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Seven Steps to Mixing Success: Applying Experiential Learning Theory to Teaching Music Mixing

Nathaniel Stoll†

Bethel University McKenzie, Tennessee, USA

Abstract

The continuing decentralization of the music production process and the proliferation of music produced in non-traditional studios has increased the impact that a professional mix can have on the final product of a music production. With current mixing technology, skilled mixing engineers may be able to take demos recorded in an artist's basement with minimal recording means, and transform these modest recordings into a polished final product. While there are plenty of resources available — both scholarly and otherwise — for students on how to mix, there is very little information on how to practice mixing. That is, students can read about how to mix in a variety of textbooks and online sources on the subject, but students are often at a loss as to how to go about improving their mixing skills. Experiential learning theory offers a unique and practical guide for mixing educators to help their students improve their mixing skills. This study develops a seven-step process for students to practice mixing in the classroom, distilled from best practices in experiential learning and audio production education.

Keywords

mixing • music education • experiential learning • audio pedagogy • educational theory • learning models • deliberate practice • audio recording • audio engineering technology

Introduction

As the accessibility and affordability of audio production tools increases, students' need for quality education in the art and technique of music mixing also increases. If you type "how to mix music" into an internet search engine, you will likely find a multitude of online sources ranging from beginner's guides to resources claiming to turn readers into professional mixing engineers with ease. Any professional mixing engineer knows that achieving professional mixing results takes a great deal of work, knowledge, care, and experience, which cannot be acquired solely through reading online articles about how to mix. However, when conducting searches through academic sources, there has been little research on how to teach music mixing effectively, except for a few research papers, such as Merchant's 2011 and 2013 Audio Engineering Society convention papers.

In assessing how best to teach mixing in a university or college setting, the educational theory of experiential learning offers a strong pedagogical foundation. Learning models and educational guidelines throughout experiential learning literature have significant applicability for teaching mixing in the higher education classroom that has not yet been investigated. In particular, general experiential learning concepts like knowledge acquisition, reflection, assessment, and action can provide a useful backbone for mixing education. Experiential learning practices enable the mixing educator to take the foundational knowledge their students acquire about mixing through more traditional educational methodologies in class, and apply that knowledge in a way that helps students improve their mixing skills throughout a course.

This study explores the question of how experiential learning techniques can make teaching mixing more effective and engaging. To examine effective teaching for mixing, the educational field of experiential learning is applied to mixing education, combining research on experiential learning, music mixing, and current best practices in audio production education to support the development of a theoretical experiential learning model that can be used by educators during mixing courses.

†*Corresponding author: Nathaniel Stoll*

E-mail: stolln@bethelu.edu

Experiential Learning Theory as a Framework

There are many variations on the definition of experiential learning, sometimes referred to in educational theory literature from the educator's perspective as "experiential education." Foundational thought on experiential learning comes from influential 20th century philosophers and thinkers, such as John Dewey, Kurt Lewin, Jean Piaget, Paulo Friere, Mary Follett, David Kolb, and other scholars, contemplating the topic of how humans derive meaning and learn through experience.[1] Modern enthusiasm for experiential learning and education is evidenced by the formation of the Society for Experiential Education (SEE) in 1971,[2] and the incorporation of the Association for Experiential Education (AEE) in 1977.[3] In 1973, the Council for Advancement of Experiential Learning worked on granting college credit for learning that adults gained outside of a university setting.[4] Both the SEE and the AEE began as U.S.-based institutions, but their focus expanded when the scope and popularity of both organizations broadened to include international audiences.[5]

Before delving into a working definition and framework for experiential learning, it may be useful to address some common misconceptions. Experiential learning is not simply learning by doing. Outside the context of academic theory, experiential learning might wrongly be categorized as promoting experience as a substitute for learning.[6] While experience is an important aspect of experiential learning, true experiential learning requires a more nuanced and detailed understanding. As Beard and Wilson ask, "Are all experiences 'experiential learning' (after all, they are all potential learning *experiences*)? The answer is no, and so we must therefore ask, *what exactly is experiential learning*?"[7]

The foundation of experiential learning is based on the work of John Dewey, notably his book *Experience and Nature*.[8] The concept of experiential learning stems from the link between students engaging in "doing" and students engaging in learning. Dewey argues that real-world experiences provide context for principles and theories learned in the classroom, but he does not believe that experiences in themselves are a good substitute for education and learning.[9] Dewey believes experiences reinforce learning by providing context for theories and principles taught in class. Without a theoretical framework for an experience, the experience provides less value for learning and lacks substance for analysis.

