significance difference. Because of the small sample size, lack of random sampling, and the fact that the population variances for the two groups on one of the subscales was not equal, a non-parametric analysis of the non-parametric Independent-Samples Mann-Whitney *U* test was also calculated.

Qualitative data from the open-ended questions on the surveys was coded and analyzed following the constant comparative method (Strauss & Corbin, 1998). Pre-test responses were open coded while post-test responses were comparatively coded between the comparison and experimental groups. In order to affirm or reject the findings from this initial coding, we used a system of axial coding that looked for relationships between the codes found in the participant responses to the pros and cons of peer review and the coded results from the posttests.

Results

Quantitative Findings

For every subscale of the RPS (Overall Cognitive Aspects, Overall Affective Aspects, Overall Satisfaction) the experimental group of graduate students who participated in the peer review experience showed higher mean gain scores (see Figure 2).

Similarly, based on the gain scores, students in the peer review group reported much less anxiety at the end of the semester than the comparison group as measured by the STAI (see Figure 3).

The peer review group showed higher mean gain scores in the Overall Cognitive Aspects scale (-2.38), the Overall Affective Aspects scale (-2.03), and the Overall Satisfaction Scale (-0.65). The mean difference on the anxiety test (2.91) was quite large because the comparison group's anxiety scores actually increased from pretest at the beginning of the semester to posttest at the end of the semester, whereas the peer review group's anxiety scores decreased across the semester. These findings related to the means are summarized in Table 1.

An independent-samples t-test analysis of these findings showed that none of these differences in gain scores between groups were significant at the $p<.05$ level. However, the difference in mean gain scores between groups showed significance at the $p<.10$ level for the Overall Cognitive Aspects scale on the RPS ($p = .094$) and for the anxiety scores ($p = .096$).

A non-parametric analysis using the Independent-Samples Mann-Whitney *U* test was also conducted ($p = .053$). Just as with the parametric analysis, none of the previously mentioned subscales showed a significant difference at the $p < .05$ level. However, the Overall Cognitive Aspects subscale showed a significant difference between the groups at the $p < .10$ level. On this scale, the average rank for the comparison group was 16.17, and the average rank for the peer review group was 23.29. The difference between the groups on the other two scales in the RPS—Overall Affective Aspects and Overall Satisfaction—did not show significant difference in this non-parametric analysis at the $p < .10$ level. The same non-significant findings were present for the anxiety scores as well, which may be impacted by the small sample sizes involved in these analyses.

In a further effort to assess the magnitude of differences between the comparison and experimental groups we calculated an effect size for each of the four scales listed previously (see Table 1). The effect sizes generally indicate that on average on all four of these scales students in the experimental group show between a third and a half of a standard deviation improvement from pretest to posttest compared to the improvement of the average person in the comparison group.

Figure 3

Mean gain scores from pretest to posttest on the Spielberger State-Trait Anxiety Inventory (STAI)

