Chapter 11. Audio Engineering and Soundwriting in an Interdisciplinary Course

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As a multidisciplinary field, sound studies should seek to find and teach the interdisciplinary aspects of sound. Fortunately, our institution, Belmont University, requires two interdisciplinary linked courses as a part of the general education curriculum, allowing us to bring our English and audio engineering perspectives to the same 25 students. We each teach a course—one titled Writing with Sound and another called Critical Listening for Audio Production—that attempts to bring these two disciplines together in a search for common technical and theoretical ground. Critical Listening provides the listening skills to evaluate objective components of audio quality such as timbre, spatial attributes, and technical attributes. Writing with Sound offers students the opportunity to apply this new technical knowledge by composing texts with sound within a rhetorical framework that examines sound's meaning.

In this chapter, we highlight a series of assignments that engages students in listening to and using sound within the technical framework of audio engineering terminology. The first assignment is a series of four listening journals. Using the language of analysis from the discipline of audio engineering to evaluate and compare songs and other audio artifacts, students examine how timbre, spatial quality, and technical quality of sound communicate meaning for the listener. Students are initially introduced to these terms through Jason Corey's (2016) textbook *Audio Production and Critical Listening: Technical Ear Training*. Since this is an assignment that is graded by both professors to offer collaborative feedback from two disciplines, the grading process also serves as an important collaborative space for faculty to provide feedback from each disciplinary perspective. Following the journal assignment, students compose an episode of a class podcast series in Writing with Sound that carefully considers rhetorical sound attributes when mixing their own composition. In addition to submitting the audio portion of this assignment, students also submit an audio track analysis of their own sound design choices by excerpting 5–10-second clips from the podcast episode to highlight approaches to sound and meaning as an audio engineer and a musician.

While some teachers and scholars in rhetoric and composition may not be able to replicate this partnership with a colleague in audio engineering, we advocate for the use of audio engineering terminology in the composition classroom to provide students with the vocabulary to talk about sound alongside linguistic

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symbols. Similar to Katherine Fargo Ahern's (2013) use of terms from acoustics and musicology in her composition courses as described in her article "Tuning the Sonic Playing Field," audio engineering terms help "introduce students to uses of sound that do not necessarily draw on the spoken word, voice, or discourse" (p. 78). Thus, these terms help students move beyond the linguistic-centered composition classroom to more fully understand the value of sound as more than simply ornament. Additionally, knowledge of terms from audio engineering has an added benefit for students looking to pursue podcasting beyond the composition classroom by equipping them with a vocabulary to communicate with engineers or to effectively navigate the more complex features of audio-editing software.

In the following paragraphs, we highlight the terms involved in this listening analysis. Whether recording a symphony orchestra or creating podcasts on a laptop, our hearing must perform an accurate evaluation of the audio quality before starting the production process (Corey, 2016). According to Jan Berg and Francis Rumsey (2003), there are two main approaches to audio quality evaluation: The "objective" method analyzes physical parameters of the audio signal such as frequency, reverberation time, and total harmonic distortion, and the "subjective" method considers the perceived quality of sound that is expressed by human judgments.

The Critical Listening course is designed to improve students' ability in both objective and subjective audio quality evaluation. The curriculum is based on the "total audio quality" evaluation model proposed by Berg and Rumsey (2003), and its schematic is shown in Figure 11.1. The model suggests three principal components of total audio quality—timbral, spatial, and technical qualities—and the course introduces a systematic training program for the students to improve their auditory sensitivity in each category.

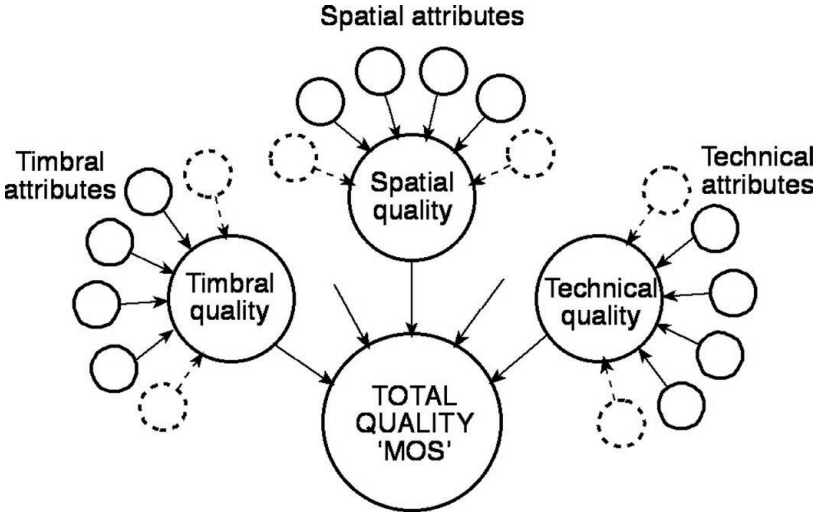

Figure 11.1. Relations between total audio quality and its subsets and attributes (diagram by Jan Berg and Francis Rumsey, 2003).

