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An Enactive Approach to Learning Music Theory? Obstacles and Openings

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While music theory learning remains at the core of traditional music education, calls for more embodied and enactive approaches to music instruction rarely address theory pedagogy directly. This paper reconsiders theory teaching through a 4E lens, by (1) clarifying the obstacles that attend a legacy of Cartesian thought underlying conventional theory curricula, and (2) introducing an affordance-rich curricular tool that promotes embodied and enactive sense-making in music theory classroom environment. The tool is an adaptation of Conduction®–a lexicon of signs and gestures created by jazz artist Butch Morris as a flexible alternative to notation, allowing Morris to compose in real-time with an ensemble of any type, size, or background. In a theory-learning context, students bring their instruments to class, form an ensemble, and take turns using signs and gestures to conduct their peers, guided through processes aligned with learning objectives (e.g., harmonic minor scales, Neapolitan chords, or polytonality), as well as to more freely experiment with musical structure *in situ*, with minimal or no reliance upon notation. Listening skills, structural knowledge, analytical proficiency, and performance technique are all enacted in the three roles students play: individual performer, ensemble member, and conductor. As students are placed in contact with the conceptual metaphors that scaffold a sense of musical structure, the cumulative effect is a deeply embodied sense of musicality, and an experience of music theory not just as an abstract exercise, but as theorizing in the present through bodily action.

Keywords: embodied cognition, music theory pedagogy, enactive account of perception, music education, meaningful action

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INTRODUCTION

> "Musical structure is not simply a reflection of the tonal practice of Haydn, Mozart, and Beethoven, but is instead an account of how patterned sound comes to have meaning for human beings" (Zbikowski, 2005).

It was a fairly conventional day teaching music theory. We were discussing layered rhythmic cycles in the music of the vastly influential twentieth-century innovator, James Brown, hoping to excavate some of the hidden complexities of what might be considered "non-canonical" repertoire. I knew I must have been somewhat successful—perhaps too successful—when a student posed a penetrating question: "He did all *that,* without knowing music *theory*?"

It struck me that this student—perhaps the whole class—believed that higher order musical thinking was confined to the particular symbols, terms, and procedures presented in their textbook

and in their 2-year theory sequence. "Theory," for them, had become an object to be attained, rather than a process in which they participated and through which they might be transformed. It disturbed me to think that I was likely complicit in this confusion. I responded with an appropriately discursive, if off-balanced: "well yes, in a sense, you see…" and "however, not exactly, no." Yet I knew that the student's question was far more complex, more tantalizing, and somehow pointed the way to a critical deficiency of music higher learning, toward something students were increasingly needing it to be.

The arguments presented here have developed over 10 years teaching music theory within conservatories, schools and departments of music, and liberal arts programs. Rather than offering a "one size fits all" curricular template, this paper presents a flexible, indeterminate methodological framework for considering music theory pedagogy through the lens of embodiment. This, it will be argued, holds powerful implications for the ethical, political, and psychosocial dimensions of music education at all levels.

My own transformation as an educator echoes that of existential psychologist Carl Rogers, who entered his profession asking the question: "How can I treat, or cure, or change this person?" After a long and devoted career, Rogers rephrased his question in this way: "How can I provide a relationship which this person may use for his own personal growth?" (Rogers, 1995). The assumption of one-directional contact was reformed into a process he understood to be *mutually transformative*. The arguments presented within this paper aim toward a framework for (a) understanding what "mutual transformation" might mean in the context of music learning, and (b) harnessing music theory's unique position in facilitating a learning environment of this quality.

Zbikowski (1997, 2002, 2005) was among the first to explore music structure through a more embodied lens, believing that a more dynamic, non-dualist approach could provide a firm foundation for the discipline of music theory. Zbikowski cites studies in cognitive linguistics and cognitive science to derive three general cognitive capacities central to the production and understanding of music: categorization, cross-domain mapping, and the use of conceptual models[1]. The benefits of grounding music theory in these ideas extends to pedagogical concerns, providing an outlet from the Eurocentrist systems of musical meaning and values for the student who should be more concerned with how music comes to have meaning for themselves.

Despite these efforts, the conventional curriculum remains little changed, and a firm mind-body dualism marches on, perhaps nowhere more clearly than in music education's adherence to the Platonic binary of theory and practice, which yet remains intact "because we have side-stepped the mind-body-reality issue instead of deconstructing it" (Bowman, 2004).

[1]Zbikowski. 447–48.

Beyond Theory vs. Practice: 4E Music Cognition in Brief

Drawing inspiration from variety of sources, including Merleau-Ponty (1945), Gibson (1966, 1979), and Lakoff and Johnson (1999, 2003), present day embodied cognition has emerged with a remarkable pandisciplinary appeal. Its advocates, though diverse, are primarily concerned with challenging established cognitivist paradigms, most notably: a foundation in Cartesian dualism; the assumption that the mind is brain-bound; the tendency to ascribe to the brain psychological concepts that only make sense when ascribed to whole organisms (also known as the mereological fallacy; Schaal, 2005); a reliance upon computer metaphors in describing the processes of the mind (computationalism); and the view that internal consciousness represents external reality (representationalism).

"E" prefixes—em-, ex-, ec-, en-, (as well as eco-)—are derived from the Latin (or Greek, in the case of "eco" from *oikos*) to signify boundary-crossing nature of what follows. Thus, while emerging "E-"scholarship is diverse, a school of thought known as 4E Cognition has arisen to challenge four main boundaries traditionally presumed and reified by cognitivism (Newen et al., 2018). The 4E perspective considers a broader range of dynamics at play in a cognizing living system, viewing the mind as embodied, embedded, enacted, and extended. The mind includes the brain but is not skull-bound, and is inextricable from the body (*embodied*); it is *embedded* (or situated) within a world with which it interrelates; it is *enacted*, emerging in the inter-action between autonomous agents and their environments; and is, perhaps, *extended* beyond the body by way of objects within the environment that present affordances (tools).

