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Constructivist Peer Review in Music Theory and Composition Courses: Technologies and Practice

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Abstract

This article considers the supporting technologies and practices for effective semi-anonymous peer review in traditional music theory and composition-related courses: orchestration, arranging, and composition. A coordinated approach probes two questions nested within one broad case study: (1) does the use of peer review in music theory and composition-related courses create meaningful, constructivist-inspired learning experiences, and (2) what web technologies can efficiently and effectively accomplish its activities? The article first provides a constructivist theoretical framework; next, it explains the methodologies, technologies, and resulting feedback from using peer review in a three-course study; and finally it provides concluding remarks on the many benefits and manageable problems that can arise in the social constructivist peer review music classroom.

Introduction

As educators surrounded by a perpetually expanding world of interconnected technologies, it is important that we continually re-evaluate these tools in the context of not only new pedagogies, but traditional, scholarly-supported practices. We're well aware of the importance of teaching a concept or providing an experience, and not teaching *the technology*, as well as finding technologies that support the pedagogy, and not vice versa (Bowman, 2014, p. 66). The pace of disruptive technologies in cloud computing, virtual and augmented realities, mobile networking, social media, etc. can at times sweep us away into an abyss of endless new

pedagogical possibilities, which is no doubt a positive derivative of such progress. However, the spirit of this article is to consider example technologies and ideas for practice of a well-established experiential learning activity.

This article considers the supporting technologies and practices for effective semi-anonymous peer review (PR)¹ in traditional music theory and composition-related courses: orchestration, arranging, and composition. A coordinated approach engages two topics nested within one broad case study: the conceptual use of PR and the technological tools to accomplish its activities. I aim to show that this approach aligns with significant theories of learning while leveraging online technologies. First, I provide a grounded framework for the use of PR in the music classroom, building on constructivist theory and useful findings from disciplinary essays and studies that have utilized formative peer assessment strategies. Second, I disclose my list of anticipated benefits and potential problems from using the process, as well as describe the methodologies and technologies I used to facilitate PR activities during music courses from 2018-2019. Third, I offer the quantitative and qualitative survey-based results of using this process in three different music courses over a three-semester period, where students wrote peer reviews on their classmates' creative works. This data is then included into a discussion that uses my initial assumptions as a point of departure. Finally, I conclude by reviewing the most significant themes that emerged from my use of PR and provide suggestions for instructors considering this model and related technologies.

Framework and Relevant Scholarship

During the two years encompassing my experimentation with PR my primary research questions remained consistent: (1) does the use of peer review in music theory and composition-related courses create meaningful, constructivist-inspired learning experiences, and (2) what web technologies can efficiently and effectively accomplish its activities? This section is divided into two subsections: connected theoretical framework and supporting scholarship for PR.

¹ See further explanation of "semi-anonymous" in the Methodology section of this paper: reviewers knew the identities of those whose pieces they reviewed, yet the reviewees did not know who comments came from.

Social Constructivist Theoretical Framework

My use of PR in the music classroom was inspired by the constructivist philosophy of meaning making through the fusion and interaction of prior knowledge and experiences. As Fosnot (1996) explains, “The theories of Piaget, Vygotsky, and the semiotic interactionists provide a basis for a psychological theory of learning called constructivism. Implied in all is the idea that we as human beings have no access to an objective reality since we are constructing our version of it, while at the same time transforming it and ourselves” (p. 23). Jean Piaget’s (1970) study of cognitive development relies on the coalescence of interaction and knowledge; he writes “there is no longer any need to choose between the primacy of the social or that of the intellect; the collective intellect is the social equilibrium resulting from the interplay of the operations that enter into all cooperation” (p. 114). The construction of understanding was central to Piaget’s thinking, and specific consideration of using PR in music orchestration, arranging, and composition exercises was propelled by his explanation that “to understand is to discover, or reconstruct by rediscovery, and such conditions must be compiled with if in the future individuals are to be formed who are capable of production and creativity and not simply repetition” (Piaget, 1973, p. 20). When creating original music from the same point of departure (i.e. in this study an assignment prompt), one learns not only through discoveries during their own creative building processes, but by reviewing another’s work and rediscovering their own intentions by reflecting on their decisions. Lev Vygotsky’s writings that led to social constructivism – the idea that “people learn to become members of society by learning from more knowledgeable members” (Wiggins, 2015, p. 16) – were likewise central to this study. He writes, “the most significant moment in the course of intellectual development, which gives birth to the purely human forms of practical and abstract intelligence, occurs when speech and practical activity, two completely independent lines of development, converge” (Vygotsky, 1978, p. 24). In the case of the present study, the “speech” of writing reviews on a peer’s creative work, which was in preparation for performance, was indeed a practical activity.

Other cognitive psychologists’ writings likewise prepared the landscape for this study, particularly in regards to its social constructive, “music learning community” (Wiggins, 2015, p. 24) design for educational settings. Jerome Bruner’s Vygotsky-aligned teachings introduced a *scaffolded* constructive environment whereby learners work with a more experienced person (or

persons) to fill in gaps where needed, and Barbara Rogoff explains this practice as *guided participation* (Wiggins, 2015, p. 17). Such scaffolding and guidance were integral to this research design in that students with greater knowledge or experiences during certain projects are able to step in with support for their peers when needed; meanwhile, the teacher is likewise ready to guide all participants during any of the stages of the building and reviewing of musical works. Important, too, is the fact that even those with more experience in certain areas, whether another student or teacher, can learn from the less experienced members' decisions and deficiencies. This circular learning potential is inherent in the symbiotic nature of PR projects. Constructivist epistemology naturally carries great significance in education, as sizeable amounts of research probe the application of its theories to deeper educational learning experiences.² Fosnot (1996) reminds us that "Constructivism is a theory about learning, not a description of teaching" (19), and she offers the following general principles of learning derived from constructivism, which were imperative support during this study:

- Learning is not the result of development, learning *is* development. It requires invention and self-organization on the part of the learner.
- Disequilibrium facilitates learning. "Errors" need to be perceived as a result of learners' conceptions and therefore not minimized or avoided. Challenging, open-ended investigations in realistic, meaningful contexts need to be offered, thus allowing learners to explore and generate many possibilities, both affirming and contradictory. Contradictions, in particular, need to be illuminated, explored, and discussed.
- Reflective abstraction is the driving force of learning. As meaning makers, humans seek to organize and generalize across experiences in a representative form. Allowing reflection time through journal writing, representation in multisymbolic form, and/or discussion of connections across experiences or strategies may facilitate reflective abstraction.
- Dialogue within a community engenders further thinking. The classroom needs to be seen as a community of discourse engaged in activity, reflection, and conversation.