According to Corey (2016), timbral quality (also called tonal or spectral quality) refers to an audio signal's frequency content and the relative power of each frequency or frequency band across the audible human hearing range, from 20 to 20,000 Hz. The characteristics of a human voice and musical instruments are primarily determined by its "timbre," so the ability to hear the timbral difference in audio programs is crucial. Previous research by René Quesnel (2009) has verified that the listener's ability to discriminate timbral quality could be improved in a relatively short period by using a systematic training method. In our Critical Listening course, specific frequency matching tasks are designed to help students identify timbral differences between audio signals. The tasks are provided with interactive computer software developed by Jason Corey and David Benson (2018), and the practice data are stored in the database and visualized real-time with supported graphical user interfaces.

Francis Rumsey (2001) defined spatial quality as the three-dimensional nature of the sound sources and their environments. Since spatial audio quality listening is a perceptually complex process, breaking down the properties into discrete components and learning how to distinguish between these specific parameters are tasks (Neher, 2004). In our course, a simple snare drum sample is used to create different spatial impressions using a digital reverberation processor. To develop their own internal timing, students listen to and remember a set of different reverberation times (0.5, 1, 1.5, and 2 seconds) and pre-delay times (20, 60, 100, and 200 milliseconds).

Technical quality listening training is designed for students to improve their skills in detecting specific artifacts of the sound. Throughout the media production process, we encounter various technical issues such as noise and distortion. If we are not able to detect and fix them appropriately, the total audio quality can be degraded even if the program features excellent timbral and spatial characters. Students listen to a 30-second recording of a musical selection, immediately replaced by the same recording with a technical anomaly. The anomalies include stereo vs. mono, reversed left-right channel, inverted signal polarity, poor MP3 encoding, and various levels of distortion. After listening to the pairs of examples, students have to identify the technical anomaly.

Assignments

Listening Journals

> Musicians, podcasters, and audio engineers often need to converse in writing, describing sound qualities in emails to each other or explaining their audio approach in grants. Using the sound discernment language/terms that we define throughout the course of the semester, please write about your listening experiences in response to the four following prompts. Describe the aural events you encounter, and your impressions of these events. Be sure to answer all questions completely. Apply topics covered in class to your listening evaluation.

Each two-page journal entry must include details such as song title, artist, album title, engineer, and producer. Specify the medium you were listening to it on (MP3, WAV, streaming service, etc.) and the headphones/speakers you used. The following songs by Fleetwood Mac, Steely Dan, Maria Schneider, Prince, and Fred Stride were intentionally chosen for their reference-quality sound and unique sonic characteristics that demonstrate each of the three audio quality attributes.

Listening Journal #1: Timbral quality evaluation

"Dreams," Fleetwood Mac vs. "Gaslighting Abbie," Steely Dan

Compare and contrast the two recordings with a focus on the timbral (spectral) qualities of the two recordings.

Listening Journal #2: Spatial quality evaluation

"Walking by Flashlight," Maria Schneider vs. "Purple Rain," Prince

Compare and contrast the two recordings, specifically focusing on the spatial qualities of the two recordings.

Listening Journal #3: Technical quality evaluation

"Something for Ernie," Fred Stride

CD quality WAV file (16bit, 44.1kHz, 40MB) vs. medium quality MP3 file (96kbps, 3MB)

Download the two files attached below. Compare and contrast the sound quality of the song in two different audio file formats. As we discussed in the class, specifically listen for the following aspects of the sound:

1. Clarity and sharpness of instruments
2. Reverberation, background noise and sustained note
3. Non-harmonic high-frequency sounds (cymbals and hi-hats)

Listening Journal #4: All things together

Choose and listen to a song from an album that won a Grammy award for Best Engineered Album, Non-Classical category. Describe the spectral, spatial, dynamic and technical aspects of the song in greater details (at least one long paragraph for each aspect).

The list of the albums: http://en.wikipedia.org/wiki/Grammy_Award_for_Best_Engineered_Album,_Non-Classical

Group Podcast + Audio Reflection

The major assignment for this course (Writing with Sound) is a class podcast series. As a class, we will decide the theme and content for the podcast, and in groups of two (or three), you will be responsible for producing an episode of the series between 10–15 minutes with a full transcript. The podcast should demonstrate the best practices of writing for the ear and audio production that we've been discussing all semester in Writing with Sound and Critical Listening for Audio Production. Your podcast episode should follow the best practices of

narrative journalism that we've been learning about in Jessica Abel's (2015) *Out on the Wire*. In addition to submitting the podcast episode MP3 file, you should also turn in a Word document that includes a full transcript of your podcast episode.

