Building a Multi-level Music Technology Scope and Sequence Based on Best Practice

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ABSTRACT

The purpose of this empirical study is to discover, examine, and analyze what components comprise an advanced high school music technology curriculum. Ideas will be gathered through interviews of high school music teachers teaching multiple levels of music technology. Additionally, college professors in the field of music technology will be interviewed regarding what skills they want to see in new students coming from a high school music technology program. Furthermore, all material will be evaluated and compiled into a scope and sequence document outlining the trajectory of student learning in a two-class high school music technology curriculum.

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Chapter 1: Introduction

Purpose

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Rationale

As the access to music technology is becoming increasingly attainable via smartphones, web-based platforms, and large-scale computer programs, students are gravitating towards these platforms as a way to participate in the music making process without traditional training in a musical ensemble. The power that these tools possess allows our students to have a vehicle for their expanding musical creativity without the need for music literacy as a barrier to making music. A class covering the basics as an introductory look into the vast field of music technology is not enough to satiate the students who are using digital music as their primary means of music making. This study is aimed to investigate how to give these students who want more opportunity in a developing field a continuing education that is concise, comprehensive, and rigorous in an advanced level class so that our students can make high-quality music with accessible technology as a supplement to what is currently available at my schools.

Motive

In my current teaching position, the class that continues to have the highest number of requests for any non-ensemble class is our music technology class. I work between two high schools in the same school district in suburban Philadelphia. Each school consists of a 16-seat music technology lab which is near maximum capacity for the music technology class it hosts. We run two sections of the class at one school and one at the other. Each year, we are at or over maximum capacity in terms of the number of requests for the class. However, some of these requests are now coming from students who have already taken the class.

These same students are allowed to take the class multiple times by the school district but then sit in a class that they have already taken. The projects are the same, and the teaching is being done to the vast majority who are new to the class and taking part in the curriculum for the first time. Their experience in trying to continue their understanding of music technology is at a dead end. Ideally, this is the beginning of the process that will give students in my district this highly sought after opportunity.

My experiences in high school and college music technology classes, as well as my brief time as a studio engineer as an undergraduate, has made me passionate about the benefits of a rich understanding of music technology. I want to be able to provide a similar experience to my students: one where they can see themselves using the information they learn in these classes for the rest of their lives, regardless of their career path. Whether it is recording themselves playing a song to put on the internet or recording, mixing, and editing a song for a band they play in, this new vision of the music technology program for my schools could provide the information these students need to feel successful as they continue to make music after high school.

Chapter 2: Background Information

The Music Industry

According to the International Federation of the Phonographic Industry (IFPI), the global music industry in 2018 grossed $19.1 billion and showed a growth of 9.7% from the previous year (McIntyre2019). From the report, those numbers mark “the fourth consecutive year of global growth and the highest rate of growth since IFPI began tracking the market” (International Federation of the Phonographic Industry 2019). The Recording Industry Association of America (RIAA) reported that in 2018, the recording industry alone accounted for $9.8 billion of the industry total and grew from 12% in the prior year (Recording Industry Association of America 2019). The report found that the recording industry, which includes revenue generated by streaming services such as Spotify, Pandora, Apple Music, Amazon Music Unlimited, and Sirius XM Radio, makes up the largest percentage of the music industry’s net worth at 75% of the total (Recording Industry Association of America 2019).

As we prepare our students to leave our schools, we must ask if we are adequately equipping students to enter such a dynamic workforce. The RIAA reports that “the music industry created, directly or indirectly, 1.9 million U.S. jobs across a very wide variety of fields (Recording Industry Association of America 2018).” From both the IFPI and RIAA reports, this industry will only continue to grow as a result of inevitable change.

This industry represents a valuable and viable opportunity for both school districts and our students. For a school district, a curriculum focusing on music technology provides both a creative outlet to its students and a potential pipeline into an ever-expanding industry. For students, classes in music technology and its many facets can potentially spark a passion, provide a creative outlet, or prepare them to enter into this industry.

Reaching Non-traditional Music Students

Music technology classes, as a non-ensemble music elective, open the pool of students who may opt to take the class to the entirety of the student body of a given school. The need to play an instrument or read music notation are not barriers to entry like in Western classical ensemble classes. Interest in music and music technology is the sole prerequisite for any student that participates in music technology classes.

Edwards (as cited in Williams 2011) found that about 82 percent of students across schools he surveyed were not active participants in their school's music program. Of students that are not enrolled in their school's music programs, Williams (2011) found that more than 67 percent of those students play a musical instrument and 78 percent cannot read music notation. Williams also addresses an issue in the scope of students that are currently being reached in most schools:

> [A] pattern in music education of an *inverted pyramid* of music participation beginning with all children engaged in music making in the early grades and progressing to increasingly fewer students participating in music as they matriculate to graduation as a high school senior (Williams 2011).

Western classical ensemble classes tend to alienate a large majority of the student body that plays an instrument but does not participate in the music program and cannot read music. Classes in music technology are an opportunity to break away from the aforementioned inverted pyramid and expand course offerings to the general student body. The 82 percent of students that do not look to classical ensembles already could find a home within the music department in a class that speaks to their innate ability to work with technology and combining it with a passion for music; the 67 percent within that group who play an instrument can find a place to display their talent

within our music program amongst their peers without barriers; and the 78 percent out of the non-participatory students who cannot read standard notation can communicate in that class through technology as the common ground, rather than traditional music notation.

Project-Based and Student-Centered Learning

The classrooms that house the music technology program at my schools include 16 student stations. By nature, the class lends itself to being a more independent endeavor than an ensemble class. My goal in this environment is to have students work independently on individual projects for the large majority of the time. Student-centered learning is the overarching goal in this model.

Boud and Pascoe (as cited in Conklin 2012) outline three conditions that must be met for a classroom to properly support project-based learning: some level of learner control, some reflection of the real environment in the learning environment, and self-involvement from the learner. Students in the current iteration of my music technology class are more deeply engaged because of both the hands-on nature of the class and the amount of control that they have over the amount, depth, and pace of their learning. Projects in the class are also constructed to simulate real experiences within the music industry, such as creating music for film, mixing and mastering audio, and recording narration.

The control that students have of their learning through project-based learning ultimately leads to the creation of a student-centered learning experience. Conklin (2012) says that student-centered learning is “a teaching form that is driven by what the students are interested in, what excites them, what draws their curiosity, and an understanding of what they are doing and why they are doing it.” Conklin goes on to say that initiating this type of involvement from students

gives them a more in-depth understanding of the contributions that they make to their own learning experiences (2012).

Lindeman (as cited in Conklin 2012) writes that the adult learning process is backward when teachers and content drive instruction rather than allowing students' experiential learning to fuel our classrooms. Knowles (as cited in Conklin 2012), addressed five assumptions about adult learning, briefly: self-concept, adult-learner experience, readiness to learn, orientation to learning, and motivation to learn. Knowles expanded these assumptions into the following statements:

1. Adults need to know why they need to know something.
2. Adults need to learn experientially.
3. Adults approach learning as problem solving.
4. Adults learn best when the topic is of immediate value.
5. As an adult's self-concept becomes more oriented toward being an independent person, the person is more self-directed in his or her learning (as cited in Conklin 2012).

Lindeman and Knowles' assertions both refer to adult education, but I see value in their application to high school students as young adults. Knowles' five assertions ultimately lead to self-motivated student work. Especially in a class that is project-based and student-centered, students should be intrinsically motivated to complete the work that they are given in this setting. This process is a valuable skill that these students can take away from these classes and into the workforce, wherever that may be.

Connecting Common Core State Standards to Music Technology

Upon the creation of the Common Core State Standards (CCSS) in 2010, the National Association for Music Education (NAfME) partnered with the National Coalition for Core Arts Standards (NCCAS). The CCSS focused on English and Mathematics and did not include the arts. NAfME, as a member of the NCCAS, set out to reimagine their 1994 music standards to not only more directly defined what music should look like in different iterations of the music classroom, but also tied these new standards into the Common Core State Standards. The result of this project was the creation of eleven anchor standards across four artistic processes: creating, performing/presenting/producing, responding, and connecting (National Coalition for Core Arts Standards 2014).