² For further reading see Fosnot (1996), Phillips (2000), and Windschitl (2002), to name a few.

The learners (rather than the teacher) are responsible for defending, proving, justifying, and communicating their ideas to the classroom community.

- Learning proceeds towards the development of structures. As learners struggle to make meaning, progressive structural shifts in perspective are constructed-in a sense, “big ideas.” These “big ideas” are learner-constructed, central organizing principles that can be generalized across experiences and that often require the undoing or reorganizing of earlier conceptions. This process continues throughout development. (Fosnot, 1996, pp. 29-30)

The direct application of these guidelines varied slightly across the three music courses during this research project, but they were all part of the PR assessment design. Invention, self-organization, errors, contradictions vs. confirmations, reflective abstraction, community dialogues (both written through PR and during in-class presentations), and “big ideas” were consistently present.

Constructivist Settings in Music Learning

Though a significant amount of research exists³ – through both studies and theoretical essays – that explores the various ways constructivist approaches can be included in the music classroom, I will mention a few notable examples here that provided background support or that intersect with the present research.

Peter Webster’s writings on constructivism and its practical applications in music education offered a particularly helpful springboard for this consideration of PR with technology in the music classroom. Webster (2011) explains that “in terms of educational constructivism in science, one reviewer identified as many as 17 different kinds of constructivism” (36), and as such he lays out four aspects of constructivist thinking that can help guide a music educator wishing to explore its connection to their students’ learning experiences:

- Knowledge is formed as part of the learner’s active interaction with the world.

³ Though by no means a comprehensive list, other helpful examples of constructivism-based scholarship in music not discussed here include: Bennett (2011) [collaborative songwriting], Blackburn (2017) [constructivist paradigm for teaching performance online], Hanken (2015) [peer learning], Hogle (2015) [social constructivist learning environments], Kladder (2019) [learner-centered classrooms], and Hill (2019) [feedback in songwriting courses].

- Knowledge exists less as abstract entities outside the learner and absorbed by the learner; rather, it is constructed anew through action.
- Meaning is constructed with this knowledge.
- Learning is, in large part, a social activity. (Webster, 2011, p. 36)

Webster's succinct list is indeed a helpful starting point for those leading classes, ensembles, applied lessons, etc. who attempt to navigate the vast amount of research on constructivist thinking. He continues:

The argument is often made that simply 'learning by doing' is not enough for constructivist learning to occur. It must go deeper by encouraging the learner to link the new with the old by using collaborative communities and engaging in questioning and problem-solving techniques. There is also the strong belief that learning experiences, particularly in music, should be presented in "authentic" and holistic ways, have the possibility of multiple outcomes, and be structured with ample opportunity for the teachers to offer guidance. (p. 37)

The present research perhaps demonstrates that Webster's guidance can help affix a fresh constructivist layer to the long-established practice of simple class orchestration, arranging, and composition projects. For instance, I have for years assigned such projects in all three classes, and indeed, there have always been lively readings and discussions of the works in class. However, it is possible that the PR layer provides a deeper integration of "collaborative communities" that generate very specific "questioning," as students know they are accountable for not only defending their creative decisions (e.g. in class), but identifying specific strengths or weaknesses in others' work. PR can also provide "authentic" and "holistic" experiences, as students prepare for the real-world challenges of putting their work out to reviewers and performers, braced for the spectrum of feedback from harsh criticism to celebrated positivity.

Jackie Wiggins (2015) offers perhaps the most extensive inquiry into the ways constructivist approaches can advise music teachers who strive to facilitate and guide learners, not direct them. Her book is grounded in social constructivist theory, and most central to this study is her discussion of "music learning communities" where "individuals take responsibility for their own learning and also the learning for their peers" (p. 24). She advocates a scaffolded approach to the music classroom where:

The more experience the participants have had working together, the higher the level of mutual understanding among community members. The teacher does have more experience and expertise and therefore serves as a resource, a guide, a mentor, a provider of support, even manager, but the teacher is also a learner—learning about and from the learner perspectives, learning from what they know about music, and learning what they need to support their learning. (p. 24)

In the context of the PR model, peer reviewers continually oscillate between the role of “teacher” and “learner;” they uncover clearly identifiable problems in others’ work while at other times observing inspiring and unique decisions that they might borrow for a later project. The benefits of *role flexibility* in peer review is of course in addition to the course instructor’s role, who is likewise a teacher/learner. Wiggins states the “ultimate outcome is independence of the learner” (p. 24) within broader music learning communities. Students in these environments should have problem-solving experiences that are holistic in nature, where they are aware of their own progress towards goals and have ample opportunity to interact with peers and teacher (p. 55). In regards to the present research, perhaps the most salient advice from Wiggins articulates that:

The best problems for learning are those that reflect problems that occur in real life—within a particular way of thinking and knowing (in formal learning, within a particular academic discipline) – problems that require learners to deal with the ideas and understandings intrinsic to that discipline. Solving real-life musical problems means solving problems using the same thought processes and procedures that real musicians use when they solve musical problems. (p. 58)

PR has the capacity to prepare students for such situations, whether it be as an adjudicator, a scholarly reader, a member of a composition award selection committee, or a teacher. Student reviewers model an activity that takes place in the community they are preparing to soon enter, one that is dedicated to ensuring quality work will propel the discipline and profession.