The field of embodied *music* cognition extends these and related perspectives to similarly challenge standard descriptions of music cognition (e.g., that musical experience is reducible to neural activity or brain states) (Krueger, 2016; Loaiza, 2016; van der Schyff et al., 2018). Embodied music cognition thus carries important implications for both music theory and music education, and shifts our basic understanding of learning, teaching, and the nature of music's fundamentals (Silverman, 2012; van der Schyff et al., 2016; Schiavio and Schyff, 2018). Beyond challenging Cartesian dualism, the propositions of 4E music cognition reach deeper to problematize the Platonic binary of *theoros/praktike* on which the curricular separation between music theory and practice is fundamentally based (Christensen, 2002), and articulates a more complex, dynamic account wherein practice and theory are mutually transformative.

Contrary to a cognitivist approach to musical thought, an embodied account describes music perception and musical action not as divorced, but rather—as forwarded by Eric Clarke—"perception must be understood as a relationship between environmentally available information and the capacities, sensitivities, and interests of a perceiver" (Clarke, 2005). This is related to Gibson's notion of affordances which, simply explained, are perceived potentials for action present in an environment (Gibson, 1979; Menin and Schiavio, 2012;

Reybrouck, 2012; Krueger, 2014) Aiming to disambiguate the usage of "affordances" in relation to music, Schiavio and colleagues introduce the concept of *teleomusical acts*—chains of actions with goal-directedness which constitute a musician's motor knowledge (Schiavio et al., 2017).

Helmholtz' late nineteenth century masterpiece—*Sensations of Tone*—provided an objective basis for music theory, and solidified a dualistic paradigm for theory pedagogy. This determinist foundation meant that the speculative theoretical tradition[2]—with its curricular space in which students traditionally made contact with the grounding, conceptual metaphors underlying music's fundamentals—was gradually overshadowed by the imperatives of Modernist education: natural sciences, empiricism, and national-liberal aspirations. The academic culture to which Helmholtz was writing saw the "popularization of science…as a tool of national unification" (Steege, 2012, p. 31). Emerging from this popularization was the wide acceptance of talent as innate—that is, biologically-based, rather than mind-based. As a result, theory's curricular emphasis shifted from the developing a student's thoughtful reflexivity to framing procedural knowledge (reflected in the growth regulative theories) and an emphasis on imitation[3] as the orienting goal of theory study (i.e., the analytic tradition), mediated by new forms of symbolic logic, such as Riemannian and Schenkerian theories, and the treatment of the notated score as immutable text.

Despite—or due to—Helmholtz' profound sensitivity and respect for art (contra science), his genuine effort to keep the "regions of physiology and aesthetics sufficiently distinct" as outlined in his Introduction (Helmholtz, 1895, p. 8) widened the chasm that separated Europe's "Two Cultures" of the natural sciences and humanities (Snow, 2001). The experimental rigor he brought to bear upon music theory's most perennial, speculative questions generated an empirical account so rich, so meticulous, that the need for further speculation (particularly non-scientific speculation) was regarded as superfluous. In the mind of Helmholtz, theory was thenceforth liberated from mystical "dreaming,"[4] and musicians the world over could at long last ascertain "the rule"[5]

Yet, at the conclusion of *Sensations* Helmholtz confesses what he sees as the "real difficulty" of musical expression:

> In [musical expression] the properties of sensual perception would of course have a casual influence, but only in a very subordinate degree. The real difficulty lies in the development of the psychical motives which here assert themselves (Helmholtz, p. 578).

Scholarship in music cognition since the 1990's has contributed much to our understanding of what Helmholtz likely meant by "psychical," though little toward what he likely meant by "motives." Important findings include: modeling the experience of prediction response in musical event onset (Huron, 2006), defining tonal hierarchies and the role of short-term memory in tracking melodic transformation (Krumhansl, 1985), connecting attributes of musicality to animal behavior[6], and a substantial literature investigating musical experience using neuroimaging[7].

Yet, music cognitive science retains that same bifurcated commitment that shaped Helmholtz' measurements: a Cartesian dualism that prevents a more complete picture of musical experience from coming to form, and the parallel anxiety that "what was measured was [itself] produced by the measurement" (Schmidgen, 2014). Dualism, as intimated by Mark Rowlands, is fatally incapable of reincorporating the non-physical mind into the body (Rowlands, 2003). If a cognitivist investigation addresses "psychical" (in Helmholtz' terms), I argue that the lens of embodied cognition goes further toward accounting for the second factor: motive. That is, specifically, motivated action. Music theory taught through an embodied lens instead opens up an *indeterminate* field, one in which students themselves are called to participate as theorists, acting equally within the speculative, regulative, and analytic theoretical spaces.

Embodied Mathematics Education as a Model

A valuable parallel to theory education is mathematics education, which has undergone a similar curricular reexamination in recent years in the U.S. Music theory and mathematics are intertwined in a legacy of Platonic thought, wherein the objects of study—whether notes or numbers—are (1) assumed to be discovered, not created, (2) seen as existing out there in the world and not the products of minds, and (3) presumed to have statements about observations to be either true or false, with no possibility for equally valid alternative forms (Lakoff and Núñez, 2001). Extending Lakoff and Johnson's argument for embodied conceptual metaphor as the basis of human rationality, Lakoff and Núñez explore what this notion suggests about the cognitive structure of mathematical reasoning. Núñez explains that the primary source of confusions in learning mathematics stems

[2]Carl Dahlhaus described three discrete music theoretical traditions: the speculative tradition, the regulative tradition, and the analytic tradition. Speculative theory—the oldest of the three, stretching back to Pythagoras—is concerned with basic musical categories and nature of the relationships between them (e.g., cosmological harmony, tetrachords, scales, meter); Regulative theory is concerned with constructing systems of musical practice (e.g., methods for structuring music, including notation, and pedagogy), and (3) Analytic theory is concerned with excavating the forms (or logic) of existing works (e.g., techniques for identifying structures, patterns, and forms). See Christensen (2002).

[3]Or *praeceptum—exemplum—imitatio* (observe, memorize, imitate) McCreless, Patrick. 2002. Ch. 27: Music and rhetoric. Christensen. p. 856.

[4]"In the book of the Tso-kiu-ming, a friend of Confucius (B.C. 500), the five tones of the old Chinese scale were compared with the five elements of their natural philosophy—water, fire, wood, metal, and earth. […] Similar references of musical tones to the elements, the temperaments, and the constellations are found abundantly scattered among the musical writings of the Arabs. The harmony of the spheres plays a great part throughout the middle ages. In Athanasius Kircher, not only the macrocosm, but the microcosm is *musica*. Even Kepler, a man of the deepest scientific spirit, could not keep himself quite free from imaginations of this kind. Nay even in the most recent times natural philosophers may still be found who prefer such dreaming to scientific work." Helmholz. p. 347.

