Rhythmic Theory Pedagogy, Ways of Knowing, and Experiential Learning

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BY BEN DUINKER

This article proposes an approach to rhythmic theory pedagogy that foregrounds the intersection of performance, creation, and analysis. Daphne Leong's recent work on this intersection uses the German verbs *wissen* (knowing that), *können* (knowing how), and *kennen* (knowing of) to describe the different kinds of knowledge generated and utilized by theorists and performers. I use Leong's theory to identify a mismatch, or gap, between what undergraduate students learn about rhythm in the theory classroom and what their practical needs are as music majors—a plurality of whom specialize in performance. As a means of remedying this mismatch, I use David Kolb's framework of experiential learning spaces to situate strategies for integrating analysis and performance in undergraduate theory pedagogy. Focusing primarily on post-tonal and non-Eurocentric repertoires and traditions, I argue that mobilizing this framework in the classroom encourages rumination on the utility of analysis for performance, and on the informative role that performance issues can assume in theory pedagogy. This approach empowers students to identify means of applying their theory knowledge beyond the classroom.

In his 1995 essay on music performance and analysis, Joel Lester assertively made the point that musicians and their performances were "strikingly absent" (197) from the prevailing literature on this topic. Since then, the voices of musicians and the performance-related issues they experience have increasingly permeated music analytical scholarship.[1] In response to these encouraging developments, this article explores how performance-centric topics can be productively integrated into music theory/analysis pedagogy in undergraduate music curricula. While the modern American discipline of music theory grew out of an aspiration to subscribe to the intellectual rigor of the hard sciences, many of the largest theory programs in North America exist within music faculties that house large, vibrant, performance departments.[2] In many institutions, the appeal and potential for cross-disciplinary

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[1]   In such discourse, I am referring not only to research that intersects analysis and performance, but especially research that consults performers firsthand. See Daphne Leong's 2019 monograph *Performing Knowledge*, for an example of how performance concerns—as experienced by performers themselves—can be woven into analytical discourse. My own exploration of interpretive difficulty (2022) also consults performers and treats their experience as a point of analytical departure.

[2]   This aspiration is especially evident in the work of Milton Babbitt and Allen Forte, at Princeton and Yale, respectively. See Rothstein (1990) for further insight on how the propagation of Heinrich Schenker's theories in North America had a role in the development of the modern theory discipline.

performance/analysis pedagogy is therefore palpable.[3]

Though analysis/performance pedagogy could arguably encompass any musical parameter, I have chosen here to focus on rhythm, a topic that has received far greater attention in theory research than it has in pedagogy. This topic still struggles to find its way toward meaningful and substantial representation in many undergraduate theory curricula, despite it being an essential part of most students' musical vocations. Rhythm's coverage in theory pedagogy—if it is covered at all—is often confined to certain repertoires and circumstances. This dearth of coverage may be a result of the theory discipline's lack of rallying around one, or even several, prevailing theories of rhythm, historical *or* modern. Many recent textbooks that purport a comprehensiveness in their agenda still do not afford rhythm the space and time of other musical parameters.[4] Consequently, rhythm-focused content in theory courses could also be created individually by instructors, without the aid of texts or resources. Labor intensive, this approach risks compromising any sense of curricular continuity.

In this article, I propose an approach to rhythm theory pedagogy that foregrounds the intersection of performance, creation, and analysis, highlighting creative and performative issues that musicians face, and ideas developed to address these issues. Musical performance and rhythm are something of a marriage of convenience here: they are both traditionally underrepresented in theory curricula, and they offer a wealth of opportunities to wed theoretical and practical learning. I begin by unpacking Daphne Leong's theory of analytical and performative ways of knowing (2019). I use Leong's theory to identify a mismatch, or gap, between what undergraduate students learn in the theory classroom and what their practical needs are as music majors—the majority of whom specialize in performance or another practical vocation such as

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3   I presently work at an institution that hosts both a large, research-oriented theory faculty and a conservatory-style performance program. Recent enrollment statistics (2021–2022) show that 68% of undergraduate music students majored in performance. My previous employer also housed a research-focused theory faculty and large performance program—there, in 2019–20, performance students comprised 60% of the undergraduate music student population.