Others have explored the social constructivist epistemology in music learning experiences through targeted studies, particularly relevant here in popular music songwriting activities. Lebler (2008) points out that peer learning is common in popular styles “where knowledge acquired alone is shared, while the traditional master apprentice and formal tuition models found in the study of classical and jazz music are relatively uncommon” (p. 195).

Kladder (2020), Reinhart (2019), Riley (2012), and Tobias (2012) offer helpful results in projects that have utilized self-directed exercises that are learner-led, often through some type of social learning environment. Tobias's (2012) use of collaborative songwriting projects in a music technology course helped students embody several roles simultaneously while using relevant technologies, and through their projects they viewed themselves holistically as musicians (341). Reinhart (2019) found that "peer-learning environments like those found in songwriting tools...can also offer safe learning spaces for the exploration and development of emotions and interpersonal relationships" (p. 10). Kladder (2020), which examines songwriting in modern band programs, posits "that if songwriting became a central identifier of the music-making process in all modern band programs, both learners and teachers could co-create music in spaces that support the construction of new knowledge. Learning would become explorative, collaborative, meaningful, and self-directed" (np). Finally, the advantages from such activities are not only a means for deeper engagement with the content or craft, but also beneficial for student health. Riley (2012) found that her songwriting course, which included collaborative analysis, songwriting projects, presentations, and journal reflections, "appears to facilitate student development through enabling emotional stability, offering therapeutic benefits, and providing a vehicle for self-expression, self-discovery, and overcoming challenges" (18).

Peer Review in Music Learning: Selected Scholarship

One step closer to the present research, other music essays and studies that have coordinated constructivist principles through peer review activities were integral to the present research. Daniel (2004) explains that peer assessment can be divided into two categories, peer marking (grades) and peer feedback (criticism) (p. 91). In his study using peer assessment in music performance settings, his students used a rubric that included both categories, grading a range of areas using five-point Likert scales and indicating three strengths and three weaknesses (95). He reported that while some students "may approach peer assessment in a casual or even negative manner, and as a result ... continue to refer to insufficiently critical evaluations, the majority appear to view the potential benefits of peer assessment as sufficient motivation to contribute in a positive and constructive manner" (107).

Latukefu (2010) set up collaborative panels as a means of peer review in a vocal music performance class; they used a rubric to provide both grades and feedback to the performer. She found the anticipated problems of over-marking friends positively or others critically, and students' perception of whether or not they should include improvement, but overall, the "main benefit that the students perceived from the exercise was that it helped them to reflect on their own practice by having to make the effort to interact with the criteria given in order to properly assess a peer" (71).

Lebler (2013) astutely points out that assessment can be characterized in three types: "(i) Assessment of learning, which occurs when a student's understanding of curriculum content is measured (the traditional role of assessment); (ii) Assessment for learning, which occurs when the goal is to identify areas in which more work may be needed; and, (iii) Assessment as learning, which involves students in the act of assessment as active participants and this involvement is intended to produce learning in itself" (114). His 2008 study on peer assessment in popular music recording projects, carried out by joint student-instructor panels, included student journaling. He found that student "journal reflections indicate that they regard the recording studio as a place where it is safe to fail, to try things out and make independent decisions on a recording's strengths and weaknesses" (205).

Finally, Kratus's (2016) reflections on informal peer feedback and review in songwriting courses in middle and high school settings provides a basic three-phase process for how the nature of peer feedback evolves in his courses. First, students are *supportive* with general praise for their peers. Second, with the help of the instructor, they learn to be more *descriptive* about the specific characteristics of the song. Third, they begin to develop *prescriptive* feedback, though hopefully not too quickly: "Regardless of how experienced or accomplished a songwriter might be, it is necessary for the student to develop sufficient confidence in his or her own abilities and trust the teacher and peers" (64).

Initial Assumptions & Methodology

With a literary foundation in social constructivism and successful precedents of PR in especially applied music, recording, and songwriting, this article uniquely examines the

technologies and best practices for PR in music orchestration, arranging, and composition courses.

Before this study, assumptions were made arriving at 5 potential benefits and problems of PR in these traditional music courses:

Five Potential Benefits of PR in the Music Theory/Composition Classroom:

1. Enlivens and contextualizes activities through practical, social experiences, including:
 - a. relevant audiences of teacher *and* peers
 - b. focused goals: a critical audience must be able to interpret and understand their music, analysis, argument, etc.
 - c. tangible outcomes: successfully communicating a music-related presentation
2. Anticipates real-world, holistic situations, not simulations; preparing for successes and failures that come with “submitting” their ideas and talents
3. Builds evaluation & assessment skills (i.e. on performance, arranging, writing, etc.)
4. Improves written communication skills (scholarly, blog, etc.)
5. Improves fluency with relevant specific technologies needed today

Five Potential Problems of PR in the Music Theory/Composition Classroom:

1. The process can create uncomfortable student learning environments
2. The process may not be taken seriously by students
3. The process may be overly time consuming
4. Peer/student feedback may not be reliable; a connected concern is students critical of their reviewers
5. Difficulties in finding the technologies to facilitate the process

Methodology and Technologies Used

This study used ubiquitous web technologies to examine the efficacy of PR in three upper-level music major courses at the University of Tennessee during the Spring 2018, Fall 2018, and Spring 2019 semesters. The three courses included, respectively: (1) *Instrumentation / Orchestration (I/O)*⁴ (N=22), focused on arranging, orchestration, and composition projects for small to large ensembles, populated by a mix of instrumental music education, theory,