[5]"It was [previously] left to the musician himself to obtain some insight into the various effects of the various positions of chords, by mere use and experience. No rule could be given to guide him." Helmholtz. p. 339.

[6]See Keehn et al. (2019) and Patel et al. (2009).

[7]See Zatorre and Halpern (2005), Loui et al. (2009, 2011), and Janata et al. (2002).

from the literal interpretation of conceptual metaphors that underlie mathematical concepts. Example conceptual metaphors would be (i) numbers Are Points on a Line, (ii) Numbers Are Sets; (iii) Container Schemas grounded in the visual system. When the full metaphorical character of these concepts is revealed, such confusions and paradoxes disappear. Núñez:

> …even the most abstract conceptual system we can think of, mathematics(!), is ultimately embodied in the nature of our bodies, language, and cognition. It follows from this that if mathematics is embodied in nature, then any abstract conceptual system is embodied (Núñez, 2006).

A number of parallels can be drawn between mathematics education and music theory pedagogy. Interestingly, a students' primary instrument appears to influence how they perceive of the similarity between math and theory. In a 2017 survey, percussion students reported only a slight similarity between theory and math, while vocal students reported a very strong resemblance (Gutierrez, 2018). Recent studies have also shown that students' performance on a math test is an important predictor of success in music theory courses (Barroso et al., 2019). Thus, the approach toward grounding mathematical thinking in an embodied perspective provides a very useful framework for music theory to make a similar transformation.

Math and music theory share a parallel history of Platonic thought. Music theorists have (1) relied upon symbolic logic since the invention of music notation, with rapid acceleration coming with the advent of the printing press; (2) presumed that what is being studied is objective, and therefore "out there" and not a product of mind; and (3) understood statements about the nature of music to be either true or false. Students who may have demonstrable musical ability but who have little or no theory training often enter a theory classroom to be immediately confronted with enigmas[8] and paradoxes[9]. Theoretical concepts are presented through symbolic logic[10] as literal truths, and taught procedurally with minimal attention paid to mapping these concepts onto students' lived experience. Theory pedagogy is replete with image schemas[11] and fictive motion[12,13]. For instance, consider the prevalence of *container metaphors*[14]—a note exists within a melody, within a rhythm, within a chord, within a key, etc.—and *orientational metaphors*[15]—notes described as objects-in-motion, going up, down, closer together, farther apart, in parallel, isochronous, etc. As Larson (2012) observed, the forces we play with and respond to are subjective and imaginative. In the case of Western classical music, grounding metaphors likely grew in conjunction with the rise and reliance upon notated music, that is, when notation began to be colloquially referred in objective terms, as a piece of music (Larson, 2012).

Here is where adopting an embodied mind perspective may shift conventional theory pedagogy's basic learning goals. While regulative theory revolves around the development of procedural knowledge (e.g., species counterpoint, voice-leading, Bach-style choral composition), and analytic theory is mediated by symbolic logic (e.g., notation, Roman numeral analysis, Schenkerian analysis), speculative theory is thus a subset of phenomenological thought, the foundation of a musician's "capacity to relate itself to something other than their own mass" (Merleau-Ponty, 2003, p. 209). 4E accounts of the musical mind represent a renewal of theory in the speculative tradition, inviting educators and students to rethink the fundamental processes that form and inform musicality and musicianship. To paraphrase neuroscientist M. R. Bennett, the brain and its activities make it possible for us—not for it—to perceive, think and *theorize*, to feel emotions, and to form and pursue *musical* actions[16]. Theory pedagogy can now turn from the soul, from the mind, and from the brain as the central objects of theory, and toward a more holistic exploration of body-world dynamics that give rise to an embodied mind, and an indeterminate state of musicking.

As 4E educational paradigms involve a conceptual shift from knowledge as stored artifact to capabilities-in-action, existing spheres of musical improvisation—in which "learning is not a matter of what one knows, but who one becomes" (Borgo, 2007)—are increasingly recognized as fertile grounds for nurturing enactive musical sense-making in real time (Heble and Laver, 2016). Yet traditional jazz programs in schools and universities tend to be out of touch with forms of improvisation that are presently evolving (Bailey, 1993; Berliner, 1994; Lewis, 2007; Hickey, 2009, 2015), and how such developments intersect with a cultural perspectives, and a range of new technologies (Borgo and Kaiser, 2010; Borgo, 2014). The adoption of freer forms of improvisation has been slow largely due to a general unfamiliarity on the part of educators, and a concern with how to assess progress and measure results. Due to its emphasis on process, diversity, and the relationships enacted between situated musical agents and their environments, improvisation does not fit neatly into standardized practices and

[8] e.g., "So the chordal seventh may resolve up when outer voices move in parallel tenths with the soprano line. What is the *value* of this knowledge to me?"

[9] "If a major seventh interval is a sharp dissonant sonority, and a resolution is a consonant arrival point, then in what sense does a major seventh chord function as a resolution?"

[10] Music notation, Roman numerals, figured bass, lead sheet symbols, etc.

[11] Image schemas derive from sensory and perceptual experience as we interact with and move about in the world. For example, given that humans walk upright and because we have a head at the top of our bodies and feet at the bottom, and given the presence of gravity which attracts unsupported objects, the vertical axis of the human body is functionally asymmetrical. This means that the vertical axis is characterized by an up-down or top-bottom asymmetry: the top and bottom parts of our bodies are different.

[12] Fictive motion is a cognitive mechanism through which we unconsciously conceptualize static entities, e.g., The Equator *passes* through many countries, or the fence *stops* after the tree.

[13] A study of university-level calculus instructors revealed that the physical gestures used during lectures showed an overwhelming tendency to match the dynamic meaning evoked via the underlying conceptual metaphors, source-path-goal schemas, and fictive motion (Marghetis and Núñez, 2013).

[14] A container schema is a prototypical image schema. To use Johnson's example of container metaphors: "You wake *out of* a deep sleep and peer *out from* beneath the covers *into* your room" (Johnson, 1987).

[15] An orientational metaphor is a metaphor in which concepts are spatially related to each other.