NAfME, in addition to partnering with the NCCAS, created different strands within these new standards to outline expectations within various course offerings in a music department. Most notably, the inclusion of guitar and harmonizing instruments, music theory, and music technology strands gave more specific guidance to a wider variety of course offerings. This is the first time that music technology, among the other electives, was given a specific set of guidelines at the national level.

The result is a document produced in tandem by the NCCAS and NAfME that sets the precedent for the expectations of students within a music technology classroom. Each standard ties in with an artistic process: creating, performing, responding, and connecting. Across all four artistic processes, there are eleven anchor standards. Additionally, the anchor standards are pared down into a one or two-word summation and include an enduring understanding and essential question or questions. The anchor standards are:

Artistic Process 1: Creating

Anchor Standard 1: Generate and conceptualize artistic ideas and work.

Anchor Standard 2: Organize and develop artistic ideas and work.

Anchor Standard 3: Refine and complete artistic work.

Artistic Process 2: Performing/Presenting/Producing

Anchor Standard 4: Select, analyze, and interpret artistic work for presentation.

Anchor Standard 5: Develop and refine artistic techniques and work for presentation.

Anchor Standard 6: Convey meaning through the presentation of artistic work.

Artistic Process 3: Responding

Anchor Standard 7: Perceive and analyze artistic work.

Anchor Standard 8: Interpret intent and meaning in artistic work.

Anchor Standard 9: Apply criteria to evaluate artistic work.

Artistic Process 4: Connecting

Anchor Standard 10: Synthesize and relate knowledge and personal experiences to make art.

Anchor Standard 11: Relate artistic ideas and works with societal, cultural, and historical context to deepen understanding (National Core Arts Standards 2014).

Within each of these anchor standards, three levels of achievement that are outlined: proficient, accomplished, and advanced. It is here where the NCCAS and NAfME include specific language for each content area. The music technology standards include specific language to the technology classroom across the different descriptors of achievement. Through this document,

teachers of the subject now have a clearer framework in which to assess student work in this setting.

Chapter 3: Research Findings

Method of Research

To gather my research, I conducted phone interviews with other practicing teachers. Interviewing allowed me to both gather core information and data as well as contextualize with personal narrative and nuance. The interviews were all intriguing, fruitful discussions that occurred between October 23 and November 15, 2019. Having the opportunity to delve into the subject matter with each of the interviewees was a tremendous learning opportunity and proved to be more informative than written responses.

I procured a list of teachers to interview from the website Music Creativity Through Technology (MCTT) (www.musiccreativity.org). On the website's homepage, creators Rick Dammers and Brian Williams dedicate the site to "music educators working with the "Other 80%" of students in our schools who do not participate in the traditional performing ensembles and music classes (Dammers & Williams)." On a separate page, Dammers and Williams curate a list of teachers who submitted curricula to the website to be featured as part of their Non-Traditional Music (NTM) profiles. Within this NTM page, I specifically looked for professors of music technology at the college level as well as high school teachers of music technology. For high school teachers, I was looking to find teachers who taught either multiple levels of music technology and/or a full year version of the same class. In addition to the list from the MCTT website, I sought recommendations from colleagues as well as from the interviewees themselves.

Out of all the interviews I conducted, only one was unable to speak on the phone. This lone case was a written response to my questions. All of the other interviews were conducted over the phone.

Demographics

After combining personal recommendations and MCTT profiles into a list of interview candidates, I sent out emails to 25 teachers across the country. Of that group, eight are college professors, sixteen teach in high school, and one teaches at both levels. The group was almost exclusively male: twenty-two men and three women.

By the time I had responses from my initial email and set up calls to interview people, the list pared down to 13 people. Out of that group, five are college professors, seven teach music technology in high schools, and one teaches both college and high school. The interviewed group consisted of ten men and three women. Geographically, the candidates lived throughout the United States. I spoke individuals in Arizona, California, Connecticut, Massachusetts, New Jersey, New York, Ohio, Pennsylvania, and Wisconsin.

Questions

The process of coming up with questions proved challenging. Ultimately, I created two sets of questions: one set for high school teachers and another for college professors. For high school teachers, I had eight main questions, four of which had included follow up questions. For college professors, I had six main questions, two of which included follow up questions.

Three questions spanned both sets of questions and served as the foundation of my interviews. These questions focused on the programs most frequently used in music technology classes, equipment used, and the use of standard notation in class. After those questions, I split up the questions to focus more precisely on what I wanted most out of each group. For high school teachers, it was what they were teaching through the full extent of their curriculum. From college professors, I sought what they need and expect from their freshman entrants into their programs. I will expand more on the remaining questions for both groups later in this chapter.

Question 1: Digital Audio Workstation. The Digital Audio Workstation (DAW) is the moniker given to the program used in a studio setting to compose, record, mix, and master music. There are many different DAWs that are available for public consumption at varying degrees of scope and size. Currently, the music technology labs at my schools exclusively use Logic Pro X, a program that is proprietary to Apple's Mac computers. Of course, students enter my program with backgrounds in various DAWs, so I wanted to probe into which DAW teachers are working with between the high school and college levels. Another key point I wanted to investigate was whether other music technology programs used multiple DAWs in their programs and if so, why. The following table outlines the DAW preferences for high school teachers (Teachers 1, 3-9) and college professors (Teachers 2, 10-13).

	Ableton	Audacity	Digital Performer	GarageBand	Logic Pro X	PreSonus Studio One	Pro Tools	Reason	Sound Trap
Teacher 1				X	X				
Teacher 2	X			X					
Teacher 3				X		X			
Teacher 4	X						X		
Teacher 5	X	X		X					
Teacher 6	X				X				
Teacher 7	X	X		X					X
Teacher 8			X		X			X	
Teacher 9	X				X		X		
Teacher 10					X		X		
Teacher 11		X			X				
Teacher 12				X					
Teacher 13							X	X	

Table 1: Teacher DAW usage within curricula

High school teachers provided a wide scope of what DAWs they use in the curriculum. Most commonly, five teachers use Ableton. There are two DAWs that have four teachers as users: GarageBand and Logic Pro X. Two teachers use Pro Tools in their curricula, and another mentioned that it is used in their recording studio space but not within the curriculum. Audacity also appears within two curricula across high school teachers surveyed. All other responses amongst high school teachers had one user: Digital Performer, PreSonus Studio One, Reason, and Sound Trap.

The number of teachers employing Pro Tools within their curriculum was lower than I expected. With its reputation as the studio standard DAW, I expected more teachers to be using Pro Tools in their classes. Teacher 9 spoke with me at length about Pro Tools within the music industry itself. As a frequent user of Pro Tools both personally and in his class, he said Pro Tools is the "industry standard, if only in reputation" (Teacher 9, personal communication on October 30, 2019). He continued that while there are other more cost-effective options, "I feel like if I graduate my students without a fluency in Pro Tools, for better or for worse… is like a liability, almost" (Teacher 9, personal communication on October 30, 2019).

At the collegiate level, there was a little more consistency in this area. Three professors said they use Pro Tools exclusively. Teacher 12 works with GarageBand, Teacher 11 Audacity and Logic Pro X, and Teacher 2 uses a combination of GarageBand and Ableton. The use of ProTools at the collegiate level is higher because of its large presence in the industry in which these institutions seek to place their students.

The presence of the multiple DAWs at the collegiate level speaks to the growing use of other DAWs within the industry. Especially in higher learning with a focus on job preparedness and entry into the field, it was interesting to see the diversity of responses, albeit still favoring

Pro Tools in the classroom. Teacher 2 said that he demonstrates basic audio and MIDI editing concepts in GarageBand and teaches more advanced concepts, such as sampling, sound design, and remixing, in Ableton. Teacher 10 said that, in the end, it boils down to personal preference and experience. At his institution, he is more comfortable using Pro Tools, but another professor is more comfortable in Logic Pro X. Over the course of the program, students use and become proficient in both.