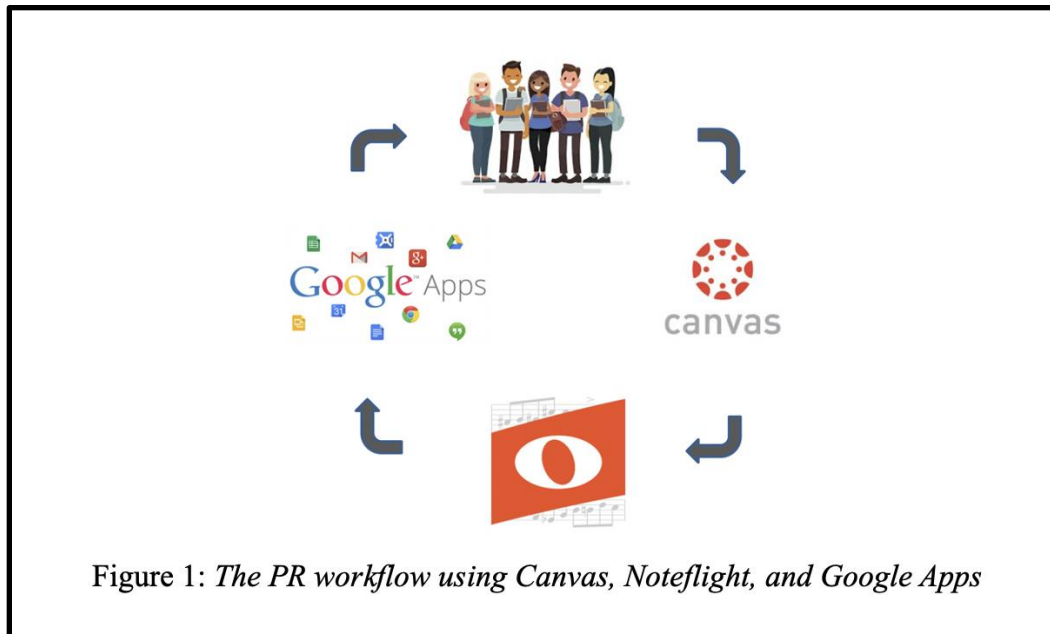
⁴ The University of Tennessee has a unique design for the two classes Instrumentation and Orchestration. They meet together for 10 weeks where they focus on arranging and composing for a variety of small to large ensembles. Instrumentation concludes at the end of this period and Orchestration continues 5 weeks and concentrates on techniques of orchestration through original compositions. Approximately 2/3 of the total class combination is in Instrumentation only, primarily music education majors, thus this study only examined projects in the combined setting (i.e. during weeks 1-10).

composition, sacred music, and performance majors; (2) *Choral Arranging (CA)* (N=14), centered on arranging and composition⁵ projects for various choral settings, populated by a mix of vocal music education, theory, composition, sacred music, and performance undergraduate majors and two graduate (MM) conducting students; and (3) *Counterpoint (Ctpt)* (N=10), concentrated on model and original composition projects with emphasis on contrapuntal activity, populated by a mix of theory, composition, sacred music, and performance majors and 1 graduate (MM) theory student. Short PR arranging/composition projects were assigned three times during each semester with the prompts ranging from “prepare this short piano work for string quartet” (*I/O*), to “create an arrangement of ‘Rocky Top’ for SATB choir” (*CA*), to “compose a short two-part invention in the style of JS Bach that includes at least two episodes” (*Ctpt*). All participants consented to the design that each project was part of a three-step process: (1) students prepared and uploaded works using the Canvas-linked Noteflight Learn course site, (2) students reviewed two to three (varied by class) of their peers’ works using a provided prompt or rubric in a prepared Google Form, and (3) projects were read/performed during class with live feedback.

Due to the nature of the technologies that best facilitated the student arranging projects, the study used a “semi-anonymous” PR process. The reviewers knew the identities of those whose pieces they reviewed, yet the reviewees did not know who comments came from. This is because a technology integral to the process, Noteflight online notation software, automatically includes the Canvas name of each composer attached to a score. The advantage here was that at least the reviewers could rely on anonymity to write freely about a work. Figure 1 provides the basic workflow of each project, where students first received their assignment in Canvas, then linked to their Noteflight template for the arranging/composition project, and finally continued to a second link to complete their PR in a Google Form. The students were all emailed the names of the students they would review, which they could access freely in Noteflight as they were instructed to set sharing settings to “everyone in the group.”⁶

⁵ Although most projects were student arrangements of pre-existing pieces, a few students were allowed to arrange original compositions on some projects.

⁶ For more information on sharing music theory assignment templates in Noteflight see McConville (2012).



The technology and design gave the students the opportunity to perform and hear each other's works both during reviews (electronically) and live readings.

I was the instructor for all three courses, and it was decided at the beginning of the study that qualitative feedback and a semi-structured design would be used for the research. This is because the intent was to experiment with and evolve the design across three *different*, but related, upper-level music theory and composition courses. Furthermore, since the rubric changed slightly during each semester, it was impossible to control all variables for a statistically rigorous study. In the *I/O* course, students had 3 days to complete their required qualitatively written reviews that included a prompt stating that they must indicate at least one particular strength, one piece of constructive criticism, and one suggestion on how they would do something differently. In *CA*, the design changed to a four-question rubric. The first three questions were five-point Likert-style that asked about their agreement (Strongly Disagree—Disagree—Neutral—Agree—Strongly Agree) with the following statements:

1. "The score was clearly notated, without scoring errors."
2. "The technical decisions of the arrangement were successful. (Including use of harmonies and melodies, ranges, voicings, and dynamics.)"
3. "The structural decisions of the arrangement were successful. (Including the formal design and its use of vocal textures and accompaniment, if used.)"