[16] "The brain and its activities make it possible for us—not for it—to perceive and think, to feel emotions, and to form and pursue projects" Bennett and Hacker (2003).

prescribed outcomes that tend to characterize music curricula and assessment (van der Schyff, 2019). In challenging cognitivist definitions of knowledge, improvisation in the music theory classroom introduces opportunities for embodied modes of self-assessment and reflective processes (Sarath, 2013), valuable tools for fostering a working, living awareness of musical structure *in situ*.

CONDUCTION: MUSIC THEORY AS A PROCESS OF ENACTIVE SENSE-MAKING

"We all have this theory…let's *do* something with it!"[17]
–Lawrence (Butch) Morris

A *theory*, properly defined, intends to explain. Yet it is not required, nor always useful, for an explanation to be tendered with words. If we think with our bodies and with things, and know more by doing than by seeing (Kirsh, 2013), then we theorize—process and explain complex phenomena—not just with symbolic and metaphorical language, but with our bodies, with things, and by doing. Examining music theory pedagogy through the lens of 4E cognition aims to broaden the explanatory potential of core study of music theory for all music-makers. Here I present theory pedagogy as a site for enactively exploring musical relationships which the student might continue to use for their own personal growth, and for nourishing a transformative process of realizing their own potentialities, as situated within a community, a society, and the world. Students, in this embodied conception, are more than theory learners; they are theorists.

Conduction as a 4E Music Theory Pedagogy

This section presents Conduction® as an embodied approach to music theory teaching. Conduction, simply put, is a vocabulary of ideographic hand gestures used by a conductor to sculpt ensemble music in real time. Its creator, Butch Morris, jazz luminary, and cornet virtuoso, understood his method as a means of accessing and amplifying basic musical competencies, and applying this musicality toward the creation of new music. The Conduction system can be tailored to serve the goals of the music theory classroom with incredible efficiency, and represents the kind of tool needed today to supplement conventional theory and musicianship curriculum[18]. Conduction is a tool which I have adapted for engaging with music theoretical concepts, allowing students to develop a sensorimotor repertoire (Thompson, 2007)[19] over the course of a theory sequence.

Conceived in the sphere of American experimental jazz, Butch Morris developed the Conduction system as a flexible alternative to notation for structuring a live performance. Morris went on to work with hundreds of ensembles around the globe, composed of classical musicians, jazz musicians, pop musicians, non-western musicians, non-improvisers, or eclectic blends. In his own words, "It doesn't matter what stylistic, social, cultural background someone comes from. [Conduction] applies to the individual, how they interpret, how they advance the collective knowledge that we gain" (Monga, 2011).

Students bring their instruments to class and perform as an ensemble, taking turns conducting their peers, guided (to varying degrees) by notated and non-notated curricular goals to generate music and experiment with musical structure *in situ*. Listening skills, structural knowledge, analytical proficiency, and performance technique are interwoven in each of the three roles students play in a Conduction: individual performer, ensemble member, conductor. My trial and error experimentation with this method in the theory classroom has shown it to be a powerful heuristic and ludic medium (Moseley, 2016) for nurturing creative action, where embodied sense-making (Thompson and Stapleton, 2009) is the primary learning objective. Conduction can be used to exercise virtually any standard theory competency (e.g., scale fluency, chromatic harmonic procedure, voice-leading and counterpoint, etc.), as well as non-Western theoretical systems (e.g., Balinese gamelan, North Indian *tabla*) and contemporary techniques (e.g., standard or free jazz, serialism, polytonality, spectral techniques). What happens after the Conduction can also be just as valuable. Recordings made in class allow students to engage in *analytic* mode—through dictation and analysis of Conduction, which can then be transposed, arranged, critiqued, and reflected upon.

Directives

Conduction makes use of signs *and* gestures. While all hand directives are issued through bodily motion, signs communicate their directive statically, while the information contained in a gesture is specifically linked to the motion of the Conductor's finger(s), hand(s), arm(s), or baton. For example, an outstretched fist would be a sign directing a short note, while during a graphic gesture the specific motion of the baton is interpreted musically. Morris' posthumously published guide to this approach, "The Art of Conduction" (Morris, 2017) identifies of a lexicon of over 70 directives, though generally only a small portion of the vocabulary is used in the majority of performance contexts. There are 19 basic signs and gestures which give the conductor control over the following parameters: pitch/tonality, time-tempo/pulse-rhythm, specific events (e.g., a sustained tone), repeats, transformations (e.g., modulation, development), dynamics, articulation, store/recall, and score-related directives. The left hand is responsible for indicating the "what" that is to occur, and the right hand (generally with a baton) executes the

[17] Butch Morris in *Black February* (Monga, 2011).

[18] Specifically this refers to competencies outlined by the National Association of Schools of Music, in the two general degree categories General Education (1–7), and Musicianship (1–5). https://nasm.arts-accredit.org/wp-content/uploads/sites/2/2015/11/BAorBS-Music.pdf (accessed February 4, 2018).

[19] Thompson describes the sensorimotor repertoire as the means by which an organism's environment emerges in process of self-actualization: "In the case of animal life, the environment emerges as a sensorimotor world through the actualization of the organism as a sensorimotor being. The organism is a sensorimotor being thanks to its nervous system. The nervous system connects anatomically distant sensory and motor processes, subsuming them in operationally closed sensorimotor networks. Through their coherent, large-scale patterns of activity these networks establish a sensorimotor identity for the animal—a sensorimotor self. In the same stroke, they specify what counts as "other," namely, the animal's sensorimotor world" p. 59.

FIGURE 1 | Directive for "Sustained tone."

event on contact with the ictus[20]. Maintaining eye contact with the Conductor is a critical aspect of Conduction, since, unlike notated music, there is no way of knowing when the conductor might give a cue[21].

To illustrate one example, the Conductor's left hand extends out, flat, palm up, to indicate the coming directive for a sustained tone (**Figure 1**)[22]. Once eye contact has been established with the intended musicians, the baton comes down and the players sound together. This tone can be specified, but is more commonly left to the discretion of the individual. The tone continues until the ensemble, or individual musicians, are directed to stop, transform (modulate, etc.), or repeated (generating a new set of sustained tones).

While any of these parameters could be in the hands of the conductor, distributing creative control throughout the entire ensemble was central to the synergistic *ethos*, the "real-time encounter" at the heart of Conduction. In a given performance Morris would rely on musicians to provide the initial ideas, the motifs and feel, which he would then transform, loop, morph, and germinate throughout the group.