Of the group of DAWs mentioned in this section, financial considerations are a large factor. Serious thought needs to be given into what makes the most financial sense and then pick a DAW with that in mind. Audacity is the only program that is free between both Windows and Mac computers. GarageBand is a free program but it is only available on an Apple computer. There is a free version of PreSonus Studio One: Studio One Prime. For an additional one-time cost, Studio One Artist and Studio One Professional are available for purchase as well. Similarly, there is a free version of Sound Trap for personal use and four upgraded monthly subscriptions. Educational bundles are also available for purchase through Sound Trap's website. Outside of those four examples, all other DAWs impose a considerable financial start-up cost.

When picking a DAW, a license is needed for each station. The cost, depending on the DAW can be prohibitive within the financial constraints of a program. The DAWs discussed in this chapter range anywhere from $99 as a one time cost to $79.99 per month ($959.88 per year) for each station's license. With these costs multiplied by the number of stations in the classroom, it can create a considerable sum of money spent before purchasing any other equipment.

The operating system used in class, either Windows or macOS, will also affect which DAWs are available for use. Almost all of the DAWs that have been discussed in this section work across all platforms. Some programs, such as GarageBand and Logic Pro X are proprietary

to macOS. Sound Trap, one of the DAWs mentioned within the interview process, is a web-based DAW and only requires internet access.

Question 2: Equipment. This question lead to the most in-depth conversation. The equipment discussed included computers, digital instruments, and microphones across all classrooms. Unique conversations arose about equipment in a DJ and lighting rig and the studio control room setup at some schools. For the college professors interviewed, I asked only about equipment utilized in the entry-level classes. For high school teachers, I asked questions about equipment utilized across all levels of their programmatic offerings, including whether there was equipment used exclusively in the advanced courses. Everyone has different resources depending on their district or university. Additionally, each classroom's compilation of equipment is different based on how teachers see fit to immerse their students in the world of music technology.

I am fortunate to work in a lab comprised of a teacher station and 16 student stations. Each station has an iMac desktop computer, 88-key Korg piano, Focusrite digital interface, Shure microphone, OnStage Stands desktop microphone stand and all of the cabling to make each station function properly. Each station is connected through a Korg GEC5, allowing me to individually conference with students at their stations, pair them up for group work, or present a group lecture through students' headphones. We also have a variety of microphones and digital instruments to provide students with supplemental tools as they start to record and create material for the class.

Through the interview process, I found that no one had a setup exactly like the one that I employ. Across all the people I spoke with, no two teachers have identical labs. The absence of a unified methodology of setting up a technology lab was a key factor in my including this

question in my interview process. I intend to take the best of what was offered to me in the responses to this question and use these responses to shape my scope and sequence.

Twelve out of the thirteen teachers interviewed use Apple computers. It was interesting to hear the way that some teachers are employing Apple phones and tablets as secondary devices because of the integration across platforms. Teacher 3 has students record sounds on an iPhone and use the AirDrop feature to transfer sounds from the phone to the computer so that they can use those sound samples in the DAW. Teachers 1, 10, and 12 mentioned their employment of the mobile version of GarageBand, Apple's entry-level DAW. In the realm of Apple products, a few teachers also mentioned the use of Apple Remote Desktop in their labs. This program allows them from their teacher station to file share and work remotely with students on their screens.

Ten of the teachers I interviewed do not have full 88-key keyboards in their tech lab. In talking with teachers who do have full-sized keyboards, Teacher 6 mentioned that only three stations in his room have full-sized keyboards and all other stations have 61-keys. Teacher 7, similarly, mainly has 64-key keyboards but has four full-sized keyboards set up for student use. That room functions for two to three periods per school day as a piano lab, so the need for full-sized keyboards not only gives more advanced players the proper instrument but also allows for more seats to be opened within the piano lab class. Teacher 8 has 49-key keyboards in his tech lab but has a separate piano lab with full-sized keyboards. Teacher 11 is the only one with full-sized keyboards at every station. Even though this is his current setup, he mentioned that if he could change equipment he would downsize to 61-key keyboards that better integrate with the DAW.

For the rest of the interviewed group, the sizes of keyboards ranged from 25 to 64 keys. All function as Musical Interface Digital Input (MIDI) controllers so they can interact with the

DAW. There is a range of different types of keyboards across the interviewees as well: some have just traditional piano controllers and others have keyboards that feature programmable pads, knobs, sliders, and wheels to integrate more with the DAW and allow the keyboard to control workflow.

Another large discussion focused on microphones that students have access to within the music technology classroom. All but one high school teacher has a small collection of microphones ready to employ for student use. Three high school teachers that I spoke to also have a recording studio at their respective schools. For these teachers, it means their collection is both more expansive and more expensive to fulfill the needs of instruments that may come into the studio space. At the college level, two of the interviewees also utilize a studio space for their class or as an extension of their programs that house an expanded microphone collection.

As with keyboards, there was no consistency across programs in regards to microphones. USB microphones are employed in some schools in addition to traditional microphones depending on whether students had access to digital interfaces at their stations. Additionally, there was no consensus on which brands were the best in any given setting. Answers ranged from relatively inexpensive brands to brands with microphones that start upwards of $1,000. For any given program, a microphone collection is built on personal preference and budgetary concerns. Teacher 10, when talking about microphone quality, said, “where you start affects where you end” (Teacher 10, personal communication on November 5, 2019). Through this statement, he is speaking to the quality of construction of the microphone and its components affecting the quality of the recorded sound. More expensive microphones tend to have better components which leads to a better quality of sound. As long as a teacher likes the sound of any given microphone and it is an appropriate cost for the program, it will be a good fit.

In the high schools, six teachers mentioned equipment collections that include a combination of electric basses, guitars, and drum sets as supplemental instruments in their curriculum. Teacher 1 stated that while they do not intend to create high-level players on these instruments, they believe students should have a working knowledge of each and the ability to play all of these instruments to some degree. This teacher incorporates all of these instruments into songwriting class which is an extension of their introductory music technology course.

Additionally, I asked all of these teachers if there were any non-traditional MIDI controllers or equipment that they have for students to use. One answer that came up often was a trigger pad which can be used to sample sounds and reproduce them with the touch of a pad. These kinds of trigger pads are included on some newer MIDI keyboards that are meant to interact specifically with a DAW. They can be used to sample drum sounds but can be programmed to use any sampled sound. Other frequent answers included electronic drum pads, drum sets, and wind instruments as well as synthesizers.

I had two poignant discussions about non-traditional equipment focused on the use of DJ equipment. Teacher 1 said that students have access in her room to two different types of DJ equipment: a full-size, two-deck digital turntable and a microUSB DJ deck. Teacher 3 had students in one class engineer a 10-minute DJ set as a final project. The project included multiple facets: pricing what a DJ setup would look like if they were to start within that part of the industry, creating a business model and proposal, and using DJ gear and software program that accompanies the hardware to put together a cohesive setlist.

The idea of integrating DJing into a music technology curriculum is a logical pairing. The ability to create a cohesive setlist is enhanced by their knowledge of basic music theory regarding tonality and key centers as well as form. The skillset required to piece all those

components together is highly marketable outside of the high school classroom. DJs are still a large part of the radio industry, but they are also largely tied into the popular music scene as well as live music for events. It is an area in which we can expand our curriculum to better suit our students for the real world market.

Question 3: Classical music notation. A topic of high interest for me was the use of classical music notation within the music technology classroom setting. Especially as an elective music class, I have seen a large number of students in my class without classical musical training and that are not participants in our ensemble class offerings. Of those students, the large majority are not versed in reading classical music notation. In the interview process, I wanted to see what other music technology teachers thought about the subject: whether or not they teach standard music notation in their classes and their reasoning as to why or why not.

All but one person interviewed does not teach classical music notation in their classes. The one teacher that does teach classical notation only has students read rhythmic notation and does not go over pitch. Teacher 7 requires that students be able to read and write using classical notation in her most advanced class which is based largely on music composition. Currently, the curriculum she uses does cover classical notation but will be removed from the curriculum upon revision this coming summer. My expectation going into this process is that there would be a mix of responses with the majority in favor of not teaching notation. The clearest response across all participants and questions was given in this nearly unanimous response. A summary of this idea was succinctly put by Teacher 11 who said, “the ability to read music should not affect how well a student will or can do” (personal communication on November 8, 2019).