Lewin's model of experiential learning explores the link between students' experience and learning. In his model, students cycle through a process of concrete experience; observation and reflection; formation of abstract concepts and generalizations; and finally, testing of these concepts in new situations, leading back to the beginning stage of concrete experience.[10]

Kolb's experiential learning theory has frequently proved viable and is used by modern educators as a foundation for their teaching practices.[11] Kolb draws upon ideas from Dewey and Lewin to expand upon a cycle developed by William James in order to construct his own experiential learning cycle.[12] In Kolb's cycle, learners move through a feedback loop of concrete experience (CE), abstract conceptualization (AC), reflective observation (RO), abstract experimentation (AE), then back to concrete experience. In this theory, the full cycle is needed for students to undergo effective experiential learning, and the feedback loop of this cycle allows for learners to achieve greater learning gains. Kolb explains:

> Learners … must be able to involve themselves fully, openly, and without bias in new experiences (CE). They must be able to reflect on and observe their experiences from many perspectives (RO). They must be able to create concepts that integrate their observations into logically sound theories (AC), and they must be able to use these theories to make decisions and solve problems (AE).[13]

This points toward the question; what kinds of experiences lead to experiential learning? Viable experiences include internships, simulations, exercises, cooperative education, and volunteering.[14] Effective experiential education happens when a teacher or mentor stimulates learning before, during, or after the experience.[15] Teachers guide students through thinking about experiences in an open and informed way, and then together they synthesize theories and ideas, which students can use to inform future experiences conceptualizing insightful viewpoints about the world. In the realm of music mixing education, a similar theory has been applied to teaching methods, which is the application of deliberate practice by Merchant.[16] Integrating experiential learning with traditional modes of learning such as reading textbooks and attending lectures is essential for the overall success of experiential education.

The foundation of experiential learning lies in connecting theory and experience.[17] In considering the different theories and cycles surrounding experiential learning, Beard and Wilson conclude that "while they are all interlinked and have influenced one another, there would appear to be a fundamental principle at work here in which we need to combine thinking with doing or applying in order to create an effective learning process."[18] A generalized version of Kolb's cycle incorporates Beard and Wilson's fundamental principle of experiential learning in practical terms: experiential learning comprises experiencing, reflecting, thinking, and acting. Kolb's generalized model, combined with Beard and Wilson's combination of thinking and doing, provide an implementable model for effective experiential learning in higher education.

Although experiential learning as a theory is similar to many other conceptual frameworks, it's not without its flaws. Boud,

Cohen, and Walker describe not only how experiences can inspire us to explore new areas of thought, but conversely, how past experiences can also create negative patterns of behavior and erroneous assumptions about current and future experiences.[19] For example, if an audio engineer has had a past negative experience utilizing a particular tool, they may resist using the tool in the future, even if the issue was the tool's application and not the tool itself.

One of the most salient potential issues with experiential learning is the student's personal bias. Buchmann and Schwille demonstrate that learners view real-world experiences through the lens of their own biases.[20] Similarly, Eisenstein and Hutchinson warn about the potential for biased learning during experiential education.[21] Beliefs or opinions of the learner can impact their reflection and analysis of their experiences, and often unintentionally distort their learning outcomes. For example, if someone is biased against a particular gender, they will bring this bias into a learning experience. To counteract this issue, educators in experiential learning must provide students with accurate and meaningful information and guide students' reflections to promote openness and critical thinking while steering students away from potentially harmful implicit biases.[22] In this respect, it is important that the educator, in addition to the student, brings an open mind free from personal bias to their teaching. Furthermore, in experiential learning the educator becomes an "experience designer" who selects appropriate experiences and creates meaningful, safe contexts for the personal, social, and external environments bounding learning experiences.[23]

Beyond the theoretical nature of experiential learning, practical application of these theories is common at modern institutions of higher education.[24] Beard and Wilson encourage educators to properly understand experiential learning before applying these techniques in the classroom:

> Deliberations about the nature of experience are not merely academic, with no practical application. It is only by considering what we mean by experience that trainers, educators, facilitators and developers of human potential can gain insight into one of the most powerful means to learning that currently exists: learning from experience is one of the most fundamental and natural means of learning available to everyone.[25]

Moving past the theoretical foundations of experiential learning, educators should consider which applications are useful and practical. The impact of Kolb's theory is evident in the Society for Experiential Education's practical field guide: "Eight Principles of Good Practice for All Experiential Learning Activities." Its principles are: intention; preparedness and planning; authenticity; reflection; orientation and training; monitoring and continuous improvement; assessment and evaluation; and acknowledgement.[26] The following list clarifies how educators should implement each principle according to SEE.

1. Intention: The educator determines why a particular experience works well for students and how the approach will likely result in learning.
2. Preparedness and planning: The educator aids students in acquiring foundational knowledge in order to draw meaning from the experience. In addition, the educator creates a flexible learning structure that aligns with both the educator's and students' intentions.
3. Authenticity: The educator ensures the experience has a real-world application.
4. Reflection: The educator allows learners to identify implicit biases or preconceived notions and contrasts them with the actual outcomes of the experience.
5. Orientation and training: The educator makes sure everyone involved understands the context and environment they are operating within to gain a better appreciation for the experience.
6. Monitoring and continuous improvement: The educator provides participants with formative evaluation that closes the feedback loop between the intentions of the experience and the knowledge gained throughout the learning process.
7. Assessment and evaluation: The educator creates a quality control check where the initial learning intentions are measured against outcomes and skills gained as a result of the experience.
8. Acknowledgment: The educator recognizes the student's growth as a result of the experiential learning, which is intended to create a positive and sustainable experience for all involved.

These principles illustrate the importance of both having an experience and learning about that experience. This combination is a common theme in experiential learning literature and is foundational to effective experiential education in practice.