Classically-trained, improvising violinist Mazz Swift participated in some early Conduction performances with Morris. She recalls—"The classical musician in me loved working with Butch. You're practicing getting the essence of you out, and also communicating that with other people." Swift herself left Juilliard due to a lack of the "organic," (Swift, 2017) a quality she instead found learning from and performing with experimental artists like Butch Morris.

Conduction is thus ideal for a student-centered music classroom, and fostering what Dylan van der Schyff describes as a phenomenological responsibility (van der Schyff, 2019). As part of the ensemble, students learn not only to explore their instruments, but to own the particularities of their sound, their ideas, and their theory of how events might and could unfold. Assuming the role of the conductor, however, reinforces a different set of competencies. In this position students take direct control over the structure and form of the ensemble's collective sound, relying on knowledge, intuition, and personal experience, while also taking risks, all in a collaborative classroom atmosphere.

Conduction finds a natural place in music theory, a discipline concerned with orienting auditory perception toward musical structure. Morris' ensembles were comprised of musicians adept at bringing "their own theory," the expressions of which Morris would subject to his own theory. "The content is coming from you, but the context is coming from me," he would say. "That's where the dialogue begins… structure/content, structure/content" (Monga, 2011). Conduction is presented here as a way of supplementing the passive learning that often characterizes the theory classroom, by inviting students to enactively dialogue with concepts as they are introduced, and accrue a sensorimotor index of these concepts along the way.

As a classroom activity, Conduction also aligns powerfully with the principles of the Universal Design for Learning (UDL). UDL is a curricular framework based on research in the learning sciences that guides the formation of flexible learning environments able to accommodate individual learning differences (Rose et al., 2002). UDL is intended to increase access to learning by reducing physical, cognitive, intellectual, and organizational barriers. Consistent with this framework, Conduction provides a classroom with multiple means of representation, expression, and engagement with virtually every level of the undergraduate theory core.

Analysis and Reflection

Every music student knows—and many lament—that theory study entails copious pages of analysis. Generally, the object of analyses are canonical works or their derivations, for the purpose of excavating, appreciating, and recomposing its virtues. Analysis of a classroom Conduction, however, brings with it a unique level of personal reflexivity. Even though Conduction often involves free association, improvisation, and real time composing, subjecting a recorded performance to analysis itself reveals copious pages worth of insight. Precisely because Conductions (in this classroom context) grow out of student decision-making, the recordings capture the process of collective sense-making, with everyone's ideas, intentions and meanderings laid bare for all to tease apart. It can be among the most ear-opening analyses students will do, as they witness their own artistic transformation over a single semester.

For this activity each student is given a stereo recording of the Conduction(s) from the day's class. While not every moment offers musical diamonds to be mined, generally students are struck by the beauty and intricacy of particular textures, voicings, and colors that morph and peak at junctures throughout the Conduction. These moments can be dictated in notation and used as building blocks for a future Conduction

[20]The ictus denotes the specific point in a visible pattern of beat points that articulates the pulse of the music to the ensemble.

[21]If the reader is unfamiliar with Butch Morris and his Conduction approach, refer to the following video: Butch Morris demonstrates "conduction". 2016. YouTube. SFJAZZ. November 14. https://www.youtube.com/watch?v=lFdHksQedA8.

[22]For additional explanation see Monga (2011), p. 26.

FIGURE 2 | Directive for "Memory 2." Written and informed consent was obtained for publication of this identifiable image.

or basis for a composition. Reflecting on the synergistic process that gives birth to these moments, evolving sometimes over several grueling minutes of disorderly sculpting, is an invaluable exercise.

If one of the goals of the theory classroom, as stated to present each composition as a highly contingent collage that integrates personal history, sociocultural context, learned formal tactics, and pragmatic goals and constraints, then Conduction is the distributed task of creating this collage in real time, with the overlapping categories of contingency evolving *in situ*.

Through a musical analysis students discover patterns within their individual musicality, patterns which can then be compared and discussed in class. Some patterns (e.g., a preference for a repeated motif), can launch discussion of traditional voice leading, perception, auditory scene analysis, and melodic contour in the context of language cognition. Other observed patterns might be profoundly individual, such as a composition student who discovers a new chord voicing, cluster, or ensemble arrangement. Students can also build on their analyses to be a more informed Conductor, and devise their own directives.

Through written reflection students articulate their process on the three heuristic levels (as individual, ensemble, conductor). In deconstructing their own decision tree they discover tendencies, habits, strengths and weaknesses that were embodied but not yet articulated. They can identify what they were hearing in the moment, but also the sounds that were present but unattended to. If the goal was to "Have an idea," recordings document the sounds of mutual transformation, exposing the dynamic overlap of the individual ideas, the ensemble's ideas, and the conductor's ideas. Through analysis students discover patterns within their musicality (understood as an ecological, rather than innate phenomenon), patterns which can then be compared and discussed in class. Analyses may vary, which is grist for the collaborative theory mill. Students interface with the merits of their performance, as well as the glitches and lapses. These analyses can proceed to change the way students listen, and expand the perceptual tools they bring not just to Conduction, but to any musical encounter.

Challenges

It should be made clear that Conduction is no silver bullet. It offers a profoundly effective mode of enacting music study creatively and collaboratively. Yet, there are difficulties, some native to the system itself, others in its application to the theory classroom.

First, eye contact between ensemble and conductor must be maintained at all times. Many musicians feel that this compulsory visual element limits the immersion that could otherwise take place. There are workarounds for this limitation, such as a directive to "close eyes" for a set length of time or number of repetitions, or until an audible cue is heard.

While repetition is a basic building block of structure, it can be a necessary evil in the sometimes slow and unsure manner students attempt to trudge their way through the sonic mud. Repetition fatigue can set in for the ensemble in the form of physical fatigue (especially for brass instruments), or simple boredom. By the same token, attentive students gain some basic orchestration knowledge by watching their peers reach their physical and technical limitations. This is also an entry point for discussing and practicing minimalist approaches, and for cultivating an awareness of the subtleties of repetition.

The success of "memory" directives (**Figure 2**)[23] relies on players' ability to recall what they were doing many minutes earlier. This is generally not an issue for instrumentalists, but vocalists without absolute pitch struggle to leap directly back to the moment. Singers can be instructed to take note of a reference pitch during "memory" directives.