Teacher 4, who teaches both college and high school gave me a new lens on a way that we should look at music notation: linguistics. He outlined the following:

> I compare music to a language. There are basically three levels of linguistic understanding. There is the phonemic level where you take sounds and symbols and line them up. There is the grammatical level where those sounds and symbols become units of meaning and semantics in which units of meaning change and are actually activated in the course of a discussion.
>
> When kids learn how to talk, we don't talk to them in sounds... We say, "Hi, it's mama." "Hi, it's dada." We talk in phrases first. So we start them at this grammatical and partially semantic level and after four or five years, then we start to teach them to read the symbols and that's when we lay the phonetics on them. That's how music should be taught (Teacher 4, personal communication on October 25, 2019).

Teacher 4 elaborated on the connection between linguistics and music saying that the development of the ear is an essential part of student growth if musical notation not present. In exchange for notation, he focuses on the study of form, repetition, variation, timbre, and basic music theory (chord progressions) in his classroom. Other teachers in their responses to this same question echoed the concepts that Teacher 4 is focusing on in his classroom. Creating musicians that can converse musically without notation as a barrier is something that does cross into the professional realm. This is important in our classes and the industry.

Everyone, in place of classical notation, has come up with a working solution to have students communicate musically. Teacher 12 communicates through the piano scroll, essentially looking at notes as points on a grid of pitch as a vertical axis and time (in beats) as a horizontal axis. Others said that they have students acquire rhythm through dictation. The best we can do

for our students is to develop them into artists who can communicate what they on a musical level using as many different aids as we can to guide them in this endeavor.

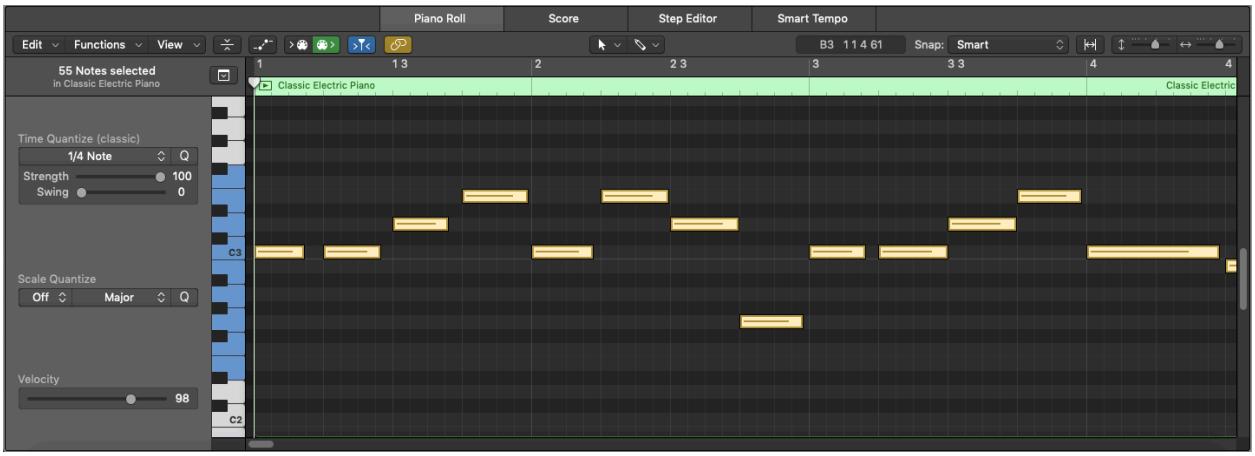

Figure 1: Piano scroll in Logic Pro X

High school specific questions. Along with the three questions highlighted earlier in the chapter, I asked five more questions to high school teachers. All of these questions looked deeper into what the curriculum at each of the interviewees' schools looks like. Having the input of colleagues about what works in their classes is the foundation of this project.

High school question 4: Introductory class. Primarily, everyone is teaching students functionality within a DAW, whether that be explicit or implicit by the nature of the projects being taught. Regardless of the DAW that is being used, all DAWs serve the same function. As long as concepts are understood within one DAW, the skills are easily transferable into another DAW.

Regardless of how teachers face the introduction of the DAW to their students, the common thread amongst interviewed teachers is that the introductory class functions as an expedition into many different areas within the field of music technology. Rather than focus on just audio engineering, recording, or composition, teachers tried to give students the most immersive experience they could offer. Across all teachers interviewed in this process, topics

taught in their collective introductory classes included rhythm, melody, harmony/chord progressions, drum beats, film scoring, composition, digital signal processing, remixing, sampling, Foley arts, using loops, podcasting, and recording audio. Everyone, regardless of the vehicle used to teach, is teaching a selection of the aforementioned topics within their introductory class.

Almost every teacher I spoke to addresses rhythm and pitch in some capacity over the course of their introductory class. As a result, these teachers are having students compose original music, whether it be melodic or percussive in the form of drum beats. Teacher 7 has students in her class learn five different scales and use them as the basis for their compositions throughout the entirety of the introductory class. Six teachers expand from just melody and rhythm to teach harmony and chord progressions. When asked why, they noted that through teaching harmony students have a more founded understanding of how to develop their music. Of the six teachers that teach harmony, they said that they only broach the subject at a basic level in their introductory classes.

High school question 5: Advanced classes. As far as new content within the more advanced classes, there are no new topics outside of the group listed earlier within content taught in introductory music technology classes. The biggest differences came from the depth of understanding instead of the breadth of topics covered. Heavier reliance on attention to detail, creative liberty, and opportunity for freedom drives advanced classes.

As I discussed the various course offerings beyond an introductory course, I found that teachers see the opportunity to relinquish control in favor of exploration, creativity, and opportunities to experiment as an essential part of their advanced courses. For three of the interviewees, they discussed that some of their students have the opportunity to design projects

and even entire quarters of the class. Within this process, students begin to develop an identity and find what works for them as creators. Teacher 4 had a student who wrote arrangements for a nine-song concert set, rehearsed and hired musicians, and ultimately performed the entire set for their peers.

In addition to the higher expectations of the students, one teacher is creatively finding ways to use his students' experience to his advantage. Teacher 9 mentioned that he almost always has multiple levels of music technology in his lab running concurrently. Because of the way the classes are set up, he said, there is a level of mentorship that the advanced students naturally assume. The higher-level students will guide the newer students through projects and, in return, will get feedback on their own projects with a new listener. In this scenario, the teacher has the opportunity to use these students to help reach people in the class who need more individualized attention.

High school question 6: Projects students enjoy. Creating an engaging curriculum is dependent on finding topics that students enjoy. High school teachers contributed that students enjoy audio engineering, composing audio for video, creating mashups, and podcasting. The most common answer was composing audio for video. Three teachers said that students enjoy Foley arts and movie scoring in their music technology experiences. Podcasting and audio engineering both had two teachers say students enjoyed those projects the most. One teacher cited mashups to be the highlight for their students.

A more abstract concept that students enjoy, according to three of the interviewees, is the freedom that music technology classes provide them. From these teachers that said they give their students creative liberty regularly, they said that students enjoyed having that level of freedom and control over their learning trajectory. This freedom also provides opportunities for

students to find their voices as musicians. Teacher 9 does weekly reflections to keep students honest about how they use their time in the class in exchange for the amount of freedom he allows. Students are asked to reflect on goals they set for themselves, create new goals, and talk about their creative process on a weekly basis. Teacher 9 went on to mention that students who keep up regularly with the reflections are less likely to "game the system" and take advantage of the absence of individualized attention within the class. Students who are honest about their work and their process within those reflections, he said, are the ones who get the most out of the class.

High school question 7: Projects where students struggle. Conversely, there are two teachers that said students struggled with creativity and freedom. Teacher 7 said that some of her students struggle with finding a starting point. Those same students, she says, will sometimes value product over process when she needs students to see the value in both. Teacher 3 said that students will seek creative direction in places where he wants them to experiment.

In regards to specific topics, students struggled with audio restoration, creating drum beats, film scoring, remixing audio, and transcribing melodies. Two teachers noted that students struggle with remixing audio the most. All other topics mentioned were brought up by just one teacher. Teacher 8, who said film scoring was a struggle for his students, expressed that some students struggle because of a lack of music theory and compositional knowledge.