While the theories of experiential learning seem to have beneficial practical applications, educators must also determine if such practices actually work by reviewing documented positive learning outcomes as a result of experiential learning practices in higher education. Leal-Rodriguez and Albort-Morant consider this and set out to find examples in the context of their Spanish business school. They note that:

> There are plenty of theoretical studies addressing how active-based practices and methodologies influence university students' level of performance. However, there is a scarcity of works that bring empirical evidence

> to sustain the existence of a positive link between the students' involvement in experience-based learning methods and their academic results.[27]

For their research, they gathered empirical evidence throughout an undergraduate course on business administration and found their student data indicated that experiential learning practices, such as professional interviews and simulations, were positively correlated with student performance on the course's final exam. However, these findings used a limited data set, and cannot be used to conclusively determine the effectiveness of experiential learning in higher education in general.

Mixing Education

Audio education in general is a relatively new field in higher education. In 1969, the first collegiate audio technology program opened at the Institute of Audio Research, with many formal audio programs starting to appear in universities and colleges in the 1970s.[28] Teaching the technical aspects of audio is a fairly straightforward process where students acquire knowledge regarding signal flow, audio equipment, recording procedures, and audio technology, and apply this knowledge to the music production process. The primary emphasis in the acquisition of such knowledge is building accurate mental models for students, who can then map their knowledge onto a larger framework rather than simply memorize facts.[29]

Moving from audio education in general to mixing specifically, the mixing stage of the music production process is where all final recorded musical elements are balanced, blended, processed, and combined into a final mix for presentation to the listener. The mixing process is intended to "creat[e] an artistic blend of timbres and dynamic levels, and assigned spatial location, distance, and environment qualities (using the skills and concepts of a traditional composer or orchestrator)."[30] Much of the current educational literature on mixing focuses on two primary aspects of mixing: the process of mixing, and the technical tools used for mixing.

Regarding the mixing process, there is no consensus on how to approach the creative and technical aspects of the work. Case outlines "a standard approach to mixing pop music" from an instrumental standpoint where the mixer starts with drums, then bass, guitars, keys, vocals, and finally any soloistic elements.[31] However, Case admits that such an approach may not always lead to quality results, and can sometimes be inappropriate. In fact, Case revised his approach in a later publication, noting that "there is no right way to mix."[32]

Nuanced guidelines for mixing are offered by authors like Izhaki and Owsinski. Izhaki describes an iterative approach where mixers continually refine level, panning, processing, modulation, delay and reverb, as well as a more holistic approach where mixers cycle from conception to action to evaluation.[33] Instead of outlining a particular process for mixing, Owsinski interviewed a large number of accomplished mixers about their processes, concluding that "just because one best-selling mixer might do things a certain way, that doesn't mean that's the only way to do it. In fact, you'll notice that what works for one may be completely opposite of what works for another, yet they both produce great mixes."[34] Approaches to mixing music are varied, and certain processes may be emphasized over others depending on the instructor. By providing students with guidance, teachers offer students starting places for their mixes that rarely should be presented as the only way to approach a mixing task. Instead, students should be encouraged to try different methodologies and adapt strategies that align with their workflow, empowering them to achieve compelling results.

Regarding technical tools for mixing, there is more consensus within the current educational literature. The foundational mixing tools typically included in mixing textbooks are level, panning, equalization (EQ), dynamic range processing, and time-based effects. Additional tools (such as modulation, distortion, pitch alteration, and sampling) are also often included in texts. It is beyond the scope of this study to offer an in-depth explanation of these tools. Textbooks by Izhaki, Senior, Owsinski, Case, Stavrou, Moylan, and Gibson go into significant detail on these topics.[35]

The mixing stage of music production is a potent example of technical audio knowledge merging with creative and practical skills.[36] As Case writes, "the challenge of coaxing art out of technology pervades the entire production process, but nowhere is it more apparent than at the mixdown session. The technical mastery and musical ability of the engineer are revealed in the mix session as every bit of equipment is applied to any and all elements of the multitrack."[37] For audio students, it can be challenging to apply technical understanding to practical techniques in order to create effective, compelling, and engaging mixes.[38] According to Bielmeier, more research on the infusion of creative practice into the classroom is needed for audio production programs to enable students to succeed professionally.[39]

In collegiate audio production courses, the practical application of technical mixing knowledge is typically left to in-person instruction or connected through listening exercises and mixing examples.[40] Unlike in music performance, which has a significant amount of literature on how to practice, there is little literature on approaches to practicing audio production skills. For music performance, there are many methods, techniques, and guidelines for practice, such as the Suzuki Method, the BAPNE Method, and the Alexander Technique, that are used by a wide audience of teachers and students.[41] In mixing, few such practice models exist. The only documented option is Colvin's deliberate practice model,[42] which was adapted by Merchant.[43] Deliberate practice has been determined by

researchers across a variety of fields to be a commonality between world-class performers in music, sports, and business.[44] Applying this approach to mixing techniques, students carry out a repeatable practice routine, analyze their performance under the supervision of a teacher, expand their mental capacity, and focus on improving areas of weakness.[45] However, such models have not been widely practiced, tested, or reviewed outside of instructors' home institutions. Instead, teachers have applied a variety of approaches at different institutions to teach the practice of mixing.