Individually, you will include a 3–5-minute supplemental audio file that takes four different 5–10-second excerpts from your podcast episode to explain how you used audio engineering listening qualities like timbre, spatial, or technical qualities to make meaning with sound. Use this audio description to make an argument for how your group's podcast uses sound to reach an audience.

Requirements

- A 10–15-minute podcast episode submitted as an MP3
- A transcript of your group's podcast submitted as a Word document
- A 3–5-minute audio argument about your group's use of sound quality submitted as an MP3

Sample Student Projects

1. A Listening Journal sample by Rebecca Waldron in response to prompt #4.[1]
2. An excerpt from a sample group podcast, *Live Nashville*, Episode 8 by Jackson Badgley, Benjamin Dufresne, and Shannon Harper
3. A sample audio reflection by Benjamin Dufresne

Figure 11.2. Podcast art created by student Shannon Harper.

1. Three student examples (text files, audio files, and descriptive transcripts) can be found on the book's companion website.

Reflection

Joel Overall: My name is Joel Overall, and I am an English professor at Belmont University, teaching a course called Writing with Sound.[2]

Doyuen Ko: My name is Doyuen Ko. I'm an assistant professor at Belmont as well. I teach audio engineering technology, specifically for this course is called Critical Listening for Audio Production.

Joel: And, Doyuen, his course is actually part of the major for audio engineering.

Doyuen: Yes.

Joel: So one of the things we're doing is partnering our two courses together as a part of the gen ed requirement, a course called Learning Community Courses, and that means that two courses are partnered together, and there has to be a link between maybe one common assignment, and that's what we'd like to present to you today is the common assignment for both of our courses.

Just a quick insight into our institution: Belmont is in Nashville, Tennessee at the very top of music row, and we have about 8,000 students. Many of them major in music business, in audio engineering, in songwriting. Am I leaving anything out?

Doyuen: Entertainment industry study.

Joel: Yes, so there are quite a few music-related majors here that students take. So this seems to have been a very popular Learning Community Course for those students. Doyuen, I'll let you talk a little bit about the common assignment that we have.

Doyuen: For this Critical Listening class, I've been teaching this class more than four years. Normally, we spend a lot of time on listening practice, using those technical terms and technical quality evaluation tools. That is our normal Critical Listening class, but for this version of the class, which is Learning Community Courses, we introduced a new concept of evaluating the sound quality, which is using a listening journal. The listening journal is about writing about the sound quality while they are listening to the music samples.

Joel: Right, and the music samples are important because it allows students to make objective evaluations, using the technical language of audio engineering. But we're also asking them in these listening journals to make a subjective evaluation as well from a rhetorical perspective. For instance, many students might want to explain how a sound quality might make them feel, but the addition of a subjective analysis allows them to do that by adopting an audience perspective to explain the potential meanings of that sound or music. So, Doyuen, what kind of technical language do students use in this listening journal?

Doyuen: They have to write about the timbral quality of the sound, and spatial quality of the sound, and the technical quality of the sound. They learn about those objective evaluation strategies during the course. They can perform the ob-

2. The audio version of Doyuen Ko and Joel Overall's reflection can be found on the book's companion website.

jective evaluation in different kinds of assignments, but now for this assignment, they have to write about it, using the proper descriptors, proper words, which was taught in the Critical Listening course, and Joel's Soundwriting course as well.

Joel: So, let's hear a few examples of a few of these sound qualities. The first one is timbre, and this is an example of optimizing timbral qualities in the voice.

Doyuen: Yes, so we have the first sample, has some timbral quality issues, which is a typical issue you can find in a recording done in a small space. So, let's hear it first.

[a 5-second clip with a man speaking the following words in a muffled voice]

Man: The box was thrown beside the parked truck.

Joel: Wow, that was bad.

Doyuen: *[laughter]* Right, if I explain it in technical terms, there was a significant boost at around 1000 Hz. So when you have too much 1000 Hz energy in the audio, you get those kind of nasal, very canny sound quality in the voice. So in our Critical Listening class, our students have to train themselves to be able to hear those different timbral qualities, and specifically, they can distinguish those different frequencies to solve the problems. So after they recognize the problem at 1000 Hz, they can fix it, and this is the fixed version of the audio.

[a 5-second clip with a man speaking the following words in a much clearer voice]

Man: The box was thrown beside the parked truck.

