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A Musician's Engineer: Best Practices For Teaching Music Proficiency At Formal Audio Recording And Production Programs In The USA

Doug Bielmeier, Wellington M. Gordon

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Introduction

The primary role of the recording engineer is to establish an environment conducive to creativity and that allows musicians to perform their best (Vandemast-bell, Werner, & Crossley, 2015). An essential part of the recording studio environment involves interactions among producers, engineers, assistant engineers, and artists/musicians (Thompson & McIntyre, 2013). Therefore, a career in the commercial audio industry requires expert technical, musical, and artistic skills to gain competence in specialized areas that support a productive recording environment (Tough, 2009). Opinions on where and how musical and artistic skills are best developed varies from ARP programs to internships and on-the-job training/ apprenticeships (Bielmeier, 2014; Bielmeier D. , 2013). The importance and inclusion of music proficiency in formal ARP programs in the USA varies and reflects the larger inconsistency of approaches to modern audio education. (Cash-Jones, 2002; Gadhoke, 1978; Gander, 1978; Lambert, 1989; Lodge, 1978; Manquen, 1978; Merchant, 2011; Phillips, 2013; Tough, 2009).However, the literature outlines a basic definition of music proficiency for recording engineers and the means for its acquisition.

Defining Musical Proficiency

Recording as a profession requires myriad proficiencies in a variety of disciplines (Ratterman, 2013). "The practitioner of audio could draw from experiences in music, electrical sciences, culture, among others," (Ratterman, 2013, p. 1). Since the audio profession is the overlap of music and sound, or art and science, students should be exposed to both fields (Scheirman, 2013). Musical proficiency can be defined as playing a musical instrument (Moylan, 2015), but could also include communicating with musicians (Gullö, 2009), critically listening (Swanson, 2013), and the awareness of music genre and style (Reba, 2010). All philosophies and approaches for the acquisition of musical skills are based on the assertion that music proficiency is important for recording engineers (Moylan, 2015; Reba, 2010; Thibeault, 2012; Vandemast-bell, Werner, & Crossley, 2015; Ratterman, 2013; Scheirman, 2013).

Acquisition Of Musical Proficiency

Recent literature discusses many ways recording engineers can gain musical proficiency and includes (a) learning to play an instrument, (b) considering the studio as a musical instrument, (c) the study of genre and style, and (d) interacting with

musicians. Understanding each philosophy and approach aids in further defining what it means to be musically proficient.

Music proficiency can be obtained by the literal study of a musical instrument (Moylan, 2015). This can include both learning musical parts from written notes on a page and through mimicking sound recordings. Learning musical parts from written notes allows students to learn music vocabulary and an idiomatic understanding of an instrument. Learning musical parts through mimicking sound recordings gives students a sense of the physical and mental aspects of performance (Simonelli, 2014). Both vocabulary and musical empathy are essential when communicating with artists and musicians in the studio environment (Rubel, 2007).

The conventional definition of an instrument may not include the use of laptops in live performance. However, today's studio could be considered an instrument since its productions can substantially shape the final musical product (Thibeault, 2012). Currently, recording engineers often are required to take a bad performance and create, through heavy manipulation, a perfect final product. This creates an increased expectation of the engineer's skills, both musically and technically. Musical proficiency may be demonstrated by the engineer's creative ability to formulate a beautiful take from an unusable one.

Traditionally, many facets and dimensions of music are reinforced in ARP curriculum by both a strategically positioned listening class and the opportunity to work with musicians within a lab setting (Gullö, 2009). In lieu of music performance and theory classes, experiential learning environments are critical. While musical proficiency is not the focus for many institutions' curricula in the USA, the importance of listening exercises with a "multi-dimensional" approach is key in both critical listening training and musical "perception" (Swanson, 2013). Critically listening to music allows students to develop comprehension, interpretation, assemble contexts, and focus on multiple levels (Corey, 2010).

The study of music genre and style awareness builds music proficiency (Reba, 2010). Students should engage in listening assignments, presentations, discussions, and lectures that draw from a variety of genre and style. Music proficiency includes being fluent in a variety of genre and styles that aid in the complex interactions between creative individuals (Ratterman, 2013).