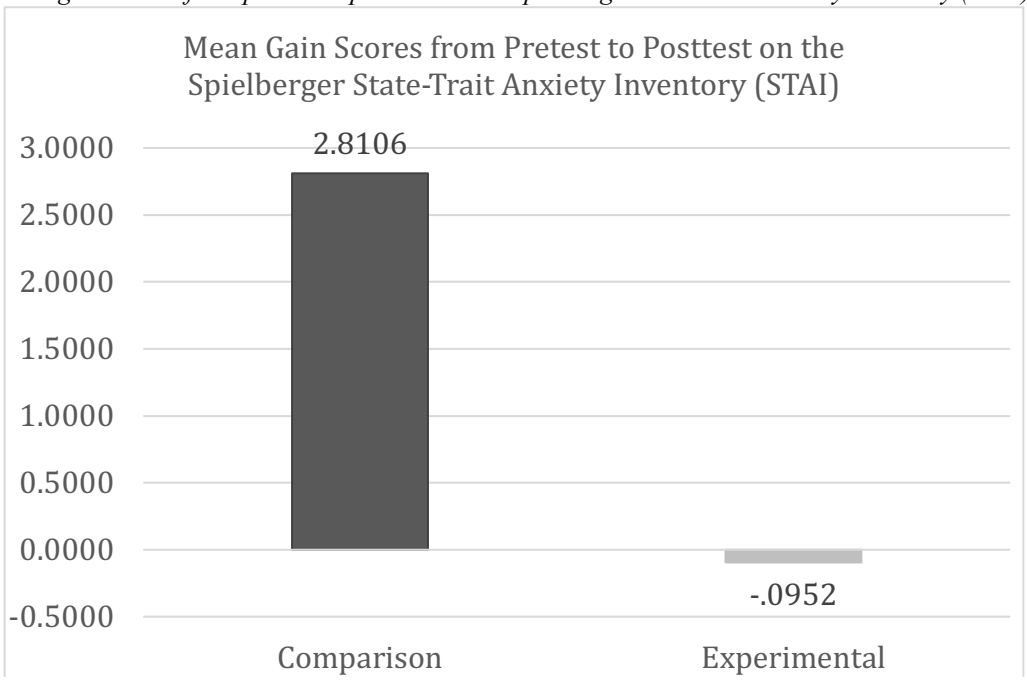


Table 1.
Comparison of Gain Scores (Pretest to Posttest) for RPS Subscales (Overall Cognitive, Overall Affective, Overall Satisfaction) and the Short-Form STAI (Overall Anxiety).

Class		N	Mean	Std. Deviation	Mean Difference	Ind. Samples t-test	Mann-Whitney U test
Overall Cognitive Aspects	Comparison	18	-0.47	5.30	-2.38	t(23.35) = -1.75 p = .094	.051
	Experimental	21	1.90	2.49			
Overall Affective Aspects	Comparison	18	0.47	6.84	-2.03	t(35.32) = -.95 p = .35	.234
	Experimental	21	2.50	6.45			
Overall Satisfaction	Comparison	18	-0.39	1.81	-0.65	t(30.88) = -1.26 p = .218	.133
	Experimental	21	0.26	1.34			
Overall Anxiety*	Comparison	18	2.81	6.76	2.91	t(37) = 1.71 p = .096	.148
	Experimental	21	-0.10	3.62			

* Negative Overall Anxiety scores reflect a decrease in anxiety from pretest to posttest.

Qualitative Findings

In the analysis of the qualitative data, we observed several themes that echo both the quantitative findings as well as findings from other researchers. For example, students reported concern with the grading aspect of peer review, and they felt that the feedback from the professor would be more significant. Although many students reported that the process was time consuming, they also appreciated the feedback provided by their peers, and they felt that the process helped them produce a better final paper.

While these qualitative findings may be found in other studies (e.g. Topping et al., 2000; Vickerman, 2009; Vu & Dall'Alba, 2007), two themes were observed in the data that provide a depth of understanding that substantiates this body of literature. These themes include an understanding in how the process impacted their learning of course content and in how the process created a system of support for the students that alleviated much of the anxiety students experienced at the onset.

In their post-surveys, students consistently reported that engaging in the peer review process expanded their opportunity to learn relevant course content. While it would not be surprising that writing a research paper increases student understanding of the focus of their paper, peer review created a space for students to learn the content that was the focus of their peers. In a step further, students reported that they were also learning about both being research-minded and constructing a cohesive paper. In referring to the research process, one student "appreciated reading about how others were going through things," and it helped "improve comprehension of acceptable formats." Students benefited from "increased comprehension of needs for my paper through evaluating others" and were "taking notice *how* others have written their assignment." One student observed, "[I]t was reassuring to know that class was on the same page of how to complete the assignment." In addition to helping students learn from their peers, this window into the writing of their peers helped create a supportive learning environment.

While improving the content learning of participating students, they also reported that peer review created a more supportive learning environment. This supportive learning environment created a shift for participating students in that a very stressful assignment (the research paper) became less stressful, even "refreshing and rejuvenating" through the peer review process. Students noted that their "peers provide good comments" and that they wanted more such opportunities in the class. One student noted, "[B]ecause we were such a close knit group, the lack of anonymity was not a cause of stress for me." This belies the assumption that peer review would create a more stressful environment as students are expected to share their writing. The research writing process was not easy for students, for example: "I began with a lot of anxiety and confusion; the peer assessment and class information helped with that," but the peer review process helped the paper "become less terrifying." One

participant wrote, "As the sections went on and the peer review process began, the anxiety lessened. I became more comfortable with the process." On the contrary, this environment built relationships that students reported helped them to write a better paper. Another student observed that, "through peer assessment I get to know my peers better and utilized assistance even outside the weekly assignment." Indeed, peer review created an environment that was supportive even beyond the expectations for writing the paper.