The fourth question asked them to write at least 100 words of qualitative feedback, including at least one particular strength and one piece of constructive criticism. Since the students responded quite favorably to the rubric in *CA*, a similar four-question design was used in *Ctpt*. The only differences between the latter two courses' designs were that *Ctpt*'s specific language on technical and structural details adjusted per course-specific topics and *CA* students reviewed only two peers' works (due to longer lengths) while *Ctpt* students reviewed three. Overall, the PR process was formative in nature, and even though two classes used a "grading rubric" during their reviews, their marks did not contribute to final grades. The students also received feedback from the instructor alongside their final grades.

The technologies used did not change during the course of the study. "Assignments" were posted to all students in each class via the Canvas learning management system (LMS). Though the basic Noteflight plan is free, our university purchased \$25 Noteflight Premium licenses for each student in all three courses through our institution's Student Technology Fee, which gave them access to our private repository of shared scores within the Noteflight Learn platform.⁷ Though this web-based notation editor continues to evolve since our usage⁸, it was selected because teachers are able to post "assignment templates," which students can click on to instantly create a unique copy of the score. This organizes each assignment into a thread of scores for the instructor, each of which is identified by the name of the user's LMS identity, since Noteflight connects directly to Canvas via the Learning Tools Interoperability standard.⁹ Perhaps Noteflight Premium's most impressive feature is its shareability, as it is easy to optionally share scores with individuals or with everyone in the class. The editor allows users to choose from over 85 sounds, and while its overall features are not as robust as industry standards such as Finale and Sibelius, its user-friendly interface is easy to learn and provides enough

⁷ For more information on Noteflight Learn see noteflight.com/learn.

⁸ At the time of this study, students and instructors could insert comments in a general comment area in the right margin. This public-style comment option was not used here because comments were not anonymous and it was difficult to indicate exactly where in the score the point was directed. The software continues to improve, as users are now able to insert comments at more specific points in the score, and the tools for assessment such as Soundcheck, have become more robust.

⁹ Noteflight connects with any Learning Tools Interoperability-enabled LMS, such as Canvas, Blackboard, and Moodle. Please consult your institution's office of information technology to confirm the process for connecting via your LMS.

optionality to make it very usable in higher education courses.¹⁰ After projects were completed the students accessed their peers' scores in the shared Noteflight classroom, played them back and studied their details, and then went back into Canvas to retrieve the rubric and a Google Form link in the original assignment thread. Google Forms was used to collect review feedback because it is not only simple to set up and copy review templates from one assignment to the next and extract unique weblinks, it collates all reviews into a neatly organized Google Sheet by clicking the green icon ("View Responses in Sheets") near the upper-right corner of the Form's main construction page. When all reviews were complete, the students were sent their two (or three) reviews and assessment scores via email.¹¹

At the conclusion of each semester, each student filled out a short anonymous Google Form questionnaire soliciting feedback on their experiences using PR in their course. Eleven of the questions used a five-point Likert scale (1-5: Strongly Disagree—Disagree—Neutral—Agree—Strongly Agree) to inquire about their agreement/disagreement with the PR process. A twelfth question regarding their feedback on having their peers' scores contribute to their grades (i.e. a more summative design) was added in the Fall 2018 CA questionnaire, and used again in *Ctpt*. It also asked three open-ended, qualitative questions.

Results and Discussion

Results from Questionnaires

Table 1 provides the results of each course's student responses to the questionnaires. Though not statistically rigorous, the data provides some useful feedback on the students' experiences using PR in their courses. The table lists response means and standard deviations for each class individually as well as cumulatively. It must be remembered that the "Overall" data combines three different but related upper-level music theory courses, each with somewhat different assignment objectives, but the combined data can give readers some *general* overall feedback because the instructor was the same and the PR processes, technologies, and scope of

¹⁰ See full package details on Noteflight Premium at noteflight.com/premium. Compare Noteflight packages at noteflight.com/plans.

¹¹ Attempts were made to find a Google Form Add-on that would automatically submit review information to their assigned reviewee, but none existed. Developers frequently offer new Google Form add-ons in the Google Workspace Marketplace, and users are encouraged to consider more recent add-ons such as "Email Notifications for Google Forms" or "Form Notifier" to automatically distribute reviews. (workspace.google.com/marketplace)

assignments were relatively similar across the courses. Tables 2a-2c provide selected qualitative feedback from each course. They include as many different perspectives as possible; repeated and potentially emergent course “trends” are italicized while isolated yet insightful comments are unitalicized.¹²

Students were asked about their reactions to the peer reviews from their classmates. All classes somewhat agreed that their classmates’ reviews helped them re-evaluate their decisions (*I/O*: 3.68, *CA*: 3.67, *Ctpt*: 3.55; supported by statements such as Tables 2a-6 and 2a-18). It was notable that *CA* was most agreeable that the process helped them as a composer/arranger (4.29), while also having a greater degree of frustration than the other classes (2.79, vs. *I/O*: 1.64 and *Ctpt*: 2.20). Some frustrations came from issues regarding learning to successfully share scores in a timely manner in Noteflight (Tables 2b-1, 2b-9), peers rushing or not taking seriously the review process (Tables 2b-2, 2b-10), the added workload of reviewing (Tables 2b-3, 2b-17), lack of confidence in peers’ advice (Tables 2b-5, 2b-11, 2b-12, 2b-16), and the harshness of some of their reviews (Tables 2b-8, 2b-13, 2b-14). Also noteworthy is that the specific technologies used were not routinely mentioned in the qualitative data as a particular source of frustration. Students reported fairly neutral reactions when asked if they were more mindful of their decisions because they knew they would be evaluated by peers (*I/O*: 3.14, *CA*: 3.79, *Ctpt*: 2.80) and if the PRs made them change their approach in the next work (*I/O*: 3.55, *CA*: 3.36, *Ctpt*: 2.50). Related to the latter, and one of the most agreed-upon statements in the survey, was that the PRs from classmates made them consider things they hadn’t when scoring (*I/O*: 4.14, *CA*: 4.07, *Ctpt*: 3.90; Tables 2a-5, 2c-1).