In looking at how mixing is taught at various institutions such as Berklee College of Music, University of California Los Angeles Extension, Middle Tennessee State University, and The Evergreen State College, syllabi and course descriptions often share a commonality by requiring students to complete mixing exercises.[46] For example, in the course "Art of Mixing" at Berklee, students are given a total of twelve mixing exercises to complete.[47] In this course, each mixing exercise is connected to a lesson, ranging from automation techniques to dynamics processing. At The Evergreen State College, students complete weekly exercises for "Audio Fundamentals and Mixing Techniques II."[48] At Middle Tennessee State University, students complete mixing exercises on soundstage, EQ, compression, expansion, and time-based effects, in addition to participating in mixing labs that bring together the knowledge and skills gained from the mixing exercises in the courses "Seminar in Advanced Mixing Techniques" and "Mixing Techniques and Technologies."[49] While these examples demonstrate that it is common for students to complete mixing exercises as part of a course on mixing, the number of assignments, and the approach to each, varies based on the institution and the instructor. Similar to the deliberate practice model, experiential learning theory can provide a useful framework for practicing mixing that is applicable to a wide variety of institutions and instructors.

Applying Experiential Learning to Music Mixing Exercises

In their study of experiential learning for undergraduates, Katula and Threnhauser point out that "experiential learning is a wonderful ideal dreamed of by a wonderful philosopher. Its translation into the curriculum of higher education remains a work in progress."[50] While the practical implementation of experiential learning is not as clear as its theoretical underpinnings, educators can benefit from practical applications of the theory. Beard and Wilson's concept of Learning Experience Design (LED) provides a practical framework for developing coursework.[51] For LED, educators cultivate both the external environment for learning — such as the setting, materials, and tools — as well as the internal conditions for learning, such as openness and knowledge. Conditions of learning refer to how humans learn and the overall process of learning, including elements like focus, interaction, attention to detail, analysis, and inference. To successfully implement LED, the instructor must be an expert of the topic presented and of experiential learning. Itin provides a practical summary of LED with regard to an instructor's duties when conducting experiential learning, explaining "the educator's primary roles include selecting suitable experiences, posing problems, setting boundaries, supporting learners, ensuring physical and emotional safety, facilitating the learning process, guiding reflection, and providing necessary information. The result of the learning forms the basis of future experience and learning."[52] LED and Itin's summary of educator duties share many commonalities with the Society for Experiential Education's "Eight Principles of Good Practice for All Experiential Learning Activities."

For mixing education, selecting appropriate experiences for experiential learning includes choosing proper recorded material for students to mix, which is the same as setting the correct intention for experiential learning activities.[53] The mixing instructor ensures the multitrack recordings selected as practice mixing exercises for students are suitable for the topic at hand and the students' level of ability by choosing materials with the appropriate length, musical genre and style, quality of recording, and number of tracks. With regard to the musical genre of the mixing exercises specifically, it is essential the instructor selects a diversity of genres to appeal to a diverse student body interacting with the materials. Furthermore, SEE's guiding principle of authenticity is a primary consideration when selecting material, which should have real-world applications in a professional setting.[54]

Regarding posing problems and setting boundaries for experiential learning, mixing exercises should focus on a certain aspect of the craft so that learners are not overwhelmed with having to apply all technical and creative elements at once. Rather, students should focus on one aspect at a time. Connecting to deliberate practice, this is similar to learners improving specific areas of weakness. Setting an appropriate level of focus helps students learn by drawing their attention to areas of potential improvement rather than distracting students with problems outside the context of a particular experience and lesson. Ideally, multitrack exercises should be free from flaws that are not part of the focus of the exercise. As the course progresses, students may be given the opportunity to apply all the skills they have learned from smaller-scale mixing exercises in the context of a larger-scale mix to reinforce real-world applications of their skills and knowledge. Further, properly designed problems include the dissemination of clear instructions and rubrics for the mixing exercises.[55] Instructions should provide guidance for the entire experiential learning process, including reflection, guided discussions, and interactions with the instructor. Rubrics should outline what constitutes success in particular mixing exercises as well as what substandard outcomes sound like

so that students may endeavor to create successful mixes. Additional audio demonstrations of more and less successful mixes may provide valuable guidance to students.

To conduct experiential learning for mixing exercises, instructors must provide learners with necessary information regarding the mixing process in advance. Looking at Dewey's pioneering notions of experiential learning, experience is not a substitute for learning,[56] so students cannot complete an exercise out of context and hope to reap the benefits of experiential learning. Instructors must provide foundational knowledge through more traditional learning modalities before students can complete mixing exercises successfully. Providing guidance in advance aligns with SEE's guiding principle of preparedness.[57] For example, before completing a mixing exercise focused on equalization, students should learn what EQ is and options for applying EQ. This information can be disseminated in a variety of ways including textbook readings, lectures, class discussions, and/or instructional videos. Experiential learning does not replace traditional modes of learning like reading and lecture, but instead enhances these modes.

Itin's mention of supporting students within experiential education has significant ramifications for mixing exercises. One of the most important forms of support is issuing timely constructive feedback to students. Both formative and summative feedback should be provided to students throughout a mixing course. Formative feedback is assessment issued to students throughout the course of their learning process, like feedback on in-progress work or feedback on smaller assignments in preparation for a larger assignment.[58] In contrast, summative assessment is issued to students at the end of their learning process during a culminating assignment.[59] Issuing student feedback in a timely manner is essential for students to build and improve incrementally as they work through exercises. As the course progresses, students can tackle more complex mixes, which provides opportunity for summative assessment. Such assessment allows students to get a sense of their overall mixing strengths and weaknesses. In addition, critiques should be constructive.