4   In a 2008 review in *Music Theory Spectrum* Hali Fieldman writes that three then-new textbooks "present a large-scale rethinking of the project of undergraduate music theory, considering anew many of the most important issues involved in both *what we teach* and how we go about it" (366, italics added). Despite highlighting the issue of "what we teach," Fieldman's review hardly discusses rhythm—or a lack thereof. One of Fieldman's reviewed texts, *The Complete Musician* by Steven Laitz, numbers 875 pages and can be used through an entire undergraduate theory sequence. Forty-four pages of the text involve rhythm and meter as their primary subject matter—almost exactly 5% of the book. Though perhaps unfair to single out Laitz, his book is like many other ostensibly comprehensive texts in its coverage of rhythm—unbalanced.

conducting, composition, or music education. I then propose a means of addressing this mismatch by invoking John Dewey's philosophy of education through experience, later refined by David Kolb in his theory of *experiential learning* (1984).

I then present five pedagogical case studies that have evolved from my own experience as a percussionist teaching rhythmic topics in core and elective theory courses.[5] These case studies focus on contemporary post-tonal music, non-Western, and popular music genres, encouraging greater inclusion of these repertoires. Though the lesson ideas I propose here were originally designed for upper-level core and elective courses (i.e., junior or senior undergraduate level or higher), several are scalable and could also be used in introductory courses. Indeed, these case studies encourage engagement and reflection with repertoires and theories, rather than mastery and proficiency. Supported by these five case studies, I argue that using percussive-centric musical traditions from beyond the Western canon can facilitate experiential learning, simultaneously empowering students' rhythmic confidence and broadening the repertoire underpinning their theory education. The in-class exercises and take-home assignments outlined in these case studies can work to counter the general dearth of rhythm coverage in theory pedagogy.

As a professional and lifelong student active in both music analysis and performance, some of my most impactful learning experiences with rhythmic theory, and music theory more generally, have involved *learning by doing*. This doing can either be corporeal—the act of performing—or it can emerge through creative activities such as composition or transcription. To clarify, these activities extend beyond what is traditionally understood as pen-to-paper analysis. For example, creating a Schenker graph, analyzing a sonata, or identifying a row aggregate are analytical actions that can be considered creative forms of *doing* music theory. But if we accept that analysis is also something we do through creative, corporeal activities, productive ways to integrate theory pedagogy with the rest of the undergraduate music curriculum become evident.[6] This integration can empower students' confidence in their own vocation and encourage them to see their music education as holistically contributing to their personal and artistic growth.[7]

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5   Russell Hartenberger (2020) outlined the lack of coverage of rhythm and meter in undergraduate music theory curricula and proposed that the percussion community—in its close association with non-Western musical traditions—might be well positioned to address this lack of coverage.

6   Here I follow an argument made by Daniel Barolsky: the performers are, in their actions, essentially analysts (2007, 3).

7   In a sense, my argument here echoes the aims of the comprehensive musicianship movement,

Ways of Knowing and Experiential Learning

Leong's monograph *Performing Knowledge: Twentieth Century Music in Analysis and Performance* approaches contemporary music from the angles of analysis and performance. She explores—together with various collaborators—points of intersection and divergence in the types of knowledge produced or gained through these two activities. Drawing from her expertise as a theorist and performer, Leong proposes that analysis and performance may represent different ways of knowing music.[8] She grounds these ways of knowing in the three German verbs that variously translate to the English verb *to know*. These are: *wissen* (knowing that), *können* (knowing how), and *kennen* (knowing of or about). The main thrust of Leong's epistemological framework is that, through analysis, theorists primarily utilize *wissen* knowledge, while through performance, musicians primarily utilize *können*, and in certain circumstances, *kennen* knowledge.

Before continuing, I must stress that Leong's conclusions are not meant to be universal. Neither theorists nor performers come to know music exclusively in one of these ways. Furthermore, many musicians—myself included—identify as both performers and theorists, and frequently integrate these ways of knowing in their practice, possibly without even being aware of it. But intersections between Leong's ways of knowing are nevertheless important to unpack. In the Anglo-American academy, knowledge transfer between theorists and performers has traditionally been unidirectional, beginning with analysis and terminating with performance.[9] As Lester explains in his essay, this transfer risks forming a hierarchy wherein performance is thought to merely validate an analysis, and he proposes we "challenge the assumption that communication need take place solely when analysts give directions to performers"

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which gained popularity in the 1960s. A. Cutler Silliman's assessment of this movement (1980, 125–9) reports that, in the author's experience, most university music curricula are not as integrated as comprehensive musicianship would propose. My own experience over the past two decades has been similar, thus demonstrating the need for continued reflection on how music theory pedagogy can be better integrated with other areas of music education.

8   For a full rendition of her coming to this realization through an experience performing chamber music, see Leong (2019, 14–17).