Students were also asked about their reactions to the PR process, itself. As mentioned, *CA* most agreed that the process was helpful in their development as a composer/arranger (4.29) while *Ctpt* the least (3.50), but, overall, the students found it helpful (3.94). All classes reported quite favorably both quantitatively and qualitatively in agreement when asked if the process helped them develop their composition/arranging evaluation skills (*I/O*: 4.23, *CA*: 4.57, *Ctpt*: 4.00; Tables 2a-3, 2a-6, 2a-8, 2a-15, 2a-16, and 2a-17). Although some frustrations arose from receiving PRs from classmates, the classes didn’t generally agree that the overall process created

¹² Feedback in italics means the comment has at least one similar comment in the course. I’ve attempted to prune out comments that are near replications of those shown, though some overlap still occurs in the table to show the various ways in which the students voiced their opinions.

an uncomfortable learning environment (*I/O*: 1.32, *CA*: 1.86, *Ctpt*: 1.80). There were, however, several comments that suggested there were certainly uncomfortable moments, notably in *CA* (Tables 2b-8, 2b-13, 2b-14, 2b-15). The students also reported somewhat favorably in agreement with a statement that said they reevaluated their decisions after reviewing others' work (*I/O*: 3.95, *CA*: 3.71, *Ctpt*: 3.70; Tables 2a-2, 2a-9, 2a-10, 2a-11, 2a-13, 2a-14) and one asking about their agreement on whether or not they would use it in their own class (*I/O*: 3.64, *CA*: 4.00, *Ctpt*: 3.20; Table 2c-10).

Because students most often talked about whether the process of: (a) reviewing others' works, or (b) the comments from classmates helped them the most (this question arose in the first semester), this direct multiple choice question was included on the questionnaire. Responses made it quite clear that they believed reviewing others' works helped them more (*I/O*: 91%, *CA*: 71%, *Ctpt*: 90%). Finally, when added in the second semester of the study, students did not respond favorably when asked whether or not they wished their reviewers' scores contributed to grades (*CA*: 1.43, *Ctpt*: 1.40).

Discussion and Reactions

While it is impossible to confirm or reject the five assumed benefits and problems stated at the outset of this study, the questionnaire results and my observations of the students across three semesters (e.g. reading every peer review, reflecting on student improvement across projects, observing class discussions after completing their reviews, etc.) revealed that the overall process was highly beneficial in these classes and the technologies were crucial in facilitating its steps and mitigating workload.

First, it was evident that the PR design provided contextualized activities through practical social experiences (Wiggins, 2015, p. 16, 24; Webster, 2011, p. 36). Student responses and statements reflected that they were aware of and motivated by the social interaction of the PR community (Daniel, 2004, p. 107); for instance, one student said "I like that we had to know what we were talking about, so that the feedback was useful," indicating recognition of being a part of a broader network of constructivist learning. This comment also symbolizes an empowerment of the students as self-directed learners (Kladder, 2020, np), and that they are responsible for justifying and communicating their ideas to the community of theory students

(Fosnot, 1996, pp. 29-30). Second, feedback supported that the activities anticipated real-world, holistic situations, where they were asked to engage in frequent questioning, consider a variety of problem-solving techniques, and weigh the possibility of multiple outcomes (Webster, 2011, p. 37). Data showed that they questioned their own scoring decisions as well as the advice of their peers. Through comments from others, though most prominently from their review of their peers' scores, they reflected on the variety of outcomes that did and could result from their decisions. Third, and perhaps most pronounced benefit, was the improvement of students' evaluation and assessment skills, aligning with Latukefu's (2010) findings. This was evident through the general, continuous improvement of the quality of their comments and their own self-reflection in the questionnaires. Observations showed that with time the students indeed progressed from *supportive* to *prescriptive* feedback (Kratus, 2016), and it is quite possible some students learned as much or more from each other than from the instructor, through a healthy environment of errors and natural disequilibrium generated by thoughtfully challenging the creative decisions of their peers (Fosnot, 1996, p. 29). In this way, the comment in Table 2b-19, regarding their appreciation that they were grateful for the opportunity to begin learning how to "critique creations (not performances)," was perhaps one of the most profound pieces of feedback from the study. Fourth, there was less convincing evidence to support that students improved their written communication skills by writing reviews. This assumption still seems quite possible, but it is encouraged that future studies use more specific language regarding the writing requirements; this was not emphasized in the present study. Though the quality of peer suggestions generally improved, they were not always well communicated, as evidenced by some of the student comments. Fifth, since the primary focus here was on the PR process and not necessarily the technologies used, students showed that they were fine with not even being "taught" how to use the technologies, and that since it was part of a broader outcome it was incumbent on them to learn the tools quickly. Indeed, only half of one 50-minute class period was dedicated to introducing students to Noteflight, links to both score templates and reviews, and self-guided instructional videos on Noteflight in YouTube. Moreover, there were very few complaints by the class regarding how to use the technology. This is perhaps a small reflection of the broader environment the students inhabit today, surrounded by web-connected technologies with user-friendly user interfaces along with bountiful professional and homemade instructional

videos a web search away. In fact, when reconsidering the fifth initial assumption above, it is often the case that students need not be fluent with specific relevant technologies today, rather, *be fluent with general technologies that help them successfully learn the specific technologies faster*. Even more broadly, this concept is a microcosm of the even greater life skill: knowing the answers is not always as critical as knowing how to find the answers.