Musical proficiency could include interacting with musicians; however, the challenge for ARP programs in the USA is to provide students with real-world recording situations (Vandemast-bell, Werner, & Crossley, 2015). Situated learning is defined by placing students into an authentic learning environment that mimics one they would find in industry (Lave, 1991). This realistic recording environment allows students to develop communication skills when interacting with clients or musicians. These skills include addressing tuning, intonation or pitch, key awareness (or lack of), rhythmic challenges, groove or playing in the pocket, improvisation, arranging or composing on the spot, and language or musical slang.

Musical Proficiency In ARP Programs In The USA

Since the late 1990s, formal ARP programs have become commonplace in music, communication, and engineering departments at four-year universities in the USA (Cash-Jones, 2002; Kenny, 1990; Phillips, 2013; Sanders, 1994).

In general, most Bachelors of Music ARP programs involve 45 credits hours studying music: theory, sight-reading, history, and instrumental studies. In contrast, most Bachelors of Science ARP programs have only about 6-12 credit hours in the same areas of music. Most certificate programs do not cover music and music-related topics at all (Phillips, 2013). This paper identifies the importance of music proficiency for aspiring recording engineers as reported by music educators currently teaching in formal ARP programs in the USA. Their responses identified a need for music proficiency, and provided resources and best practices for the integration of music skills into ARP courses and curricula.

Methodology

Sample & Collection Process

During the summer and fall of 2015, twenty-five schools were selected to participate in this research and were selected to represent a variety of geographies and program types within the USA. All twenty-five schools prepared students for careers in the commercial audio industry. Responses were solicited from faculty, lecturers, administrators, and leaders. From a list of potential schools, each department was contacted by phone. Those interested in taking the online survey received a follow-up email link to the survey. The online survey allowed for the secure collection of faculty responses compliant with Institutional Review Board (IRB) guidelines. This survey was open from early August until mid-October of 2015.

Instrument

The online survey began with a series of questions on the background of each educator. The questions collected information about (a) college affiliation, (b) their highest level of formal ARP training, and (c) their current rank or position. Next, via a modified Likert matrix, educators ranked their level of music proficiency. Figure 1 shows the survey question for music proficiency rankings of educators.

Figure 1. Survey Question: Educator ranked level of musical proficiency

Which of the Music Skills listed below do you have and at what level of Proficiency?

	N/A	None	Basic	Intermediate	Advanced	Mastered
Play one or more instrument						
Read and write music						
Music Theory						
Aural Skills						

The next section of the survey included open-ended questions to better understand best practices of teaching music proficiency. These open-ended questions asked educators to report on:

- Musical background and general proficiency in music
- How their institutions strengthen and reinforce the musical proficiencies of students
- How music proficiency is addressed in courses they teach
- Strategies to teach students who are not musically proficient
- Identify books or online materials they use or recommend for students to acquire music proficiency skills

Analysis & Validity

All quantitative data from the survey was analyzed via descriptive statistics. An initial coding method for all open-ended questions broke down the qualitative data into discrete parts to closely examine and compare for similarities and differences (Strauss & Corbin, 1998).

By using a non-experimental approach, this research aimed to further understand the relationship between formal ARP training and music proficiency. The use of a non-experimental method focuses on the perspectives of the participants, not the researcher (Descy & Forcier, 2008). Visionaries in ARP research in the USA all used a non-experimental approach in an attempt to better understand the perspectives of the audio recording industry and educators in ARP programs (Lightner, 1993) (Sanders, 1994) (Walsh, 1996). (Lightner, 1993; Sanders, 1994; Walsh, 1996).

Results & Discussion

Sample

Faculty from 25 different colleges in the USA responded to the online survey. Figure 2 shows the cross-section of the educators' current rank/position. Figure 3 shows the variation of the educators' highest level of formal recording education and training. The majority had attended a four-year music college or masters (MFA type) program. Of the entire faculty, 23.5% did not attend any formal recording training program.