High school question 8: Final projects. In regards to final projects, four teachers set up their final project as an independent study of sorts. Within a handful of guidelines, students can design their projects. Teacher 3 split his second-level class into three strands and then had students pick a final project within whichever strand they selected. The idea of giving students the creative freedom to propose their project gives the students the chance to work within their

tastes and employs a level of intrinsic motivation to produce work with sufficient understanding and technical demand expected in a final project at the respective class level.

College specific questions. The questions for college professors were designed to determine what skills a student starting as a music technology major should possess before starting in a collegiate music technology program. Although there were only three questions, these questions were focused primarily on the entry-level classes for incoming freshmen into a music technology program.

College question 4: Expected incoming student knowledge. Expectations of incoming freshmen to a music technology program were scattered. Some people had high expectations, like Teacher 10 who expected to have incoming freshmen that are proficient on an instrument, able to pass a theory test and have passed pre-calculus or higher during high school. This professor's program is affiliated with their university's College of Music and if students do not meet entry requirements of the program, he will send students to the School of Media and Communications which is a more generalized program. Teacher 13 said that in partnership with a local high school that serves as a pipeline to the community college where she works, she expects incoming students to have the fundamental knowledge to get them through Avid's Pro Tools 101 and 110 courses coming into her program. Others have low expectations of students, such as Teacher 11 who said he honestly had no expectations other than the hope that students know something about music.

College question 5: Assessment of incoming students' knowledge. When asked how student knowledge is measured as they enter into college programs, there was one answer that resonated with me above all others. Teacher 10 outlined that as part of the application to the program, students have to submit a one to three-minute video about a project that they made. In

the video, students explain the compositional, editorial, or engineering choices that they made and that, he said, would be a determining factor of the applicants' level of understanding. Explaining the logic behind your work and how you came to those conclusions helps teachers to understand a student's depth of understanding but may also force students to think more deeply about how they come to the decisions that they make within their coursework. It is a question we can pose to students and work with them to better understand the justification behind why and how certain processes, sounds, and effects work.

College question 6: What do you want incoming students to know. In regards to something that these five professors want their incoming students to know, the responses were once again varied. Teacher 10 hoped that he would have students with a balanced music and science background. Teacher 2 asked for students to have an open-minded approach to music and being creative. Teacher 11 asked that students come in with experience musically, whether it be singing, rapping, or just making beats. Teacher 4, who teaches at both levels wished that his students would come in with a better trained musical ear. Lastly, Teacher 13 reasserted her desire to have students proficient in a DAW, specifically in Pro Tools, upon entering her class. In essence, well-rounded incoming students are musical, creative, are good students, and are experienced within the music technology field.

Chapter 4: Conclusion

Key Takeaways

After compiling and analyzing all of my research, I have concluded that there is no singular answer for how to best shape a curriculum in music technology education. Everyone that I interviewed runs a successful program unique to their situation. Likewise, my proposed vision for the classes at my schools does not exactly fit into any one teacher's model. What I hoped to create was a catalog of what works best and what is most widely taught across the interviewed group.

Common Understandings

I plan to teach my music technology courses primarily through Logic Pro X. This, by default, means that a music technology classroom needs to operate using Apple computers. For a one-time cost per station, purchasing Logic Pro X gives perpetual ownership and updates as they are released by Apple, making it the most powerful and cost-efficient discussed amongst interviewed teachers. Additionally, Logic Pro X should be supplemented with Pro Tools | First, a free program. Students, through this free program, can learn the functionality they will need in a DAW that is considered the industry standard. Ableton Live Lite can also be used as a supplement, targeted at students who are using technology in live performance.

Additionally, students should have access to a 61-key piano that serves as a MIDI controller and a small audio interface to connect it to the computer. Students should also have a dedicated pair of headphones provided by the school that would be used in a studio setting to mix and edit audio. Each classroom should also have access to a small collection of microphones to provide students for use when recording instruments, voice, or sound samples. Electric guitars, electric basses, and electronic drums should be made available for students to learn as they

prepare to enter an industry where these tools are commonly used. DJ equipment should also be purchased for use in an advanced music technology curriculum. With all of this hardware, the proper cabling is required. Cabling needs should be done in consultation with a product specialist from the company that equipment is being purchased from.

Teachers should avoid the use of classical music notation within the music technology curriculum to enable students to most effectively communicate musically while avoiding barriers to creativity. This does not preclude teachers from teaching music theory concepts like melody, rhythm, harmony, or form. Finding creative ways to teach these concepts, whether that be through dictation, use of the piano roll, symbolic notation, allows students to find their methodology to most effectively talk about music. Considering that this class caters to non-traditional music students who most likely do not have a background reading classical musical notation, eliminating a creative block for these students should be of the utmost importance.

Scope and Sequence

For my proposed scope and sequence, I am working under the current scheduling framework of my school: music technology is a one-semester class, meeting three out of every four days for 55 minutes per class. In the introductory class, I propose four major units of study: DAW introduction and functionality; music theory; recording and digital signal processing; and composition and sound effects for film. Within this proposed course of study, students will complete 24 projects. Topics within these larger units of study include: using loops, song form, manipulating audio, rhythm, melody, piano skills, recording, digital signal processing, automation, basic mixing techniques, music composition, synthesizers, and Foley arts. Students will also complete one of three final projects: remixing song stems, creating Foley effects for a video clip, or completing a proposed independent study.

The advanced class will similarly work within four different major units of study: live instruments and advanced recording; advanced digital signal processing; film scoring; and music theory and DJing. I am assuming that this class will take on the same scheduling framework as my current classes. Instead of 24 projects, these students will complete 12, allowing students more time to experiment, fail, and recover from mistakes. Topics within the larger units of study include advanced software instruments; musicianship on bass, drums, and guitar; piano skills; digital signal processing applications; music composition; tonality; major and minor keys; chord progressions; time compression and expansion; and DJ skills. Students will then complete a final project from one of four choices: composing a film score and Foley effects; remixing and recreating a song; performing a live DJ set; or completing a proposed independent study.

Both classes will be asked to complete a weekly reflection at the end of the last class of any week. Students will be asked to respond to the following questions: what was the goal for this week; what did you do to contribute to your goal; list one thing that went especially well; list one thing that did not go as well as expected; and how does this affect your outlook for next week's work? By doing so, students will gain valuable self-evaluation, time management, and communication skills.

Reflections

Before the research process started, my largest concern was not being able to find a way to connect such vastly different programs. In the end, the things that tied all these programs together were not necessarily topics taught, but concepts that shape the classes themselves. While individual setups and projects varied, I found that all programs centered around the following four tenants:

- Music technology classes should be a safe space to create and fail

- In this setting, music notation is a barrier to creativity
- An introductory course should have as few barriers to making music as possible
- Advanced classes should have fewer, more intense projects

The way I conducted the bulk of my research greatly and positively shaped the end product. Speaking to each teacher individually, rather than using a survey, allowed me the freedom to ask questions, collaborate, and further explore any given topic, creating a rich narrative that has proven invaluable. If I would have gone through this process any other way, I do not believe I would have had been as enlightened and received such rich, in-depth answers to my questions.

Final Thoughts

Through this process, I have learned a lot about the field of music technology education field. It has opened my eyes to many good projects, programs, and philosophies. There is still much more that can be done and we owe it to our students to continually evolve our curriculum as this field evolves. All of that which I am proposing is a living document. Eventually, changes will be made as the industry and the technology change. This should be used as a starting point for discussion rather than an end. For someone in a similar situation to mine, I hope that this provides a useful guideline.