Student feedback and instructor observations provided some support for the initially anticipated five potential problems of PR, though not uniformly. First, even though mean scores trended towards disagreement with the question asking if the PR process created an uncomfortable learning environments, qualitative data provided some sentiment to the contrary, and instructors should be aware of such a possibility in the PR process. Instructors should carefully mitigate a potentially unsafe learning environment with “mean” comments (Table 2b-13), even though “harsh” comments (Table 2b-8, 2b-14) and being “criticized” (Table 2b-15) are perhaps realities that the students should experience. As Wiggins (2015) says, the “best problems for learning are those that reflect problems that occur in real life” (p. 58), and some of the feedback reflected Latukefu’s (2010) mention of students “over-marking friends and others critically” (p. 71). Second, it was indeed apparent that some students did not take the process seriously, which was a cautionary observation from Hanrahan and Isaacs (2001, p. 65) and revealed by both the student feedback and observed reviews. Instructors are urged to experiment with engaging rubrics and persistently remind the students of the importance of the natural reciprocity of the learning community. Third, Snowball & Mostert (2013) have argued that the PR process can be overly time-consuming (p. 653), and though this problem is entirely subjective and contextual, the right technologies can greatly mitigate its potential burdens for both students and instructors. In fact, *I/O’s* review process was likely a bit too time consuming because they reviewed three peers’ works and the size of the arrangements grew each time. Instructors are encouraged to create rubrics that are both efficient for reviewing and that focus student comments (Table 2c-8). Fourth, Falchikov and Goldfinch (2000, p. 288) and Liu and Carless (2006, p. 282) have both questioned the potential pitfall that student feedback may not be reliable; in the present study this concern seemed connected to students suspicious of others not taking reviews seriously, especially in *CA*. There were certainly some suspicious reviews, but some comments such as Table 2a-10 and 2c-2 revealed that some students learned a valuable

real-world lesson about reviews: not all of them are of quality. A sort of “musician’s sensory gating” process is an important life skill as an artist, meaning this problem can actually be a benefit. Fifth, indeed the technologies required to set up a smooth PR process can take a bit of work, but this pitfall is again a benefit because instructors, like students, should be accountable for researching and problem solving – in this case a pedagogical inquiry. There are again plentiful web tools – many free, some for a marginal cost – such as *Flat* (notation software, see Kersten, 2021) and *Bandlab* (digital audio workstation, see Fick, 2021) for collaborative projects that can facilitate a variety of constructivist goals, and it is imperative that instructors find solutions and share ideas (the very nature of ATMI). In the present study, once a few Google Forms and Noteflight templates were prepared, they could be copied and pasted to build out the infrastructure.

Table 1:
Peer Review Questionnaire Results: Orchestration, Arranging, and Composition Courses Spring 2018 – Fall 2019
Quantitative Data

Question	Inst./Orch. SP18, N=22 Mean, St. Dev.	Choral Arr. FA18, N=14 Mean, St. Dev.	Counterpoint FA19, N=10 Mean, St. Dev.	Overall 2018-19, N=46 Mean, St. Dev.
In general, the peer reviews from my classmates...				
...made me re-evaluate my decisions.	3.68, 1.04	3.57, 0.85	3.30, 1.06	3.55, 0.96
...made me frustrated.	1.64, 0.85	2.79, 1.53	2.20, 1.03	2.11, 1.22
...made me consider things I hadn't when scoring.	4.14, 0.89	4.07, 0.47	3.90, 0.99	4.07, 0.80
...made me more mindful of my decisions b/c I knew I would be evaluated by my peers.	3.14, 1.25	3.79, 1.12	2.80, 1.75	3.26, 1.36
...made me change my approach in the next work.	3.55, 0.86	3.36, 1.01	2.50, 1.18	3.26, 1.04
The peer review process for our 3 projects was helpful in my development as a composer/arranger this semester.	3.91, 0.81	4.29, 0.47	3.50, 0.97	3.94, 0.80
The peer review process helped me develop my composition/arranging evaluation skills.	4.23, 0.75	4.57, 0.65	4.00, 0.94	4.28, 0.78
The peer review process created an uncomfortable learning environment.	1.32, 0.48	1.86, 1.10	1.80, 1.14	1.59, 0.88
The process of reviewing others' work made me reevaluate my decisions made in my own work.	3.95, 1.00	3.71, 1.07	3.70, 1.25	3.80, 1.06
I would use a peer review process in a class of my own.	3.64, 1.09	4.00, 0.68	3.20, 1.14	3.65, 1.01
Which do you feel helped you more when reflecting on your own work: (a) reviewing others' works (b) comments from my classmates on my work?	91% a 9% b	71% a 29% b	90% a 10% b	85% a 15% b
I wish that the peer reviewers' scores had contributed to my grade on projects.	N/A	1.43, 0.76	1.40, 0.70	1.42, 0.71

Table 2a:**Peer Review Questionnaire Results Qualitative Question 1:*****“What aspects of the peer review process contributed to your learning this semester?”***

Selected Responses
<p><u>Instrumentation/Orchestration:</u></p> <ol style="list-style-type: none"> 1. “I got to see new ideas, but had to look closely to determine any issues that could arise, then could avoid those issues in my own writing/arrangement.” 2. “Looking at what others did and being reminded of what to do as well as how to make mine more fun and interesting.” 3. “The feedback was fantastic! It helped very much., but also grading someone else's helped my learning.” 4. “It made me really think about why something did or didn't work.” 5. “I liked that we had to know what we were talking about, so that the feedback was useful. Also, hearing other people's opinions and interpretations helped me think of new things to try.” 6. “I had to know: a) how to appropriately review others, b) how to better prepare my assignments, if they weren't detailed people let me know about it.” <p><u>Choral Arranging:</u></p> <ol style="list-style-type: none"> 7. “Reviewing others' work was a great way to review all the techniques we learned about. It was enjoyable to see the range of creativity, we each had our own style in the class.” 8. “I liked that the reviews made me have to think more technically when reviewing others' arrangements.” 9. “I became more aware of my own compositional techniques through reviewing the mistakes and successes of my peers.” 10. “I could take things with a ‘grain of salt’ but I could also take ideas from others and use in my works!” 11. “Seeing examples of others' work reminded me of techniques I had overlooked and inspired me.” 12. “Being able to study someone else's score at a slower rate than in class contributed. Also, being able to see what vocal majors write when given the same assignment as instrumentalists.” 13. “Listening to people's arrangements who are more advanced than me helped me think about new things.” <p><u>Counterpoint:</u></p> <ol style="list-style-type: none"> 14. “Looking at others' pieces gave me insight on my own work and made me realize ideas I could have used on my own. It also encouraged me to write better knowing my peers were viewing my piece.”