9   Edward Latham (2005) writes that "[Erwin] Stein [with his 1962 monograph] ushered in an era of prescriptive writing on the part of music theorists eager to diagnose and cure the performer's 'malady.'" To some extent, that era persists: recent prescriptive writing by theorists intended (at least partially) for performers includes monographs by Swinkin (2016) and Ito (2020), where both authors develop theories whose goal, at least in part, is to instruct or guide performers.

and to "argue that more reciprocal discourse would enhance our understanding of music-theoretical issues as well as performance issues" (1995, 198). As Leong's book demonstrates, the theory discipline has begun dismantling this hierarchy in its research agenda. Her research shows that a productive *bilateral* exchange between analytical (or *wissen*) knowledge and performance (*können*/*kennen*) knowledge is possible in music theory scholarship. My goal here is to encourage that same bilaterality in music theory pedagogy.

Theories of learning that mobilize *können* knowledge—learning by *learning how to*—have long been established in educational philosophy, famously championed a century ago by the American philosopher John Dewey.[10] At the heart of Dewey's educational philosophy lies experience. An experience-based education, or *experiential learning* in its modern term, orients itself to the learner, and not the curriculum.[11] Experiential learning is generally understood as a combination of learning through doing, and through reflecting on that doing.[12] David Kolb defines experiential learning as "the process whereby knowledge is created through the transformation of experience" (1984, 41). The "transformation of experience" of which Kolb writes involves the inseparable transformative processes of knowledge acquisition and mobilization. They are inseparable because in an experiential learning environment, knowledge is acquired *through* its mobilization—the processes are concurrent. In other words, rather than thinking about mobilization as something that occurs after acquisition, Dewey and Kolb invite us to conceive of these actions as dependent on one another. Through the case studies below, I propose that experiential learning of rhythm in the theory classroom provides fertile ground for knowledge acquisition and mobilization to occur in such a concurrent, mutually dependent context.

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10   Dewey's theories have come to form the basis of experience-based education in North America, and were espoused early on by John Andrew Rice, who in 1933 founded the arts-focused Black Mountain College in Asheville, North Carolina, notably hosting John Cage as a faculty member. Rice also attracted faculty like painter Robert Rauschenberg, pianist David Tudor, choreographer Merce Cunningham, and artists Josef and Anni Albers, the latter two being educated in another practice-oriented environment: the Bauhaus School of design.

11   Furthermore, it facilitates knowledge acquisition that will benefit the learner in real-world experiences, or as Dewey puts it, in the "actual conditions of life" (1938, 48).

12   Pappa et al. define experiential learning as "the process of making meaning from direct experience, namely learning through reflection on doing" (2011, 1003).

Case Studies

I now turn to five case studies that illustrate what those activities might look like, and how they engage with Leong's ways of knowing. Each case study illustrates the benefits of uniting knowledge acquisition and mobilization in the classroom, subscribing to Dewey's assertation that "when we experience something we act upon it, we do something with it; then we suffer or undergo the consequences" (1959, 38). The first case study involves studying the metric structure of polyphonic music created by the Aka Pygmies and applying it to an analysis and performance of Steve Reich's *Clapping Music* (1972). In the second case study I propose using South Indian *solkattu* to establish continuity in rhythmic topics throughout the theory curriculum. The third case study focuses on Ine Vanoeveren's writings about performing complex rhythms (2018) and applies them to a rhythmic analysis and excerpted performance of Brian Ferneyhough's *Bone Alphabet* (1992). The final two case studies involve hip hop music, a genre whose style features sampled drum breakbeats (sampled drum patterns from funk records) and rhythmized vocalizing known as flow. These case studies focus on beat and flow recomposition, respectively. Drawing on a recent co-teaching experience with forensic musicologist Claire McLeish, I propose a way that these two final case studies can be used to develop a group project where students argue—in mock legal fashion—for or against copyright claims drawn from real cases in the hip-hop industry.[13] Producing and delivering such legal arguments is, in a sense, a way of performing an analysis, and is again an active application of passively attained knowledge.

In David and Alice Kolb's work on experiential learning, the authors write that "learning involves a taking in and processing of experience and a putting out or expression of what is learned" (2005, 208). Naturally, nearly any assessment- or metrics-based educational model involves an "expression of what is learned"—assignments, tests, or exams fit this description, for example. The difference between tests and exams and more creative, performative assignments, is that student creativity and agency are more readily foregrounded in the latter. This idea is not new. Peter Schubert's resuscitation of Renaissance-era pedagogical methods that foreground model composition and improvisation are testament to the broad applicability of the Kolbs' space for acting and reflecting. When Schubert teaches students how to improvise two-part counterpoint, mistakes are common, and reflection/discussion of

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13   McLeish initially developed this group project, and together we adapted it for use in classrooms of music majors and non-majors alike.

these mistakes forms an important part of the learning process.[14] In a similar sense, many of the assignments discussed below in the case studies involve an element of reflection, where students are invited to ruminate on their experience with the assignment—what were its challenges and how did they surmount them? The central goal here is that such reflection will support and feed into students' retention of what they learned.