Appendix A

National Core Arts Standards: Music Technology Strand

Creating	**Anchor Standard 1: Generate and conceptualize artistic ideas and work** **Enduring Understanding: The creative ideas, concepts, and feelings that influence musicians' work emerge from a variety of sources.** **Essential Question(s): How do musicians generate creative ideas**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Imagine	MU:CR1.1.T.Ia Generate melodic, rhythmic and harmonic ideas for **compositions** or **improvisations** using **digital tools**.	MU:CR1.1.T.IIa Generate melodic rhythmic and harmonic ideas for **compositions** *and* **improvisations** using **digital tools** and ***resources***.	MU:CR.1.1.T.IIIa . Generate melodic, rhythmic, and harmonic ideas for **compositions** and **improvisations** that incorporate **digital tools**, **resources**, *and* ***systems***.	**Imagine**
Creating	**Anchor Standard 2: Organize and develop artistic ideas and work.** **Enduring Understanding: Musicians' creative choices are influenced by their expertise, context, and expressive intent.** **Essential Question(s): How do musicians make creative decisions?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Plan and Make	MU:Cr2.1.T.1a . Select melodic, rhythmic, and harmonic ideas to develop into a larger work using **digital tools** and **resources**.	MU:Cr2.1.T.II1 Select melodic, rhythmic and harmonic ideas to develop into a larger work *that exhibits* ***unity*** *and* ***variety*** using **digital** and *analog* tools.	MU:Cr2.1.T.IIIa . Select, develop, *and organize* multiple melodic, rhythmic and harmonic ideas to develop into a larger work that exhibits **unity**, **variety**, *complexity, and coherence* using **digital** and **analog tools**, ***resources****, and* ***systems*****.**	**Plan and Make**
Creating	**Anchor Standard 3: Refine and complete artistic work.** **Enduring Understanding: Musicians evaluate, and refine their work through openness to new ideas, persistence, and the application of appropriate criteria.** **Essential Question(s): How do musicians improve the quality of their creative work?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Evaluate and Refine	MU:Cr3.1.T.Ia . Drawing on feedback from teachers and peers, develop and implement strategies to improve and **refine** the **technical** and **expressive aspects** of draft **compositions** and **improvisations**.	MU:CR3.1.T.IIa *Develop and implement varied strategies to improve* and **refine** the **technical** and **expressive aspects** of draft **compositions** and **improvisations**.	MU:Cr3.1.T.IIIa . Develop and implement varied strategies *and apply appropriate* ***criteria*** to improve and **refine** the **technical** and **expressive aspects** of draft **compositions** and **improvisations**.	**Evaluate and Refine**

Creating	**Enduring Understanding: Musicians' presentation of creative work is the culmination of a process of creation and communication** **Essential Question(s): When is creative work ready to share?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Present	MU:Cr3.2.T.Ia **Share compositions** or **improvisations** that demonstrate a proficient level of musical and technological **craftsmanship** as well as the use of **digital tools** and **resources** in developing and organizing **musical ideas.**	MU:Cr3.2.T.IIa . **Share compositions** and **improvisations** that demonstrate an *accomplished* level of musical and technological **craftsmanship** *as well as the use of* **digital** and **analog tools** and **resources** in developing and organizing **musical ideas**.	MU:Cr3.2.T.IIIa . ***Share*** *a portfolio of musical creations representing varied* ***styles*** *and* ***genres*** *that demonstrates an advanced* level of musical and technological **craftsmanship** as well as the use of **digital** and **analog tools**, **resources** *and* ***systems*** in developing and organizing **musical ideas**.	**Present**
Performing	**Anchor Standard 4: Select, analyze, and interpret artistic work for presentation** **Enduring Understanding: Performers' interest in and knowledge of musical works, understanding of their own abilities, and the context for a performance influence the selection of repertoire.** **Essential Question(s): How do performers select repertoire?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Select	MU:Pr4.1.T.Ia Develop and explain the **criteria** used for selecting a varied **repertoire** of music based on interest, music reading skills, and an understanding of the performer's **technical** and technological **skill**.	MU:Pr4.1.T.IIa Develop and apply **criteria** to select a varied **repertoire** to study and perform based on interest; an understanding of **theoretical** and **structural** characteristics of the music; and the performer's **technical skill** using **digital tools** and **resources**.	MU:Pr4.1.1.T.IIIa Develop and apply **criteria** to select varied **programs** to study and perform based on interest, an understanding of the **theoretical** and **structural** characteristics, as well as expressive challenges in the music, and the performer's **technical** skill using **digital tools**, **resources**, and **systems**.	**Select**
Performing	**Enduring Understanding: Analyzing creators' context and how they manipulate elements of music provides insight into their intent and informs performance.** **Essential Question(s): How does understanding the structure and context of musical works inform performance?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Analyze	MU:Pr4.2.T.1a Describe how **context**, **structural** aspects of the music, and **digital** media/**tools** inform prepared and improvised **performances**.	MU:Pr4.2.T.II1 Describe and demonstrate how **context**, ***theoretical*** and **structural** aspects of the music and **digital** media/**tools** inform *and influence* prepared and improvised **performances**.	MU:Pr4.2.T.IIIa *Examine, evaluate and critique* how **context**, **theoretical** and **structural** aspects of the music and **digital** media/**tools** inform and influence prepared and improvised **performances**.	**Analyze**

Performing	**Enduring Understanding: Performers make interpretive decisions based on their understanding of context and expressive intent.** **Essential Question(s): How do performers interpret musical works?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Interpret	MU:Pr4.3.T.Ia Demonstrate how understanding the **context**, expressive challenges, and use of **digital tools** in a varied **repertoire** of music influence prepared or improvised **performances**.	MU:Pr4.3.T.IIa Demonstrate how understanding the ***style,*** ***genre,*** **context**, and use of **digital tools** and **resources** in a varied **repertoire** of music influences prepared or improvised **performances** and performers' **ability** to connect with audiences.	MU:Pr4.3.T.IIIa Demonstrate how understanding the **style**, **genre**, **context**, and *integration* of digital technologies in a varied **repertoire** of music *informs* and influences prepared and improvised **performances** *and their* **ability** to connect with audiences.	**Interpret**
Performing	**Anchor Standard 5: Develop and refine artistic techniques and work for presentation.** **Enduring Understanding: To express their musical ideas, musicians analyze, evaluate, and refine their performance over time through openness to new ideas, persistence,** **Essential Question(s): How do musicians improve the quality of their performance?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Rehearse, Evaluate and Refine	MU:Pr5.1.T.Ia Identify and implement rehearsal strategies to improve the **technical** and **expressive aspects** of prepared and improvised **performances** in a varied **repertoire** of music.	MU:Pr5.1.T.IIa *Develop and* implement rehearsal strategies to improve *and* ***refine*** the **technical** and **expressive aspects** of prepared and improvised **performances** in a varied **repertoire** of music.	MU:Pr5.1.T.IIIa *Apply appropriate* ***criteria*** *as well as feedback from multiple sources* and develop and implement *varied* strategies to improve and **refine** the **technical** and **expressive aspects** of prepared and improvised **performances** in *varied* ***programs*** of music.	**Rehearse, Evaluate and Refine**
Performing	**Anchor Standard 6: Convey meaning through the presentation of artistic work.** **Enduring Understanding: Musicians judge performance based on criteria that vary across time, place, and cultures.** **Essential Question(s): When is a performance judged ready to present? How do context and the manner in which musical work is presented influence audience response?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Present	MU:Pr6.1.T.Ia Using **digital tools**, demonstrate attention to **technical accuracy** and **expressive qualities** in prepared and improvised **performances** of a varied **repertoire** of music.	MU:Pr6.1.T.IIa Using **digital tools** *and* ***resources***, demonstrate **technical accuracy** and **expressive qualities** in prepared and improvised **performances** of a varied **repertoire** of music *representing diverse* ***cultures, styles, and genres***.	MU:Pr6.1.T.IIIa *Integrating* ***digital*** *and* ***analog tools*** *and* ***resources,*** demonstrate an understanding and attention to **technical accuracy** and **expressive qualities** of the music in prepared and improvised **performances** of a varied **repertoire** of music representing diverse **cultures**, **styles**, **genres**, *and* ***historical periods***.	**Present**