Control is a constant negotiation on all three levels, as plays of dominance and submission, action and passivity in the dialogue between individual, ensemble and conductor can be an obstacle to Morris' dream of "going somewhere important together" (Monga, 2011). In a classroom setting the most common control-related issue is a novice conductor who lacks the confidence to lead, resulting in a wash of sound that never really goes anywhere. There may be a surfeit of ideas supplied, but the onus is on the conductor to construct the pieces into a living, breathing musical organism. The variance of student backgrounds is a

[23] For additional explanation see Morris (2017), p. 34.

strength when weaving together a unique, diverse sound, but can be a challenge realizing that musical autonomy is itself a cultural variable. Students from a strict conservatory background will have little experience producing notes that haven't been notated, and need to grow in confidence before they can assemble a simple phrase. On the other hand, students with a jazz improvisation background may take umbrage with the precise control the conductor may exert, as intimated by improviser Mark Dresser: "'I've seen Conduction be a disaster with people who just don't like to be controlled" (Borgo, 2007). Personality differences also factor into which students tend to dominate regularly. These musical negotiations can be a springboard for powerful conversations about power, equity, shared spaces, and Morris' vision of Conduction as a sonic microcosm of democracy itself.

Finally, having "an idea" on the spot is not necessarily an easy thing for a professor to do, much less students who may lack confidence in their abilities or who are intimidated by their peers. This is where Conduction shines as a confidence-building exercise. For perhaps the first time in their musical life students can be empowered to boldly explore, foster a musical instinct, and, even if just temporarily, sidestep a fear of wrong notes. As soon as a student is acknowledged for bringing an idea to the table, no matter how small, a rush of dopamine mitigates stress. Small ideas will begin to be linked together to form medium length ideas, sequences, themes, embellishments and then developments. Incredibly, the evolution of these productive skills enhances their ability to perceive and engage with larger forms and structures from the ensemble. Confidence grows by witnessing oneself face a challenge and meeting it well. Perhaps best of all, the motley ensemble of odd instrument combinations played by students of diverse cultural and musical backgrounds, grows in confidence together. A student's confidence in their own ability to "have ideas" crosses over into their larger sphere of musicking, in union with the overarching goals of the theory classroom[24].

[24]Specifically the following competencies outlined by NASM.
1a: Technical skills requisite for artistic self-expression
1d: Knowledge and skills sufficient to work as a leader and in collaboration on matters of musical interpretation. Rehearsal and conducting skills are required as appropriate to the particular music concentration.
1f: Growth in artistry, technical skills, collaborative competence and knowledge of repertory through regular ensemble experiences. Ensembles should be varied both in size and nature.
2a: An understanding of the common elements and organizational patterns of music and their interaction, the ability to employ this understanding in aural, verbal, and visual analyses, and the ability to take aural dictation.
2b: Sufficient understanding of and capability with musical forms, processes, and structures.
3: Composition/Improvisation. Students must acquire a rudimentary capacity to create original or derivative music. It is the prerogative of each institution to develop specific requirements regarding written, electronic, or improvisatory forms and methods.
5: Synthesis. Students must be able to work on musical problems by combining, as appropriate to the issue, their capabilities in performance; aural, verbal, and visual analysis; composition/improvisation; and history and repertory.
https://nasm.arts-accredit.org/wp-content/uploads/sites/2/2015/11/BAorBS-Music.pdf (accessed February 4, 2018).

SAMPLE ACTIVITIES

The strategies an instructor might use are virtually inexhaustible. Students are also encouraged to invent their own gestures to conduct the ensemble. Below are six examples of Conduction activities tailored for specific competencies at fundamental, intermediate, and advanced levels of music theory. It is effective to treat them like games, challenges or puzzles for a conductor and ensemble to solve collectively.

Exploring Modes and Scales

Scale proficiency is generally demonstrated through correct identification of scale degrees, key signatures, and scale types by ear and on paper. Identification alone, however, falls short of the fluency that only comes with deeply embodying scale structures. Before even introducing scales, as such, Conduction can be used to reveal the depth of students' a priori intuitions about pitch and pitch sets. This activity uses the sustained tone directive (left hand outstretched, flat face up) and the modulation directive (thumbs up/down generally directs modulation higher or lower by an indefinite amount, but can be changed to direct half steps, whole steps, diatonic, etc.). Without any preparation, conduct a sustained pitch ("bah" or "ah" for vocalists). Some classes will immediately gravitate to one pitch at the outset, others will need to be guided there by canceling some students (waved off) then directing them to copy a neighbor (make eye contact, tug at the ear lobe while pointing to the person to be copied). It usually takes no more than 10 s to establish a single pitch, at which point I stop for 3 min and discuss some relevant concepts, such as language acquisition in infancy, the phenomenon of absolute pitch, or how we are able to match pitch. It doesn't really matter what is discussed, as the point is to distract them briefly and then direct them to again produce a pitch. Without fail the class will immediately recall the same pitch. The stability of short-term pitch memory has just been demonstrated. This is how the concept of tonal center is experienced prior to being articulated.

Split the class in half, and have one side drone the established pitch. Direct the second half to produce a new sustained pitch up, and direct them to agree on a pitch. Classes generally settle on a pitch that forms a consonant interval with the drone. At this point I again stop and briefly discuss acoustic beats. I now direct individuals to form consonance or dissonant intervals over the drone not by name, but purely through their sense of beat roughness. A variation of Krumhansel's classic probe tone studies (Krumhansl and Shepard, 1979) can be the basis of a fun activity. While one student sustains a tone of their choice, the rest of the class on a sheet of paper rates the preferability, or "fit" of the tone over the drone. After a few minutes the ratings are compared, and the traditional tonal hierarchy is invariably represented in the collective preferences. This is how a scale is illustrated through experienced prior to being articulated in notation.

Now is the time to identify scale degrees. Call the drone "1" and hold up one finger to direct that pitch. Once everyone is on 1, hold two fingers in preparation and ask them to try to intuit what "2" would be. There's generally enough experience in the room to correctly land on the second scale degree, and proceed in this way up the whole major scale without much

FIGURE 3 | Directive for "Repeat."

intervention. Sign language numbers are useful when wanting to direct "scale numbers" (scale degrees) above 5. After a few times performing the major mode up and down, leaps can be introduced by signing 1–3, 1–7 (below), 1–4, etc. Once the class sounds confident, it's time to invite a brave volunteer to direct the class. They will be tasked to use these scale numbers to create a phrase, and repeat it (thumb and forefinger shaped like a "C" signifying "repeat this idea" **Figure 3**)[25] until the numbers are no longer required. Multiple students will try this, and enjoy the process while reinforcing the scale by ear and number identity. The same activity can be applied to minor scales.