15. “The process of reviewing pieces and finding errors helped me avoid those in my own writing. It made me aware of common mistakes and after I cut these out I really improved my music.”
16. “I feel that I am weakest in analyzing others' works and the peer review focused my practice of that.”
17. “As I peer reviewed, I was able to really focus on what I had learned and use that knowledge to detect errors in other students' work.”
18. “It made me consider whether the changes they requested would improve my compositions.”

Table 2b:**Peer Review Questionnaire Results Qualitative Question 2:*****“What aspects of the peer review process distracted you in the learning process this semester?”***

Selected Responses
<p><u>Instrumentation/Orchestration:</u></p> <ol style="list-style-type: none"> 1. “It was annoying when people hadn't put their scores on Noteflight publicly.” 2. “Sometimes I felt like people may have rushed through their reviews and not given them much thought.” 3. “Doing 3 for every person.” 4. “Having to critique really good arrangements.” 5. “Not everyone is an expert on each instrument arranged and their comments can be annoying.” 6. “I need to write a review about an arrangement that clearly just needed ‘don't start it the night before.’” 7. “Others who took completely different approaches make me scared in that I did the whole thing wrong.” <p><u>Choral Arranging:</u></p> <ol style="list-style-type: none"> 8. “Certain members of the course were sometimes harsh in their reviews and didn't take into account the preference of the composer. Instead they made their preferences seem like the right way to do things.” 9. “A little bit of Noteflight confusion regarding sharing and finding scores.” 10. “I feel sometimes the reviews were rushed because my reviewers needed to turn them into get a grade.” 11. “Getting reviews from people who didn't know what they were talking about.” 12. “Some people don't have a solid theoretical understanding of music to accurately discuss use of harmony.” 13. “Two of my peers were actually kind of mean in their reviews. It was not constructive criticism. It was just saying how everything was wrong.” 14. “Sometimes the comments were harsh and it was sometimes frustrating to feel like you had to defend artistic decisions made.” 15. “At times, I felt like I couldn't experiment or go beyond the parameters of the assignment knowing my work might be criticized by people I know and who know me.” <p><u>Counterpoint:</u></p> <ol style="list-style-type: none"> 16. “Some people made comments that weren't necessary and critiqued things that weren't really an issue.” 17. “The time it took to actually review a whole composition and to write about it.” 18. “It mostly just took up time with very little payout.” 19. “The trouble people have with articulating what they are critiquing. We don't often get a "critiquing" class for any subject, so lacking that means we start with huge skill gaps between people that critique creations (not performances). But the fact that we started doing this was important.”

Table 2c:**Peer Review Questionnaire Results Qualitative Question 3:*****“Please provide any additional comments or suggestions on the peer review process this semester.”*****Selected Responses**Instrumentation/Orchestration:

1. “Sometimes I immediately brushed off a comment as ridiculous. Then after I thought about it a little more and tried a few things, I realized what they were saying might be a good idea. I also realized that this is what I also do after being evaluated on my instrument in solo class.”
2. “I learned not to get too upset with comments because some of them were critiques on things that weren't consistent with my intentions.”
3. “I didn't like having to give criticism; some people are too good and others you don't want to break their self-esteem.”
4. “In my opinion, it is better to discuss in class but I can see how this can be helpful for others.”
5. “I don't think people gave enough criticism. They just found a lot of stuff they liked.”

Choral Arranging:

6. “I think this is a valuable methodology. I think we could reduce the number of reviews while increasing the expectations.”
7. “Maybe a pre-submission peer review for the larger projects so we could have had a chance to apply some of our peers' revisions and suggestions.”
8. “The 1-5 scales were beneficial. They helped me focus my comments.”
9. “Noteflight is actually a program I like a lot, it just takes a little time to figure out the sharing tools.”

Counterpoint:

10. “Good practice. For me to use it in a future class the tech will need to be in place, which helped boost it this semester.”
11. “I am really not as interested in my peers' perspective as I am with the other content in the class.”

Conclusions and Suggestions for Using PR

This study found that carefully selected supporting technologies, combined with constructivist-aligned PR practices, can lead to highly successful learning experiences in certain traditional music theory and composition-related courses. Among the most useful findings in this study was the student and instructor belief that students improved their composition/arranging evaluation skills, a topical example within the broader universe of the necessary musician life skill of peer and self-evaluation. Student feedback also suggested that by reviewing their peers' works, students began to contemplate and apply ideas they initially hadn't considered, which in some cases provided paths to becoming more self-directed learners by diagnosing their own learning needs and taking initiatives on subsequent projects. As Bauer (2020) explains, such self-direction is yet another "complex skill that is important for continuing involvement and success in music and life" (p. 135). The PR process provided opportunities for real-world situations and required them to learn and use relevant web technologies to realize tangible outcomes. PR in music theory and composition has become a mainstay in my curricula, and as a helpful starting point I encourage instructors to consider:

- as many music notation, DAW, file sharing, and cloud communication options as possible; pricing, mobile accessibility, and collaborative tools are all important factors.
- peer assessment rubrics that use a mix of quantitative scoring and qualitative feedback; provide specific in-class (training) or written directions on how to review.
- managing the workload—a meaningful PR process can take time; I suggest a three-stage draft→PR→final copy process, which I arrived at with time.
- frequent reminders to the class that they are part of a social music learning community; they are responsible for not only their own learning, but their peers' as well.

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