	MU:Pr6.1.T.Ib . Demonstrate an understanding of the **context** of music through prepared and improvised **performances**.	MU:Pr6.1.T.Ib . Demonstrate an understanding of the **context** of music through prepared and improvised **performances**.	MU:Pr6.1.T.IIIb *Demonstrate an **ability** to connect with audience members before, and engaging with and responding to them* during prepared and improvised **performances**.	
Responding	**Anchor Standard 7: Perceive and analyze artistic work** **Enduring Understanding: Individuals' selection of musical works is influenced by their interests, experiences, understandings, and purposes.** **Essential Question(s): How do individuals choose music to experience?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Select	MU:Re7.1.T.Ia Cite reasons for choosing music based on the use of the **elements of music**, digital and electronic aspects, and **connections** to interest or **purpose**.	MU:Re7.1.T.IIa *Select and critique contrasting **musical works**, defending opinions* based on manipulations of the **elements of music**, digital and electronic aspects, and the **purpose** and ***context** of the works.*	MU:Re7.1.T.IIIa Select, *describe and compare a variety of musical selections* based on *characteristics* and knowledge of the music, *understanding of* digital and electronic aspects, *and the **purpose** and **context*** of the works.	**Select**
Responding	**Enduring Understanding: Response to music is informed by analyzing context (social, cultural, and historical) and how creators and performers manipulate the elements of music** **Essential Question(s): How do individuals choose music to experience?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Analyze	MU:Re7.2.T.1a Explain how knowledge of the **structure** (repetition, similarities, contrasts), technological aspects, and **purpose** of the music informs the response.	MU:Re7.2.T.II1 Explain how an ***analysis*** of the **structure**, ***context***, and technological aspects of the music informs the response.	MU:Re7.2.T.IIIa *Demonstrate and justify* how an **analysis** of the **structural** characteristics, **context**, and *technological and creative decisions, informs interest in and response to the music*.	**Analyze**
Responding	**Anchor Standard 8: Interpret intent and meaning in artistic work.** **Enduring Understanding: Through their use of elements and structures of music, creators and performers provide clues to their expressive intent.** **Essential Question(s): How do we discern the musical creators' and performers' expressive intent?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Interpret	MU:Re8.1.T.Ia Explain and support an interpretation of the expressive intent of musical selections based on treatment of the elements of music, digital and electronic features, and purpose.	MU:Re8.1.T.IIa *Connect* the influence of the treatment of the **elements of music**, digital and electronic features, ***context,*** **purpose**, and *other art forms to* the **expressive intent** of **musical works**.	MU:Re8.1.T.IIIa *Examine, cite research and multiple sources* to connect the influence of the treatment of the **elements of music**, digital and electronic features, **context**, **purpose**, and other art forms to the **expressive intent** of **musical works**.	**Interpret**

Responding	**Anchor Standard 9: Apply criteria to evaluate artistic work.** **Enduring Understanding: The personal evaluation of musical work(s) and performance(s) is informed by analysis, interpretation, and established criteria.** **Essential Question(s): How do we judge the quality of musical work(s) and performance(s)?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
Evaluate	MU:Re9.1.T.Ia Evaluate music using criteria based on analysis, interpretation, digital and electronic features, and personal interests.	MU:Re9.1.T.IIa *Apply* ***criteria*** *to evaluate music* based on **analysis**, **interpretation**, *artistic* ***intent***, digital, electronic, and *analog* features, and ***musical qualities***.	MU:Re9.1.T.IIIa Develop and justify the evaluation of a variety of music based on established and personally-developed criteria, digital, electronic and analog features, and understanding of purpose and context.	**Evaluate**
Connecting	**Anchor Standard 10: Synthesize and relate knowledge and personal experiences to make art.** **Enduring Understanding: Musicians connect their personal interests, experiences, ideas, and knowledge to creating, performing, and responding.** **Essential Question(s): How do musicians make meaningful connections to creating, performing, and responding?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
	MU:Cn10.0.T.Ia Demonstrate how interests, knowledge, and skills relate to personal choices and intent when creating, performing, and responding to music.	MU:Cn10.0.T.IIa Demonstrate how interests, knowledge, and skills relate to personal choices and intent when creating, performing, and responding to music.	MU:Cn10.0.T.IIa Demonstrate how interests, knowledge, and skills relate to personal choices and intent when creating, performing, and responding to music.	
Connecting	**Anchor Standard 11: Relate artistic ideas and works with societal, cultural, and historical context to deepen understanding** **Enduring Understanding: Understanding connections to varied contexts and daily life enhances musicians' creative, performing, and responding.** **Essential Question(s): How do the other arts, other disciplines, contexts, and daily life inform creating, performing, and responding to music?**			
	HS Proficient	**HS Accomplished**	**HS Advanced**	
	MU:Cn11.0.T.1a Demonstrate understanding of relationships between music and the other arts, other disciplines, varied contexts, and daily life.	MU:Cn11.0.T.1a Demonstrate understanding of relationships between music and the other arts, other disciplines, varied contexts, and daily life.	MU:Cn11.0.T.1a Demonstrate understanding of relationships between music and the other arts, other disciplines, varied contexts, and daily life.	

Appendix B

Interview Questions

High School Teacher Questions

1. What is the DAW you use primarily?
    a. Do you use more than one DAW?
        i. Why or why not?
2. What equipment and instruments do you have in your tech lab?
    . Do you need additional equipment for your second level class that is not necessary for your first level class?
    a. Do you have any non-traditional instruments or MIDI controllers for student or teacher use?
3. Do you teach formal composition/written notation as a part of your tech classes?
    . Why or why not?
4. What do students learn in your first music tech class?
5. What are the main concepts you teach in your second level class?
6. What projects do the students enjoy the most in the second class?
7. Is there a project in your second class that students struggle with?
8. What does your final exam/project look like?

College Professor Questions

1. What is the DAW you use primarily?
    a. Do you use more than one DAW?
        i. Why or why not?
2. What equipment do you utilize in your entry level classes?

3. Do you teach formal composition/written notation as a part of your entry level class?
    . Why or why not?
4. What do you expect students to know in your entry level music tech class?
5. How do you measure student knowledge upon entering the class?
6. Is there something you wish students knew more about when they enter your class?

Appendix C

Interviewee Demographics

Teacher 1: High School, Connecticut, Female

Phone interview conducted October 23, 2019

Teacher 2: College, New York, Male

Email interview conducted October 25, 2019

Teacher 3: High School, Connecticut, Male

Phone interview conducted October 25, 2019

Teacher 4: College & High School, Ohio, Male

Phone interview conducted October 25, 2019

Teacher 5: High School, Wisconsin, Male

Phone interview conducted October 27, 2019

Teacher 6: High School, Massachusetts, Male

Phone interview conducted October 28, 2019

Teacher 7: High School, New Jersey, Female

Phone interview conducted October 30, 2019

Teacher 8: High School, New Jersey, Male

Phone interview conducted October 30, 2019

Teacher 9: High School, Arizona, Male

Phone interview conducted October 30, 2019

Teacher 10: College, Pennsylvania, Male

Phone interview conducted November 5, 2019

Teacher 11: College, Massachusetts, Male

Phone interview conducted November 8, 2019

Teacher 12: College, New York, Male

Phone interview conducted November 13, 2019

Teacher 13: College, California, Female

Phone interview conducted November 15, 2019

Appendix D

Scope and Sequence for Music Technology

Music Technology & Production (Level 1 - Elective)

Course Description

Music Technology & Production (Level 1) seeks to give students a basic understanding of concepts in music technology. The course covers musical topics such as song form, piano skills, rhythm, melody, chord progressions, and provides ample opportunity for students to compose. From a technological standpoint, the class starts at the basics of functioning in a Digital Audio Workstation (DAW) and progresses through audio manipulation, quantization, microphone usage and technique, automation, and synthesizers. Students will put themselves in the roles of mixing engineers, film score composers, and recording artists throughout the course of the class in simulated experiences in the music technology field.