Constructive criticism plays into other roles described by Itin, such as learning facilitation and ensuring the emotional safety of students.[60] Student feedback should focus on areas for improvement, along with specific techniques for students to try. Issuing feedback listing the flaws in a student mix without providing constructive ways to improve amounts to poor learning facilitation and missed learning opportunities. Similarly, an instructor should ensure the emotional safety of students when giving feedback by including elements of the student's mix that are positive to avoid eroding student self-confidence. Following these general guidelines aligns with SEE's last three guiding principles of experiential learning activities: monitoring and continuous improvement; assessment and evaluation; and acknowledgement.[61] Attending to these issues when providing student feedback is a large part of ensuring proper support during experiential learning.

Additionally, through the lens of SEE's principles, the idea of ensuring safety applies to orientation and training for experiential learning activities. Training should include a discussion about hearing damage and the potential dangers of loud listening levels while mixing, such as the occupational noise exposure limits outlined in 29 CFR 1910.95 by the U.S. Occupational Safety and Health Administration.[62] In terms of emotional safety, instructors should outline proper etiquette for classroom conduct, and most importantly, lead by example. Instructors should facilitate proper etiquette by initiating discussions concerning how learners and teachers will communicate together. All parties must strive to create an environment of openness free from negative judgements and bias, and to cultivate a classroom culture accepting of diversity (e.g., opinion, race, ethnicity, artistry, gender, and political stance). Attending to the physical and emotional safety of students is essential to maintaining a healthy and productive learning environment throughout the duration of experiential learning.

Looking at the educator's role in facilitating experiential education, mixing exercises should be presented in a logical progression with ample opportunities for students to learn from the instructor and other students. An example is presenting information on level and panning before moving on to more complicated concepts like EQ and compression. While instructors should have the freedom to organize student learning in whatever way seems most effective to them, this means instructors must properly plan and organize their lessons to aid students in the logical acquisition of knowledge leading to accurate mental models and conceptual frameworks for mixing.[63] Such organizational and lesson planning should still have flexibility to accommodate learning in unforeseen ways, as illustrated by SEE's guidelines for preparedness and planning in experiential learning.[64] This flexibility includes facilitation of class discussion in a manner that promotes participation by the entire class, not just select individuals. Discussions can take a variety of formats, including online discussion posts, in-class discussion, paired or small group discussion, or any other form of discussion that is possible depending on the course infrastructure. Overall, facilitation is integral to the instructor's role throughout experiential education.

One of the most significant factors separating experiential learning from regular experience is reflection. The topic of reflection is seen in many experiential learning sources, including Beard and Wilson, Kolb, and SEE's guiding principles.[65] When designing mixing exercises, in order for

such activities to be considered experiential learning, student reflection must be part of the process. In an ideal scenario, Beard and Wilson describe the importance of prospective reflection on the future, reflection during an experience, and retrospective reflection on the past.[66]

Prospective reflection can play a powerful role in mixing exercises. Before students begin mixing, they can perform something similar to a visualization an athlete or musician might make before a performance. In such a premeditation, students write down notes on issues they hear which need to be resolved, what they want the final mix to sound like, and an educated guess as to the mixing techniques and tools that will accomplish these goals. Owsinski describes such a process with professional mixers. He explains that "by and large, most mixers can hear some version of the final product in their heads before they even begin to mix… Even if an engineer is brought in specifically to mix, many won't even begin until they have an idea of where they're going before they start."[67]

Moving onto reflection during an experience, students should be instructed to listen to their in-progress mixes. That is, students should reflect on how their mixes sound as they make changes to the mix in a cyclical process of mixing and evaluating.[68]

Finally, retrospective reflection includes three potential steps: initial student self-reflection, instructor feedback, and further student reflection on how they can improve their mixing in the future. Connecting reflection to deliberate practice, reflection through experiential learning is an in-depth method of performance analysis as described by Colvin.[69] In summary, without various mechanisms for reflection, the learning potential of mixing exercises is significantly diminished.

Best Practices for Teaching Audio and Mixing in Higher Education

There are hundreds of audio engineering technology (AET) programs across the United States at institutions of higher education.[70] However, according to Tough, "formal research specifically on AET curricula is nonexistent with the exception of Lightner (1993), Sanders (1994), and Walsh (1996), whose research and contributions were pioneering in the field."[71] Even with the existence of journals focused on audio education like the *Journal of the Music and Entertainment Industry Educators Association*, the majority of scholarly research on audio education historically focuses on the topic of music business rather than AET.[72]

Tough explains further, "the number of doctoral dissertations in the areas of music business or music technology concerning audio engineering, recording technology education, or recording technology curriculum can be numbered on one hand due to the relative youth of the field and its perception as being in its incipient stage as an academic discipline."[73] Given the minimal state of educational research on audio engineering technology, the scope of the research examined in this study was widened to include music industry and music technology education in general. While the application of experiential learning in mixing education has not been directly researched in scholarly literature,[74] there is significant overlap between the recommendations previously detailed in this article and recommendations found elsewhere concerning educational best practices for music industry and audio engineering technology education. These commonalities will be explored here in detail, and are encouraging for further research collecting empirical data on the potential effectiveness of using experiential learning in mixing education.