Figure 2. *Educator Indicated Position Title and/or Current Rank*

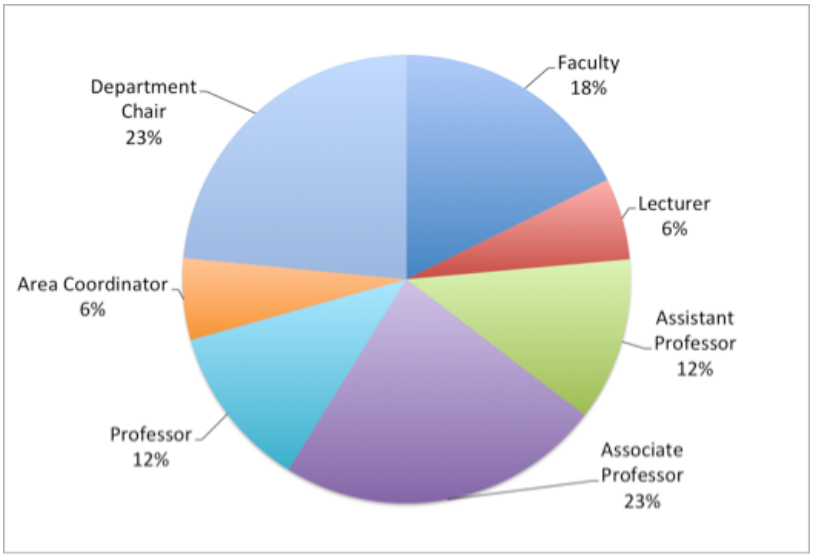
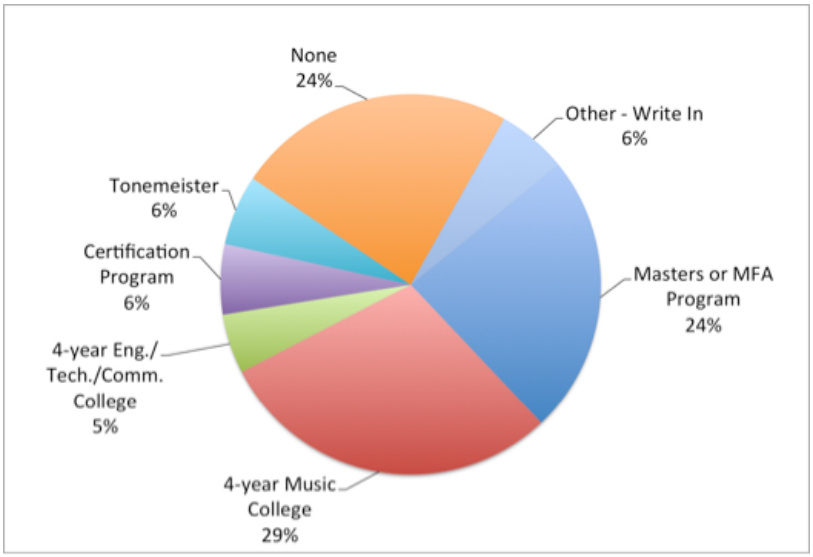


Figure 3. *The Formal ARP Program Faculty Attended*



The results indicate a balanced level of responses from both faculty and administrators ranging from lecturers and full professors to area coordinators and department chairs. The types of degrees were varied: Bachelors in music, Masters in music, and Doctorate in Musical Arts. However, almost 25% of the educators indicated no formal training in ARP, and was most likely comprised of the small percentage of educators who indicated they were composers and did not identify themselves as recording engineers.

Figure 4 shows more than half of the educators indicated mastering aural skills, where almost a third reported an advanced proficiency. Three educators indicated either that they had no proficiency, or thought proficiency in reading or writing music was not applicable. One educator replied that, "I am a non-musician. I earned my living as a professional audio engineer and record producer for more than two decades, so I'm a professional music listener, so to speak." This response suggests that the educator is not aware of the broader definition of music proficiency as indicated in the literature, and therefore should re-evaluate his status as a non-musician. Successful producers and engineers must have high levels of proficiency in communicating with musicians (Gullö, 2009), critical listening (Swanson, 2013), and an awareness of music genre and style (Reba, 2010). Furthermore, educators and ARP programs should consider this broader definition when evaluating student levels of proficiency and during curricula design. Nevertheless, being musically proficient is commonly related to the ability to play and instrument.

Figure 4. *Music Proficiency of Specific Skills as Ranked by Educators*

	NA	None	Basic	Intermediate	Advanced	Mastered	Responses
Play one or more instruments	0 0.0%	1 5.9%	1 5.9%	5 29.4%	6 35.3%	4 23.5%	17
Read and write Music	1 5.9%	2 11.8%	1 5.9%	3 17.6%	6 35.3%	4 23.5%	17
MusicTheory	0 0.0%	1 5.9%	3 17.6%	4 23.5%	5 29.4%	4 23.5%	17
Aural Skils	0 0.0%	0 0.0%	1 5.9%	2 11.8%	5 29.4%	9 52.9%	17

The educators' professional experiences in the recording industry varied in length and position. One educator cited his 25 years of professional work and 17 years as a teacher, while another identified the Grammy he won. Other educators indicated their work touring with bands as live sound engineers, while others were members of professional performance and recording ensembles.