Future iterations of this activity include singing the note name in response to the scale number, i.e., in the key of D the conductor will direct 6 and the class will sing "B." Often times a student will invent a riff or phrase that becomes the basis of a song or composition. Kodály method hand signs can also be used instead of scale degrees.

Improvisations

Conduction was created as a system for organizing improvisers, and is optimized for this. Its fundamental utility for the theory class is to challenge students to "have an idea," which they do whenever they take the baton and exercise musical sense-making. As part of the ensemble, students should also be given the opportunity to generate ideas. Highly structured activities like the above should be balanced with opportunities for more open exploration of sonic space. The pedestrian directive (folding the fingers inward, like a "come here" motion, **Figure 4**)[26] is used to invite a player to generate an idea, to fill the room with the sounds that they feel are most needed. The conductor can wait patiently for the player to find an intriguing phrase or motif, then direct them to repeat, then spread the idea throughout the ensemble using copy, and continue altering it at will, or allowing it to develop on its own. This provides students the chance to analyze the auditory scene evolving around them, and find a place for their own voice.

These scenes tend to host equal portions of sublime and ridiculous, both of which are invaluable to analyze and discuss in retrospect. At times a conductor will labor to achieve a particular result that they find is actually quite underwhelming, while at other times stumble into a mesmerizing texture by complete accident. Student assumptions about what constitutes "music" are frequently challenged through these early improvisations, but no one denies how enthralling it can be to open up to new worlds of sonic possibilities.

Neapolitan Chord Resolutions

Use a similar approach to the diatonic triad activities, direct a student to generate the four-voice progression i–iv–V–i. In the iv–V be sure the tonic moves to the leading tone, and subdominant up to the dominant. Repeat this voicing a few times with different orchestrations if possible, so that everyone has performed each voice. When the harmonic motion has been well-engrained, pause on the iv, raising the tonic up a minor second, which will form the Neapolitan chord[27]. Continue to resolve the voices to the V in the same motion as the iv. This activity emphasizes the predominant function of the Neapolitan chord, and its derivation from the minor subdominant. Again, perform the progression multiple times with varying orchestration, so everyone has a chance to experience each voice in the proper resolution.

Once everyone is together, reinforce the idea in multiple keys and voicings. This exercise primarily challenges the conductor to understand what they're hearing and arrange voices in real time to form a chromatic alteration. This can be imitated for a number of chromatic alterations (augmented sixth chords, secondary and embellishing diminished chords, etc.).

Polytonality

By the end of the theory core the typical theory student is able to identify instances of polytonality in an analysis, but have limited exposure to the sound of polytonality[28]. The opportunity to perform in class means that students can develop a sense of the sound of bitonality and polytonality, and the characters of various key combinations. Conduction gives students the rare chance to experiment with polytonality with the immediacy of a keyboardist, though with none of the requisite technical ability. One or more short melodies can be provided, or even written by students, which can be modulated freely using modulation

[25] For additional explanation see Morris (2017), p. 31.

[26] For additional explanation see Morris (2017), p. 15.

[27] Neapolitan chord is a major chord built on the lowered (flattened) second scale degree. By chromatically altering the iv chord, this device is used by composers (especially Romantic) to accentuate movement to the V (dominant) en route to a cadence. It tends to be used to create drama. A popular example can be heard in Beethoven's Sonata Quasi una Fantasia (Moonlight Sonata), Op. 27, No. 2. m. 14.

[28] Polytonality refers to the simultaneous presence of more than two tonal centers in a given phrase, section, or composition.

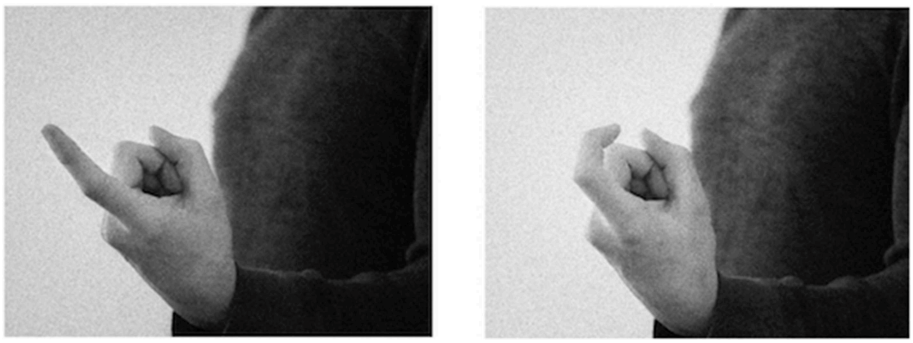

FIGURE 4 | Directive for "Pedestrian."

directives. Melodies should include each scale degree in order to create a more accurate experience of the interactions between keys. Begin with bitonality. Performing a melody in unison, then split into two groups, and modulate around the circle of fifths in order to hear the effect of key proximity. After completing the circle, change both keys and challenge students to identify the relationship between them. Instead of performing a given melody in unison, it can be interesting to conduct a more aleatoric texture by staggering entrances and varying tempos.

One effective method of immersing students in the sound of simultaneous keys is to conduct groups to improvise freely within two or more keys, or even invented scales. For instance, conduct one half of the class to improvise freely in D major, and the other half in B major. The unique quality of consonances and dissonances churns, creating many interesting moments, but after a few minutes an overall sense is formed. This can be done with three or more simultaneous keys, though the effectiveness decreases the more a class is subdivided.

It is appropriate to close with a few statements offered voluntarily by students who have engaged with Conduction in this theory context, which realizes what Roland Barthes described as the real product of the composer, the substance of the musical work, which is "to give to do, not to give to hear, but to give to write" (Barthes, 1977, p. 153).

> "It's an amazing way to get used to analysis, since its music I was a part of when it came together."
> "It's really helpful, even fun, to analyze the notes that *we* made."
> "It helps me see that there's more in the music than it sounds like. It's a lot more clear, and less frustratingly complex this way."