Two studies by Merchant are closely aligned with the topic of best practices in music mixing education.[75] In each of these studies, Merchant examines the "Mixing Techniques and Technologies" and "Seminar in Advanced Mixing Techniques" courses that have been offered at Middle Tennessee State University since 2007. Best practices for mixing education described by Merchant include: concentrating on foundational mixing skills; practicing one mixing technique or tool at a time in order to work up to larger projects that apply multiple skills; deliberate practice; requiring written reflections; and working on important interpersonal skills.[76] Merchant concludes that "continued research is required in audio education pedagogy to confirm that universities are preparing students not just to survive but thrive in the recording industry of the 21st century."[77] This sentiment is echoed throughout recent research on audio education, which emphasizes that the search for best practices in this field is only just beginning, and will continue to develop alongside a rapidly-changing music industry.

In 2005, Strasser conducted a related study on the impact of using a marketing simulation game in a music business course at Northeastern University.[78] This study provides empirical data in the form of student surveys analyzing the effectiveness of using a simulation game as an experiential learning technique. In order to develop his method, Strasser links his study to research done on best practices for educational simulations in other fields as follows:

> According to Drea et al., simulations should be highly structured around five principles: 1) There must be a link between the simulation and the learning objectives. At the conclusion of the simulation students must better understand the overall course objectives; 2) Students and instructors must understand the "rules of the game" quickly and with minimal effort; 3) The simulation should not distract students from the learning process; 4) The simulation should motivate students to higher performance levels; and 5) A debriefing session should occur at the conclusion of the simulation so that the instructor may have feedback on the students' progress towards defined course objectives.[79]

In these principles, there are clear connections to experiential learning and mixing education. Principle four, encouraging students to perform at higher levels, is very similar to deliberate practice in mixing, where students stretch their mental capacities to their upper limits.[80] Moreover, principle five, concerning debriefing, is similar to the concept of reflection, which is essential to experiential learning.[81]

Strasser also discusses research by Cruickshank and Telfer that illustrates simulations should complement other teaching methods rather than replace them. He writes, "although the simulation was the primary vehicle for investigating marketing principles and assessment, the lecture method remained the primary method for disseminating information. Each lecture was built on the corresponding stage of the simulation."[82] This approach is similar to the experiential learning method of knowledge acquisition preceding completion of mixing exercises. The results of Strasser's study show that simulation has a positive impact on student learning surrounding music marketing. However, the small sample size and limited scope of his data mean that his results cannot be generalized to experiential learning situations outside of his own classroom.

One area that has been studied within the realm of experiential learning and music industry education is the effectiveness of internships.[83] According to Kopplin, "there is very little data on experiential learning's efficacy in music industry education."[84] Kopplin conducted a 2016 survey of MEIEA members from AET programs across the country to begin solving this issue. He found an overall agreement between instructors that one of the best practices for their audio students was internships and/or hands-on experiences that were as close to real-world experiences as possible.[85] However, Kopplin also admits that such data is limited to professional opinion. Further data is needed regarding the efficacy of experiential learning and the success of students after experiential learning.[86] In another study, Strasser and McLaughlin measured the effectiveness of cooperative education, a form of experiential learning primarily connected to industry internships, by examining music industry students involved in cooperative education and their grade point averages.[87] Surprisingly, they found the following:

> The data reported… suggest that while experiential education may help students master the material presented in a course, there is no significant statistical correlation between participation in cooperative education and improved academic performance as measured by GPA… Furthermore, this study affirms the theory that experiential education should not be designed to shape classic didactic methodology but rather should be used to shape practice-based learning performance.[88]

This study provides empirical justification for Dewey's theory that experiential learning should not replace, but rather supplement, traditional modes of learning.[89] Similarly, these findings justify the importance of knowledge acquisition. While Strasser and McLaughlin's research is potentially disheartening for proponents of experiential learning,[90] the authors admit that their study was limited in scope and cannot be applied as a general rule outside of Northeastern University, where study data was collected.

Moving to the potential of virtual internships in music business, Channell and Anderson apply SEE's eight guiding principles for experiential learning as a set of standards for music business internships.[91] SEE's principles provided Channell and Anderson with best practices for virtual music business internships, as evidenced through a successful case study with a student working as an intern for an artist and repertoire (A&R) company. However, the small sample size of this study limits the applicability of these results to other contexts.

Overall, these studies by Channell and Anderson, Strasser and McLaughlin, and Kopplin provide useful perspectives about how to best provide effective music industry internships in higher education. However, their limited scope means further research is needed to uncover best practices, with a broader application to music industry education on a national scale.

Examining AET education, Bielmeier and Gordon conducted a survey of faculty in audio recording programs across twenty-five institutions to determine best practices for teaching musical proficiency in these programs.[92] They start their study with the observation that "the importance and inclusion of music proficiency in [audio recording programs] in the USA varies and reflects the larger inconsistency of approaches to modern audio education."[93] Mixing education also seems to have similar inconsistencies, although one similarity in educational approach is the usage of mixing exercises.[94] Bielmeier and Gordon recommend the creation of a musical proficiency textbook for recording engineers covering topics like keyboard proficiency, ear training, rehearsal etiquette, and musical analysis.[95] Thankfully for mixing engineers and educators, textbooks on mixing already exist and can be incorporated into the knowledge acquisition stage of experiential learning. In their discussion of developing a musical proficiency textbook, Bielmeier and Gordon emphasize the importance of identifying common musical vocabulary for students who vary in musical proficiency.[96] Elmosnino similarly describes the importance of developing a common vocabulary in critical listening education.[97] In mixing, this sentiment is echoed by authors such as Moylan and Izhaki.[98] To summarize, developing a common vocabulary for discussing mixing is an educational best practice that is illustrated across many studies on related areas of audio education.[99]