Music Proficiency Beyond Specific Courses In Music

Almost half of the educators responded that at their institutions, student music ensembles were key to improving and nurturing the music proficiency of students. These included voluntary music clubs, department run ensembles, and even individualized lessons. One educator referred to the impromptu ensembles that are created due to the musical community that has developed at his institution, "…students are working on projects voluntarily and collaborating with each other outside of class projects."

The results suggest that for ARP programs that do not have departmentally run ensembles or individualized lessons, the existence of voluntary music clubs or impromptu student run ensembles is imperative. These ensembles can create a musical culture and community that fosters students working on projects voluntarily and collaborating outside of class projects. This culture can help in the acquisition of the music proficiency (Gullö, 2009) identified as the ability to communicate with musicians.

Another group of educators expressed the importance of real-world exposure to music including internships and going to performances or music events. The prevalence of such performances is more likely in highly urbanized areas or for ARP programs housed within music schools. However, an important factor is the quality of these performances and the caliber of musicians. Access to these quality performances may be difficult for students attending a rural vocational ARP program and therefore, these programs should concentrate on bringing musical performance to campus via concert series and music festivals.

This same group of educators included internships as part of this real-world exposure to music. Internships in ARP programs have been a complex issue regarding credit hours, regional availability, and poor student performance reflecting on their sponsoring university (Bielmeier, 2014). In the 1990s, the audio industry apprenticeship system of the 70s and 80s was

transformed via internship at the growing number of ARP programs. At that time, educators indicated that only 38% of ARP programs required internships (Kenny, 1990). Current research reported that less than half of educators poled responded that their ARP programs required internships (Bielmeier, 2014). Additionally, no consensus of length or location was displayed. Therefore, it would be a mistake to rely on internships, or be the only source, for musical proficiency.

Finally, one educator opined that this real-world exposure could happen through co-learning: when a student works with a more musically proficient student. The assertion is that this will raise the level of proficiency for the weaker student and reinforce the proficiency of the stronger student. This type of co-learning sets up a paradigm by which one engineer is communicating with another to prepare for future communication with a musician and or client (Thibeault, 2012). The one drawback of this type of group work is when the partnership is not mutually beneficial: a stronger student carries a weaker student or the stronger student is not interested in 'helping' the weaker student. In compensation, the socio-conflict approach partners students of similar or complementary abilities (King, 2008): pairing a technically skilled student who has weak music proficiency, with a musically proficient student who has limited technology skills.

Some educators cited higher-level coursework that strengthens students' musical proficiencies as well as electives in more advanced music topics. One educator commented, "Many students participate in ensembles. Additionally, our recording students take a scoring-for-picture course and an audio-for-video course." Another educator explained the higher-level students are "…required to take classes in musical aesthetics, MIDI composition, and technical ear training." Only one educator indicated the use of benchmarks and annual performance juries to evaluate student proficiency in music.

Music Proficiency Skills Taught In The Classroom

Only a few educators in this study indicated their courses did not address music proficiency. While many educators identified the inherent music topics and aspects that organically become part of the coursework. One educator explained that in his program, music technology is taught as an extension of music performance. While another posited that though his course is not music focused, the aesthetics of music style are frequently discussed while evaluating music mixing approaches and expectations.

Overall, strengthening or reinforcing music proficiency was not done by conventional test or quiz. Rather, the enhancement of musical and technical skills was achieved by integrating musical elements, skills, and proficiencies within coursework and assignments. Many educators believed that integrating musical elements, skills, and proficiencies within coursework and assignments enabled the simultaneous enhancement of musical and technical skills; weekly projects or assignments throughout the semester provided detailed feedback in both areas.

Based on these results, a strong and recursive feedback component could help to build students' musical proficiencies in what Gullö (2009) (Gullö, 2009) indicated as the ability to communicate with musicians. Additionally, this feedback loop requires the students to critically listen and make adjustments accordingly. One part of the definition of music proficiency is the ability to critically listen (Swanson, 2013). A specific example of this type of feedback-based assignment is the 'sound alike' project in which students recreate a composition or song from both a musical and technical perspective. This type of project builds students musical proficiency in what Reba (2010) (Reba, 2010) described as an awareness of genre and style. Additionally, this project required students to apply a technical process or parameter to gain a required musical outcome. This musical proficiency and ability is imperative for today's engineers who often substantially shape the final musical product (Thibeault, 2012).