Unit Name/Time frame	Big Ideas, Topics, Key Concepts	National Core Arts Standards	Student Activities	Assessments	Differentiation
Unit 1: DAW Introduction & Functionality	Working in DAW Computer keyboard shortcuts Using loops Song form Manipulating audio	MU:Cr1.1.T.IIa MU:Cr2.1.T.Ia MU:Cr3.1.T.IIa MU:Re7.2.T.IIa MU:Cn10.0.T.IIIa	Project 1A: Project and Track Creation Project 1B: Introduction to Loops Project 2A: Loop Melody Project 2B: Song Form Analysis Project 2C: Loop Song Project 3A: Monologue Jumble	Project Submissions Project Mastery Guidelines Weekly Reflections	Group projects Alternative assignments (as needed based on IEPs) Project extensions (based on GIEPs)
Unit 2: Music Theory	Rhythmic accuracy Quantization Pitch accuracy Basic piano keyboarding skills Recording MIDI into DAW	MU:Cr1.1.T.Ia MU:Cr2.1.T.Ia MU:Cr3.2.T.Ia MU:Pr4.I.T.IIa MU:Pr5.1.T.Ia MU:Pr6.I.T.Ia MU:Re8.1.T.Ia MU:Cn10.0.IIIa	Project 4A: Basic Piano Roll Rhythms Project 4B: Advanced Piano Roll Rhythms Project 4C: Drum Dictation Project 4D: Piano Roll Drum Beat Project 4E: Drum Beat Composition Project 5A: Piano Keyboard Worksheet Project 5B: Melodic Dictation	Project Submissions Project Mastery Guidelines Weekly Reflections	Group projects Alternative assignments (as needed based on IEPs) Project extensions (based on GIEPs)

Unit 3: Recording & Digital Signal Processing	Microphone technique and usage Recording analog audio into DAW Digital signal processing: function and usage Automation Basic mixing and mastering techniques	MU:Cr1.1.T.IIa MU:Cr2.I.T.IIa MU:Cr3.I.T.Ia MU:Cr3.2.T.IIa MU:Pr4.1.T.Ia MU:Pr4.2.T.IIa MU:Pr5.1.T.Ia MU:Pr6.1.T.Ia MU:Re7.2.T.Ia MU:Re8.T.Ia MU:Cn10.0.T.IIIa	Project 6A: Audio Effects Project 6B: Automation Project 7A: Emergency Radio Broadcast System Project 7B: "Beat-boxing" Project 7C: DJ Drop Project 7D: Band Bio Podcast Project 8A: Song Stem Remix Project 8B: Song Stem Re-Creation	Project Submissions Project Mastery Guidelines Weekly Reflections	Group projects Alternative assignments (as needed based on IEPs) Project extensions (based on GIEPs)
Unit 4: Composition and Sound Effects for Film	Music composition Synthesizer introduction Foley arts	MU:Cr1.1.T.IIa MU:Cr2.1.T.IIIa MU:Cr3.1.T.IIa MU:Pr4.2.T.IIIa MU:Re7.1.T.Ia MU:Re8.1.T.Ia MU:Cn10.0.IIIa MU:Cn11.0.IIIa	Project 9A: Synthesizer Ambient Music for Short Film Project 9B: Foley Arts	Project Submissions Project Mastery Guidelines Weekly Reflections	Group projects Alternative assignments (as needed based on IEPs) Project extensions (based on GIEPs)
Final Project	Movie scoring Mixing and mastering techniques	MU:Cr1.1.T.IIa MU:Cr2.1.T.IIIa MU:Cr3.1.T.IIa MU:Cr3.2.T.IIa MU:Pr4.1.T.Ia MU:Pr4.2.T.IIIa MU:Re7.1.T.Ia MU:Re8.1.T.Ia	Option A: Large Song Stem Remix or Recreation Option B: Extended Movie Scene Foley Option C: Proposed Independent Study	Project Submissions Project Mastery Guidelines Weekly Reflections	Group projects Alternative assignments (as needed based on IEPs) Project extensions (based on GIEPs)

		MU:Re9.1.T.IIa MU:Cn10.0.IIIa			

Music Technology & Production (Level 2 - Elective)

Course Description

Music Technology & Production (Level 2) seeks to expand on topics addressed in the first level of the course sequence as well as introduce new, more advanced subjects in the music technology realm. Musically, students will continue to compose music with the involvement of various analog and digital instruments and use digital signal processing to enhance their musical performances. This course will have students working with advanced programing within the Digital Audio Workstation (DAW) and learn to manipulate and effectively employ these tools. Students will continue to advance their experiences in the roles of mixing engineers, film score composers, and recording artists throughout the course of the class in simulated experiences in the music technology field.

Unit Name/Time Frame	Big Ideas, Topics, Concepts	National Core Arts Standards	Student Activities	Assessments	Differentiation
Unit 1: Instruments and Advanced Recording	Advanced software instruments Recording analog and MIDI audio Basic musicianship on bass, drums, and guitar Digital signal processing Piano skills	MU:Cr1.1.T.IIIa MU:Cr2.1.T.IIIa MU:Cr3.1.T.IIa MU:Pr4.1.T.IIa MU:Pr4.2.T.IIa MU:Pr4.3.T.IIa MU:Pr6.1.T.IIa MU:Re8.1.T.IIa MU:Re9.1.T.IIa MU:Cn10.0.T.IIa	Project 11A: Children's Song Remix Project 11B: Instrumental Foundations: Guitar, Bass, Drums Project 11C: Build-a-beat Project 11D: Children's Book Rap	Project Submissions Project Mastery Guidelines Weekly Reflections	Group projects Alternative assignments (as needed based on IEPs) Project extensions (based on GIEPs)
Unit 2: Advanced Digital Signal Processing	Digital signal processing Contextual understanding of when and how to apply signal processing Recording analog and/or MIDI sources	MU:Cr1.1.T.IIa MU:Cr2.I.T.IIa MU:Cr3.I.T.Ia MU:Cr3.2.T.IIa MU:Pr4.1.T.Ia MU:Pr4.2.T.IIa MU:Pr5.1.T.Ia	Project 12A: Song Stem Remix: Advanced Project12B: Song Stem Recreation: Advanced	Project Submissions Project Mastery Guidelines Weekly Reflections	Group projects Alternative assignments (as needed based on IEPs) Project extensions (based on GIEPs)

		MU:Pr6.1.T.Ia MU:Re7.2.T.Ia MU:Re8.T.IIa MU:Cn10.0.T.III			
Unit 3: Film Scoring	Music composition Piano keyboarding skills Recording analog and MIDI sources Time compression and expansion	MU:Cr1.1.T.IIIa MU:Cr2.1.T.IIIa MU:Cr3.1.T.IIIa MU:Pr4.2.T.IIIa MU:Pr5.1.T.IIa MU:Re7.1.T.IIIa MU:Re7.2.T.IIIa MU:Re8.1.T.IIa MU:Cn.10.0T.IIIa MU:Cn.11.0.T.IIIa	Project 13A: Make a Commercial Project 13B: Film Score	Project Submissions Project Mastery Guidelines Weekly Reflections	Group projects Alternative assignments (as needed based on IEPs) Project extensions (based on GIEPs)
Unit 4: Music Theory and DJing	Music theory (tonality, keys, major and relative minor, song form, chord progressions) Crossfading Basic DJ ability	MU:Cr1.1.T.IIa MU:Cr2.1.T.IIIa MU:Cr3.1.T.IIIa MU:Pr4.1.T.IIIa MU:Pr4.2.T.IIIa MU:Pr4.3.T.IIIa MU:Pr5.1.T.IIIa MU:Pr6.1.T.IIIa MU:Pr6.2.T.IIIa MU:Re7.1.T.IIa MU:Re7.2.T.IIIa MU:Re8.1.T.IIa	Project 14A: Pop Song: Music Theory Breakdown Project 14B: Mash-up Project 14C: DJ Mini-Set	Project Submissions Project Mastery Guidelines Weekly Reflections	Group projects Alternative assignments (as needed based on IEPs) Project extensions (based on GIEPs)

		MU:Re9.1.T.IIIa MU:Cn10.0.T.IIIa			
Final Project	Music composition Recording analog and/or MIDI sources DJ ability	MU:Cr1.1.T.IIIa MU:Cr2.1.T.IIIa MU:Cr3.1.T.IIIa MU:Pr4.1.T.IIIa MU:Pr4.2.T.IIIa MU:Pr4.3.T.IIIa MU:Pr5.1.T.IIIa MU:Pr6.1.T.IIIa MU:Pr6.2.T.IIIa MU:Re7.1.T.IIa MU:Re7.2.T.IIIa MU:Re8.1.T.IIa MU:Re9.1.T.IIIa MU:Cn10.0.T.IIIa MU:Cn11.0.T.IIIa	Option A: Film Score and Foley Option B: Song Stem Remix and Recreation Option C: Extended DJ Set and Performance Option D: Proposed Independent Study	Project Submissions Project Mastery Guidelines Weekly Reflections	Group projects Alternative assignments (as needed based on IEPs) Project extensions (based on GIEPs)

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