Delving further into Elmosnino's literature review of critical listening education,[100] there are many educational best practices for critical listening that are applicable to mixing. Scholars generally agree that students should start their

critical listening training with simpler exercises before continuing onto more complex exercises, and that exercises should only examine one variable at a time.[101] Applying these best practices to mixing exercises, the idea of creating a logical progression of singularly-focused mixing exercises is reinforced. Elmosnino also cites a presentation from the 139th AES convention by Martin and Massenburg entitled "Advanced Technical Ear Training: Development of an Innovative Set of Exercises for Audio Engineers." In this presentation, Martin and Massenburg propose a general best practice to balance "technical ear training with more authentic audio engineering endeavors," like simulations of mixing tasks.[102] The application of experiential learning to mixing exercises is supported by this critical listening best practice. In particular, its mention of "authenticity" relates directly to one of SEE's guiding principles.[103]

Furthermore, the connection between technical ear training and mixing simulations made by Martin and Massenburg gives rise to an important area of further inquiry. That is, one aspect of mixing education that needs further research is the connection between mixing education and other areas of audio education, like critical listening, recording, and production. Finally, Elmosnino recommends keeping training sessions short so students do not get bored or frustrated, and implementing feedback systems to facilitate continued improvement.[104] Both of these best practices are important for mixing education for the same reasons cited by Elmosnino (i.e., to reduce frustration and foster continued improvement). Looking at audio production education, Bielmeier explores best practices for teaching audio production by applying creative practice.[105] He describes what he calls a "basic creative recording project" or "BCRP",[106] and utilizes Smith and Dean's five phases of the creative process: planning, creation, refinement, dissemination, and reflection.[107] Bielmeier's application of this process to his BCRP links creative practice to learning. Furthermore, these five phases show commonalities with experiential learning, such as SEE's guiding principles of planning and reflection.[108] In Bielmeier's description of a BCRP, he outlines in detail best practices for reflection and assessment in what he defines as "a recursive feedback loop." As he states,

> A recursive feedback loop requires students to submit projects and course work, receive feedback from instructors, and then make alterations in response. Potentially, students could rework a specific project several times until they have reconciled all feedback to the professor's satisfaction. This recursive feedback loop integrates one-on-one or mentor/mentee opportunities within the classroom and hones a student's ability to communicate with clients and coworkers and to respond to feedback." [109]

The process of feedback Bielmeier describes is similar to the concept of reflection in experiential learning and Kolb's steps of reflective observation, abstract conceptualization, and active experimentation. The possibility of students reworking a project multiple times is an ideal best practice during a single BCRP that is completed over the course of an instructional term. However, in the context of a mixing course where students undertake numerous mixing exercises, fewer revisions are possible from a logistical standpoint regarding instructor workload. Accordingly, only one round of revisions between student and instructor is recommended for courses utilizing many mixing exercises.

Seven Steps to Mixing Success: An Experiential Learning Model for Mixing Education

Bringing all of these ideas from experiential learning and best practices in music industry education together, I developed the following seven-step learning model as a useful guide for instructors conducting experiential learning with mixing exercises: knowledge acquisition, premeditation, doing, reflecting, assessment, thinking, and acting (Figure 1). For proper implementation of this model, a series of exercises should be developed that follows a logical progression of mixing tools and techniques. The exercise series should have an appropriate difficulty level matching the skillset of students utilizing the materials, and the exercises should come from a diverse array of genres to appeal to a diverse student population. This model breaks down the process of experiential learning for each individual mixing exercise, borrowing concepts from SEE's eight guiding principles and Kolb's experiential learning cycle.[110]

1. *Knowledge acquisition*: Students learn about the technical tools and process of mixing. Foundational knowledge on mixing is most commonly gained through traditional modes of learning like reading texts, taking notes, attending lectures, and discussing concepts in class. As an example, for an exercise on compression, this is the step where students learn how compressors work, and how they are typically used to accomplish various sonic goals. One possible way of approaching this step is to assign a textbook reading in combination with in-class demonstrations and discussions. SEE classifies this first step as preparedness and planning.
2. *Premeditation*: This is the "visualization" stage, where students take notes on issues they hear with the recordings provided, what they want their final mix to sound like, and possible tools and techniques to use in order to achieve their vision.
3. *Doing*: During this step, students actually mix the exercise. This is where the bulk of the experience takes place. In terms of Kolb's model for experiential learning, this step is called concrete experience (CO).