Teaching Students Who Are Not Musically Proficient

When asked how they deal with students who are not musically proficient, only one educator answered 'with great difficulty.' Many educators responded that students at their institution are musically proficient. However, the levels and expectations of music proficiency varied among institutions. One educator posited that musical proficiency is helpful and should be required for a producer, but may not be necessary for an engineer. In contrast, another educator stated that the ARP program he taught at only accepted musicians and required a double degree in performance or composition. While another educator stated that his

program offered remedial courses for students who were not musically proficient; however, these were poorly attended.

Most educators offered strategies or approaches to foster music proficiency that focused on using musical examples that students are familiar with and breaking down the content into manageable parts. One educator stated that it is important to start with music that the students understand and can identify its role (e.g. a kick drum), and then build on less recognizable instruments (e.g. bass). This coincides with another educator's focus on general song structure and arrangement as opposed to specific 'notes on the page' approach.

One educator described teaching a student body with disparate levels of music proficiency as challenging, and therefore, encourages students who are non-musicians to listen to music, hang out with musicians, and educate themselves about style and technology. Programs that identify this as a recurring issue assigned a professor to help these musically deficient students. Many educators identified the variation in the students' levels of music proficiency as problematic when designing instructional methods.

The results indicated one-on-one tutoring was offered by the educators as means to address the individual musical needs of each student. This type of private instruction has been utilized to teach students mixing concepts by applying the deliberate practice model (Merchant, 2011). However, this method was observed to be more effective when class sizes were below 10 students and ideal with 3 to 4 graduate-level students (Bielmeier, 2014).

Other educators identified creating common vocabulary to create course instruction that was useful to all students. Identifying and creating this common vocabulary could be the role of a text specific to teaching music proficiency to students in ARP programs.

Materials For The Acquisition Of Music Proficiency Skills For Students

Most educators did not identify the use of books to teach music proficiency. Rather these educators drew from personal experience, graduate work, and self-made online instructional materials. Table 1 shows a limited list of texts and online materials educators reporting using.

Table 1. Texts and Online Sources Reported by Educators for Student Acquisition of Music Proficiency Skills

Online Sources	**Textbooks**
Berklee Online	Alten, Stanley R. *Audio in Media*. 9th ed. Boston, MA: Wadsworth, 2011. Print.
Lynda.com	
EdX.org,	Huber, David Miles, and Robert E. Runstein. *Modern Recording Techniques*. 7th ed. Amsterdam: Focal/Elsevier, 2010. Print.
http://acousticslab.org/psychoacoustics	
	Bartlett, Bruce. *Practical Recording Techniques the Step- By-Step Approach to Professional Audio Recording.* 6th ed. Hoboken: Taylor and Francis, 2012. Print.
	Davis, Gary, and Ralph Jones. *The Sound Reinforcement Handbook*. 2nd ed. Milwaukee: Hal Leonard, 1989. Print.

Music Proficiency For Recording Engineer Textbook

To build a more cohesive strategy for developing music proficiency, a music-proficiency for engineer's textbook (and/or interactive website) should be developed. This text would be based on the best practices identified from this study, and would develop: playing a musical instrument (Moylan, 2015), communicating with musicians (Gullö, 2009), critically listening (Swanson, 2013), and an awareness of music genre and style (Reba, 2010). The text could also help educators facilitate the application of these skills through participation in performance ensembles, real-world exposure, and higher level course work. Table 2 outlines possible sections in a music-proficiency for audio recording and production textbook.