Discussion

Students in any professional field where research and statistics are a required part of the graduate curriculum typically feel at least minor anxiety as they face the prospect of a research course (Davis, 2003; Kracker, 2002; Kracker & Wang, 2002). In fact, this anxiety is likely at the root of the extremely negative perception that students have toward research courses (Onwuegbuzie, 1997). Thus, any intervention—pedagogical or otherwise—that might reduce this anxiety could enhance student performance in research courses.

The following unsolicited email was sent by a student regarding the research methods course and illustrates the anxiety and stress described above which was assuaged by the peer assessment methods used in this course:

> "Going into a research methods class was a bit scary, to say the least, so the fact that it became my favorite class in the program, and earning an A, was a happy surprise for me. I appreciate how you took a difficult subject and made it truly understandable and enjoyable. Giving us the ability to work in groups was an extremely helpful learning tool, as I was able to learn from the feedback of my peers, as well as having the opportunity to analyze their work and offer them feedback. I feel that you have provided me with a great foundation in research that I will be able to carry with me in future classes and in the social work field" (personal communication, June 15, 2016).

From this simple anecdote it is clear that peer assessment can reduce the anxiety of students in research courses and even significantly provide learning and skills that apply both in academic and professional settings.

The findings in this study suggest that the reduction of anxiety in students taking research courses plays a key role in making students comfortable with research content. In the quantitative analysis, average anxiety scores actually increased across the semester for the comparison group, which is to be expected in the typical arc of course expectations during a semester-long research methods class. Students would be expected to be experiencing more stress during finals week than they did in the first weeks of the semester. With this context in mind, it is noteworthy that the anxiety scores for the peer review group decreased at the end of the semester.. In other words, students who experienced peer assessment actually reported less stress at the end of their research class that the comparison group who reported slightly more stress, though admittedly these differences between groups were not statistically significant. At the same time, the qualitative data suggests that the intervention creates an environment that provides a strong system of support both socially and academically to help students. In this environment, students monitor and evaluate their own work through the work of their peers, providing both assurance and guidance regarding their progress through their research paper. It is important to recognize that peers were not doing all of the evaluation; the professors also provided substantial feedback, yet students recognized the added value and the low-risk environment that peer feedback provided. These results therefore suggest that that reduction in anxiety is one of the more promising aspects of the group-based, peer review approach evaluated in this paper.

In addition to providing a supportive learning environment, the intervention created an environment that supported the cognitive aspects to writing the research paper. This is seen in students' remarks concerning both their learning of the research process and in their learning not only the social work content of their paper, but also in the content of the papers of their peers. The best performer among the three RPS subscales was the Overall Cognitive Aspects scale. Examples of questions from this subscale include, "I know how to approach a research assignment," and, "When first given a research assignment, I know how to begin." When taken together with the anxiety scores and the qualitative data, these findings suggest that engaging in group-based peer assessment activities in a research course may help students understand research concepts better and decrease their anxiety about research, while leaving them generally not excited with research as a skill. While student comments in the qualitative section of the survey showed a clear and unsurprising value placed on the formative feedback provided by the professors in these courses, students also remarked on the benefits of receiving this feedback specifically from their peers. As this intervention scaffolds both the social and the cognitive aspects of learning to write a research paper, students develop a greater sense of self-efficacy in relationship to this difficult task.

Implications for Research Instructors

The peer review and group learning process evaluated in this article did not convert every student into an avid researcher, but it appears to be helping students understand research concepts in an innovative way. As such, peer review should not be seen as a

panacea to stressed graduate students, but as a tool that can lessen anxiety and help students focus on both content and process in writing research proposals. For professors of courses in which graduate students write research, using peer review can cause two shifts. The first shift occurs in the instructional ethos of the classroom from being teacher-focused to a more collaborative and communal process. The second shift occurs as students focus less on the conventions (grammar, syntax, style, etc.) of research writing and more on the essential concepts of research that center on making claims based on the systematic collection and analysis of data.

Limitations

All of the qualitative and quantitative data collected in this study came from a total sample of 39 graduate students in two sister schools in communities in the northeastern United States. The sample was a convenience sample of two classes that were not chosen at random. Obviously, all of these factors limited the possibility of significant statistical findings at the traditional .05 level and speak to the limited generalizability of the findings presented here. Certainly there are innumerable variables that impact the experience of stress while writing, and not all such variables are accounted for in this paper.

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