Butch Morris' Conduction® system offers a rich, heuristic tool for learning music theory concepts in the classroom, one which (1) addresses recent challenges presented to conventional approaches, (2) efficiently rehearses Performance, Composition/Improvisation, and Synthesis competencies outlined by the NASM, and (3) which aligns with the Universal Design for Learning (UDL) framework. Theory professors and instructors in proactive music programs are encouraged to experiment with Conduction in the classroom using the above approach, and tailor it to their own classrooms. Conduction can be used periodically, regularly, or be used as the basis of a stand-alone theory/aural skills course or performance ensemble. Butch Morris' posthumously published text—"The Art of Conduction" (Morris, 2017)—can be consulted for a more thorough guide to his lexical vocabulary.

CONCLUSION

Toward the aim of a meaningful instrumental music pedagogy, a 4E framework for music theory asks students and teachers to reflect upon the following questions:

- **Embodied**: How might one's perceptions and experiences of musical structure be an outgrowth to bodily being and sensation? How is the body—both the material body and "body" as a social construct (e.g., traditional imaginings of the idealized body[29])—located and acted upon in the context of music pedagogy, analysis, the production of theory, and presumptions about music's fundamentals? How might analysis be informed by conceptual metaphors for bodily experience (e.g., an intuition for melodic/harmonic/rhythmic gravity and magnetism; Larson, 2012).
- **Embedded**: What role(s) does the socio-cultural environment play in shaping the ways we listen to, process, and encounter musical structure? What meanings underlie both inherited and emerging repertoires, and qualify who is authorized to posit arguments regarding their basic musical categories, and nature of the relationships between them?
- **Enactive**: What does music theory study offer in terms of capabilities-in-action? What new relationships might emerge when the analytical repertoire intersects the sensorimotor repertoire? How do patterns of bodily action inform and prescribe how sounds might potentially be structured?
- **Extended**: How do objects within the environment that present affordances (e.g., co-performers, instruments,

[29]For a thoughtful account of various meanings of music theoretical traditions through the lens of disability studies, see Straus (2011).

technologies) and other ecological factors both facilitate and limit conceptions of musical categories, including rhythm, pitch, harmony, voice, notation, imitation, variation, forms, logic and grammar?

Here music theory pedagogy has been presented as a site for establishing musical relationships which the student might continue to use for their own personal growth, and for nourishing a transformative process of realizing their own potentialities, as embodied minds situated within a community, a society, and the world. Today's students open themselves to a world in unprecedented transition. The conventional focus on procedural knowledge and symbol system competency, while valuable, falls short of nourishing the reflexive, phenomenological responsibility required to navigate, negotiate, and generate the required explanations for today. Instead, what has been advocated here is the "integrity and trustworthiness of action and its agent, the minded body" (Bowman, 2004, p. 27). This nourishing demands more of the educator than an inscription of external musical objects, but the guided process of structuring musical actions in a personal, visceral mode of incorporation[30]. When music is treated as a rhetorical text, students interact with the pheno-textual elements of the music work.

When a curriculum privileges the regulative and the analytic at the expense of the speculative, it determines how the student operates in relationship to their world, limiting the potential for self-actualization to occur. Whereas, a curriculum designed around the *equilibration* of these three orientations presents music theory as an indeterminate field oriented toward mutual transformation. 4E perspectives enter to offer modes of thinking about music-making that are non-dualist and indeterminate. Such accounts are compelling to musicians, who, rather than being merely provided a governing rule are finding in this emerging field a framework for renewed musical speculation, that ancient subset of philosophical thought concerned with basic musical categories, and the nature of the relationships between them. This lens invites educators to reconsider the processes that form and inform musicality and musicianship, and presents a platform for rethinking the core learning objectives of music theory study, and an opportunity for the transformation of music education broadly.

After much experimentation in the music theory classroom, this article introduced one curricular tool in support of 4E music pedagogy. When adapted to the learning goals of the theory class, Butch Morris' Conduction® –a technique that makes use of signs and gestures—positions students in sensorimotor contact with embodied metaphors underlying musical structure. As a means of coordinating a musical environment, Conduction can be a valuable curricular tool to enact the learning objectives of music theory, or simply ludic exploration in the mode of music(k)ing[31] (Small, 1998; Elliott and Silverman, 2015). With an unyielding charisma Morris would implore his ensembles to "Have an idea!," to "Let's all play something *important*!," and "We have all this theory, let's *do* something with it" (Monga, 2011), and as such embodied and enactive sense-making is central to Conduction's design. Conductions in the classroom can also be recorded and analyzed as an assignment. If the goal was to "Have an idea!", recordings made in class document the evolving sounds of mutual transformation, exposing the dynamic overlap of the individual's ideas, the ensemble's ideas, and the conductor's ideas, in their collective journey toward "something *important*." Through this unique analysis students discover patterns within their musicality (understood as an ecological rather than innate phenomenon), patterns which can then be notated, compared and discussed in class or in a team, distributing sense-making throughout the class. It can be among the most eye-opening analyses students may perform in a theory class, as they engage intentionally with music structure, function, and form with increasing sophistication, and in so doing, students work together to advance their collective knowledge.

Butch Morris designed Conduction with a democratic vision, one that firmly aligns with music educationalist Mark Laver, who writes—"Pedagogy that amplifies instrumental skills and deemphasizes creative and critical thought impacts not only graduating students; it impacts the contours of democracy" (Laver, 2016, p. 243). Where instrumental skills and creative and critical thought intersect is the precise space in which embodied and enactive notions of the mind meet music theory, or more precisely: processes of musical theorization. Curricular tools that draw students and teachers alike into this space, not only promote a more holistic musical experience, but nourish the potential for the mutual transformation of individual, community, society, and world.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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[30]This wording is taken from David Borgo's paraphrasing of an interview with bassist Bertram Turetzky: "Turetzky is referring to a disjuncture between inscribed and incorporated forms of knowledge. Many music programs place undue emphasis on the normalized, abstract, and detached mode of inscription, rather than the more visceral and personal mode of incorporation" (Borgo, 2007, p. 66).

[31]The term "musicking" is offered by Small (1998) to describe the active nature of musical experience (music conceived as a verb, not a noun). This perspective is developed by Elliott and Silverman (2015), who use the word "musicing" to differentiate their perspective.

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