Table 2. Music Proficiency for Audio Recording and Production Textbook

Section	Description	Proficiency
Keyboard Basics	Develop basic keyboard skills	IP, CM
Basic Keyboard Theory	Keyboard based theory skills	CM
Music Ear Training	To be able to hear intervals and interval sequences, chords and reinforce intonation/pitch accuracy	CM, CL, EP, RWE
Technical Ear Training	Frequency and timbre identification	CL
Performance Reporting	Understanding how to write a review of a musical performance or event	CM, CL, GA, SA, EP, RWE, HLCW
Music Rehearsals	Understanding how a music rehearsal is run and the objectives	CM, EP, RWE
Composition Music	Basic fundamental concepts in rhythmic studies, bass line development, melodic development and harmony construction	CM, GA, SA, EP, RWE, HLCW
Composition Video	Introduce and apply compositional techniques to video vignettes.	CM, GA, SA, EP, RWE, HLCW
Genre Specific Techniques	Introduce and apply studio techniques to enhance a performance musically (genre and style specific)	CM, GA, SA, EP, RWE, HLCW

Note. Instrumental Proficiency = IP; Communication with Musicians = CM; Critical Listening = CL; Genre Awareness = GA; Style Awareness = SA; Ensemble Performance = EP; Real-World Exposure = RWE; Higher Level Course Work = HLCW.

A music proficiency for engineer's textbook would allow for the development of a basic instrumental proficiency to become the gateway to music theory concepts. This text could introduce the keyboard, which is often viewed as a gateway to learning music theory as well as understanding other instruments (Rogers, 2004). Keyboard concepts could include, intervals, basic sequences, and chords (e.g. Major, Minor, dominant, diminished, and 7^{th}). (?)

Music ear training is a cornerstone of many four-year music programs (Phillips, 2013). Studying intervals, chords, and rhythms aurally reinforces and internalizes pitch accuracy (Larrouy-Maestri, 2015) and could help an engineer to judge performances during a recording session. In addition, technical ear training should be in a music proficiency for engineer's textbook to develop the ability to properly discern sound based on frequency and timbre to aid in the process of isomorphic mapping (Corey, 2010).

A section on performance reporting would allow engineers to articulate aspects of a musical performance or rehearsal. This music and technical knowledge could be applied when describing aspects of musical performances and musical rehearsals

during the recording process.

The study of composition introduces and applies music theory that can aid in the development of music proficiency (Guderian, 2012). When collaborating with a producer and composer, engineers should be familiar with lead sheets, notation, and scores. Congruently, studying music composition for video and film introduces and applies music theory that can also reinforce music proficiency. With traditional radio and broadcasting landscapes changing, audio students need to be familiar with basic methods of composing for visual media (Strobin, 2015; Keown, 2015) (Strobin, 2015) *(Keown, 2015)* and the involved aspects of audio recording and production.

Finally, a section of a music-proficiency for engineer's textbook should focus on audio recording and production techniques. These techniques are often genre specific and are identified as common tools to create specific musical outcomes. For different genre and styles, the section could discuss release times on compressors, auto-tune as an effect, use of equalization, and reverbs (gated and other techniques) (Thibeault, 2012).

A music-proficiency for recording engineer textbook/website would serve as both a resource for students and help educators define learning objectives for a music proficiency specific course. How to incorporate a music-proficiency for engineers course into the disparate types of ARP programs in the USA would require further examination and research.

Conclusion

The definition of music proficiency is different for musicians and recording engineers. While both may play a musical instrument, it is more important for recording engineers to critically listen, recognize music genre and style, and communicate purposefully with musicians and clients. Most educators, in this study, viewed music proficiency as an important part of their ARP program. Therefore, to collect best practices for teaching music proficiency, educators were asked open-ended questions that included: (a) educator's musical background, (b) their institution's program to develop musical proficiencies, (c) how they addressed musical proficiencies in their courses; (d) how they taught students who were not proficient, and (e) the books and online materials they used to acquire musical proficiency skills. Educators asserted that for students to become proficient or further improve their music skills, participation in performance ensembles and real-world exposure to music is helpful. In general, they identified music proficiency as an integral part of what they taught or as a prerequisite for their program. In addition, educators offered some strategies for teaching non-musicians, and many educators integrated music skills and technical skills within a course or assignment. Those educators who did not consider music proficiency important may not have considered the broader definition of music proficiency as defined by the literature to include instrumental proficiency, communication with musicians, critical listening, and genre/style awareness.

Few educators offered any specific resources, text or online, for the acquisition of music proficiency for their students. Rather these educators drew from personal experience, graduate work, and self-made on line instructional materials. A recording engineer-specific text for the acquisition of music proficiency skills is warranted and should include basic keyboard proficiency, music theory, musical/technical ear training, performance reporting, rehearsal management, composition for music and video, and genre specific recording techniques. The use of a music proficiency text and infusion of music proficiency within ARP curricula is needed. This infusion of music proficiency will aid in the development of well-rounded recording engineers seeking employment in the audio industry.

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