Joel: Wow, that was better.

Doyuen: Right, so it cleaned up those nasal qualities of the voice. The listeners may think it's not a huge deal, it's not a big difference, but you can hear the quality difference between before and after audio. The difference is that our students were able to hear the problem, and they were able to fix that. So at the end, you get better program in your podcast and other media program.

Joel: So here, we have two examples of different spatial qualities.

[a 7-second clip of a snare drum with .5 seconds of reverb, followed by a 7-second clip of a snare drum with 2 seconds of reverb]

Doyuen: What you just heard was two drum hits, two snare hits with a different reverb time. As you heard, there's a big difference in spatial quality. The first one only had about .5 second reverb time, and the second one had about 2 seconds of reverb time. It's very long and wet. For creating audio programs, sometimes you have to add those spatial effects to create some sort of spatial dimension in your recordings. So we use those kinds of digital processors to make it happen in the recording.

Joel: Can I ask a question?

Doyuen: Yeah.

Joel: So my question is "Why would a student who's creating a podcast need to pay attention to the spatial qualities of the voice or whatever sound effects they have?"

Doyuen: Right, there are different podcasts, of course, sometimes it can be just dry and very direct-sounding voice. But sometimes, such as for dramas and more dramatic stories, sometimes they want to add those special effect for effective deliveries. So, depending on the programs, if they know how to use those effect efficiently, their program could be much more interesting and could be much more effective.

Joel: So reverb is one way to actually either cut the confusion out. Let's say reverb is distracting the audience, they can learn to identify it and cut it out, or they could actually use it as a part of the story.

Doyuen: Yes.

Joel: As a part of creating the effect of what they are trying to say.

Doyuen: Yes, in fact for musicians, it's been the acoustics or reverberation is known as a part of the instrument. So, especially classical musicians, they are always actually playing with the room, right? Not just their instrument, but their instrument is playing with the room. So it is a part of the story, part of the program, and I believe it is the same thing for the voice and dramas and radios and podcasts.

Doyuen: So we have those examples, and students have to go over different samples. They have to memorize the quality of those samples, and we have a specific way to evaluate for each category in our assignments. So, that's what we do in Critical Listening class.

Joel: And this is something that we're both trying to assess and look at, and part of the purpose for assessment in this situation is to help me, a non-specialist in audio engineering, to learn to also listen with the students to understand some of those qualities that they should be listening for. So, as we grade these together, I'm looking forward to learning but also using this as a scaffolding assignment that goes into my assignment.

That assignment, then, is a Group Podcast and Audio Reflection. I am asking my students, the entire 25-student class, to come up with a theme for a podcast, and then they will split off into groups of two or three, since we're an odd number of students, in order to produce each in these smaller partnerships an episode of the podcast that ranges from 10–15 minutes. And this episode will also include a full transcript. In addition to this, students will individually be creating a 3–5-minute supplemental audio file that takes some 5–10-second excerpts from the podcast in order to do this same thing: to listen to what they've created, to talk about why perhaps they've left in a technical quality, something like reverb. But to do this maybe in more so a rhetorical way or an intentional way to affect the story that's happening that they're reporting on. We're using Jessica Abel's (2015) book *Out on the Wire*. As she and Ira Glass talk about in that book, they discuss the genre of podcasts known as narrative journalism, and this is something that

I think is very important to narrative journalism, and that is knowing how to use specific sound effects, how to manipulate the audio in certain ways, and rather than just say, "Okay, each of your groups needs to go out and find an audio engineering student at Belmont to help you," I'm asking them to engineer their own mix and to do it very intentionally as a part of the story.

In the end, some of the takeaways that we have for this assignment. I'm very thankful to Doyuen for allowing me to kind of piggyback on an assignment that's already well-oiled and something that the teachers in audio engineering do. But I think it's very important as sound studies scholars and also people who teach sound assignments or soundwriting assignments to find ways to become more interdisciplinary, to borrow from fields like audio engineering or some of the other fields that we're looking at that deal with sound studies in order to provide students with that interdisciplinary experience that is necessary. In particular, our group of students, most of them want to be songwriters or audio engineers or something involving creative work. This I think is a very important assignment for them that helps combine the fields for them to be dynamic producers, and creators, and soundwriters in their field.

Doyuen: What I learned from teaching this course for many years was that I can teach them to evaluate the sound quality objectively, but what I was feeling lacking is the subjective evaluation part, which is about talking about the sound quality, and express their feeling in writing and speaking. And I think this assignment, this combined assignment, will give them to think about those aspects, and then develop their skills to convey their feelings and opinions in terms of the writing. So I think it's an interesting combination of the disciplines.

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