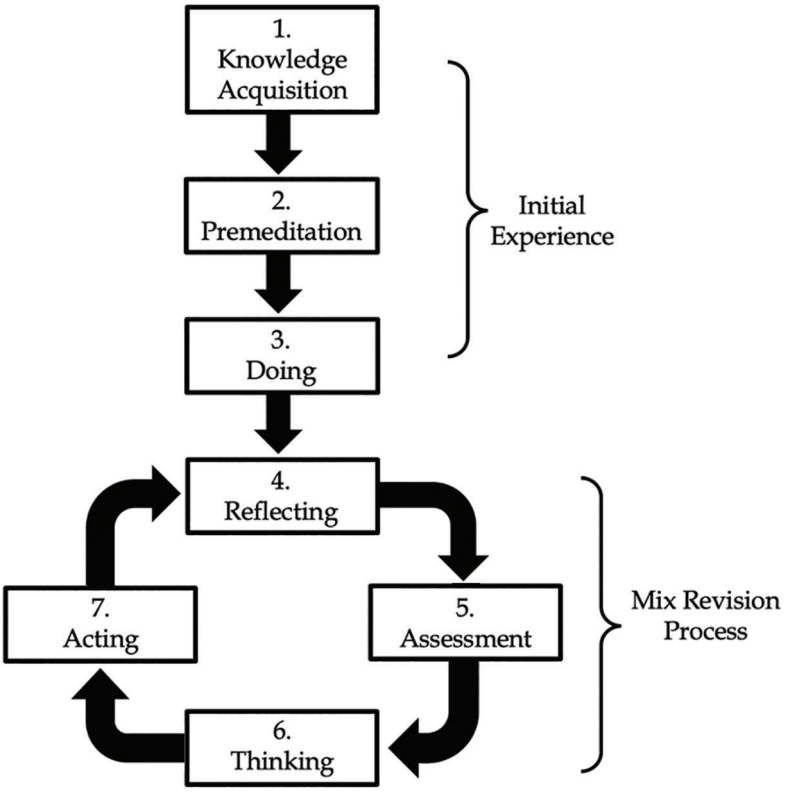

Figure 1. Seven-step experiential learning model for mixing education.

4. *Reflecting*: Kolb calls this step reflective observation (RO), whereas SEE uses the same terminology of reflection to categorize this step. Reflection should take place while a student is mixing so that they are continually evaluating and altering their mix. After the student finishes their mix, reflection should happen again in a form that encapsulates the student's experiences before they receive instructor feedback. This could take the form of a brief written summary where the student outlines what they learned and compares their initial premeditation with their final result.
5. *Assessment*: This step falls under SEE's guiding principles of assessment, evaluation, and acknowledgment. At this stage, the instructor provides timely constructive criticism to the student. For proper constructive feedback, instructors need to provide positive aspects of a student's mix, in addition to areas for improvement, including specific techniques or tools for the student to try in order to achieve a better mix. If an instructor only emphasizes what is wrong with a student mix, this can erode student confidence without opportunity and hope for future mixing improvements. Additionally, students often benefit from explanations of why mix revisions are necessary. For instance, this could include the musical reasoning for why a different technical approach might sound better, or why a different mixing tool could better fit the emotional content of a song. Similarly, providing feedback on why positive aspects of a student mix were musically or emotionally appropriate for a recording can help students build upon their success in the future.
6. *Thinking*: During this sixth step, the student rectifies the difference between steps four and five. That is, students compare their self-reflection with the feedback they have received from the instructor and prepare an actionable plan for how to mix better in the future. This is what Kolb calls abstract conceptualization (AC).
7. *Acting*: This step is the execution of the plan developed in the previous step (6). Kolb calls this active experimentation (AE), and SEE refers to this as "continuous improvement." This final stage is where the student attempts revisions to their mix in order to achieve improvements.

It is important to note that this model includes three sequential steps, moving from knowledge acquisition to premeditation and then doing. These three steps encompass the initial experience for the learner in Figure 1. The next four steps form a cycle that can be repeated as many times as desired, or as many times as is practical for the time constraints of the learning environment. In this way, the four-step cycle of reflecting, assessment, thinking, and acting outline a constructive and educational mixing revision process in

Figure 1. Going through this revision process once should give the learner the complete benefits of experiential learning, and repeating this cycle as time allows may offer further learning benefits, so long as both the learner and educator stay motivated to continue working on the same mixing exercise. The culmination of these seven steps is a model for mixing exercises that adheres to best practices in experiential learning and music industry education.

Conclusion

There is ample literature covering the tools and processes of mixing. Students can read a variety of textbooks that provide essential knowledge about how to mix. Such texts teach students foundational mixing knowledge about topics like balance, panning, EQ, compression, reverb, and delay. However, literature and research concerning how to improve mixing skills — in other words, how to practice mixing — is much more limited. Deliberate practice is currently the only formal model of practice that has been studied and applied to mixing education in scholarly research. The field of experiential learning, which has a rich history of philosophical and practical inquiry in the realm of educational theory, provides mixing educators with useful guidelines when directing students through the process of improving their mixing skills.

In particular, the applicability of SEE's "Eight Principles of Good Practice for All Experiential Learning Activities," such as intention, authenticity, reflection, assessment, and evaluation, is seen throughout research regarding best practices in music industry and AET education. These principles are similarly useful for practicing mixing. However, data on the practical effectiveness of experiential learning is limited, especially in the realm of music industry and AET education. This leaves a significant gap in research regarding best practices for mixing education. Further research is needed to assess the practical validity and effectiveness of this seven-step model using experiential learning in conjunction with mixing exercises to improve students' mixing skills. Hopefully, the learning model outlined in this article will help educators conduct case studies and collect empirical data concerning the effectiveness of experiential learning techniques in the mixing classroom.

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