Before proceeding to the case studies, I must mention that the institutions where I designed and delivered these lessons may not mirror the demographic realities of other music schools. Liberal arts colleges with music-focused arts programs, or music programs with foci external to the classical conservatory model, for example, may not focus so heavily on performance. That said, each of the case studies I have discussed here can be scaled somewhat so that they are accessible for a variety of students—they do not require familiarity with any specific curriculum to excel in the learning experiences discussed here. As mentioned in the introduction, technical mastery of the performance and/or composition tasks described below are of secondary importance to critical reflection and engagement. In my own teaching, I have found that even the most advanced students of performance, theory, and analysis are on equal footing with their peers in completing these assignments. This observation likely owes to the diverse methods of assignment submission; many of the case studies involve submitted work that is not written—i.e., that is performed. This approach works toward creating a more inclusive environment in theory pedagogy, leveling the playing field for all to succeed.

Case Study 1: Performing Phasing

Popularized in Western music through the works of Steve Reich, phasing is a process that describes two or more isochronous (of identical length), cyclical processes whose beginning/end points migrate from alignment to non-alignment, or vice versa. A visual analogy of phasing involves a set of windshield wipers in disrepair that move at different speeds: little by little, the wipers migrate from moving in unison to moving in opposite directions.[15] Reich is perhaps best known for his use of phasing

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14   See Schubert (2013), where he highlights the importance of learning from mistakes: "[A] requirement for a shift [towards experiential learning] is teachers willing to ask students to sing, play, and make mistakes."

15   Another analogy involves two different-sized church bells that are swung simultaneously. The larger, lower-pitched bell will swing in a longer span, meaning its clapper—the device swinging inside it and hitting its edge—will make contact at a slower rate, and the sounds of the bells will gradually and constantly drift out of and into synchronicity with one another.

in his works *Piano Phase* (1967) and *Drumming* (1971), but the underlying concept—the migration of two identical rhythmic patterns so their start/endpoints are not aligned—appears in many of his other early works and was developed as a technique he originally used in tape-based compositions including *It's Gonna Rain* (1965) and *Come Out* (1966). While Reich developed his phasing techniques through technological experimentation, some musical traces of phasing—the lack of a clear, unified downbeat and metric hierarchy—exist in certain non-Western musical practices.

The Aka Pygmies, a community indigenous to the jungles along the border between Central African Republic and Cameroon, have cultivated one such practice. Their musical traditions, documented extensively by Simha Arom (1985) and Susanne Fürniss (2006), revolve around vocal polyphony, involving simple sung lines whose endless variation and layering result in a remarkably complex texture. As Fürniss explains (175), songs in the Aka polyphonic tradition typically involve four parts, each with its own dense layering and variation structure. These part types include the *Mòtángòlè*—"the one who counts"—the principal voice; the *Ngúé wà lémbò*—"mother of the song"—a lower part like a bass part; the *Òsêsê*—a part quite static in rhythm and pitch; and the *Dìyèí*, a "yodel" sung above the other parts.

Beat:	1	2	3	4	5	6	7	8	9	10	11	12	*1*	*2*	*3*	*4*	*5*	*6*
Dìyèí					▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	
Mòtángòlè	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨						
Òsêsê					▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	
Ngúé					▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨

Example 1

Metric structure of *Dikòbò Dámù Dá Sòmbé* (Fürniss 2006). The shaded boxes indicate when during the 12-beat cycle each part is vocalizing. The beat numbers across the top indicate the beat in the 12-beat cycle. Note the circular repetition of the beat numbers.

Many Aka songs operate in a ternary-divided 12-beat cycle. Calling this cycle a *meter* invites scrutiny, because Western theories of meter quite often assume some form of metric hierarchy, a notion that is absent in Aka music. For example, Fürniss analyzes an Aka song called *Dikòbò Dámù Dá Sòmbé*, the basic temporal structure of which is reproduced in Example 1.[16] No one of the 12 beats in *Dikòbò* is understood as

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16   I create this schematic, based on Fürniss's transcription, with awareness of the ongoing debate in ethnomusicology regarding the utility and appropriateness of written transcriptions of musical practices that do not rely on Western notation. Bruno Nettl (2015, 72–88) discusses this ongoing debate in the field, specifically highlighting the degree to which a transcription can be understood as representative of a musical work or practice. In the present case study, I have students listen

structurally superior or felt as stronger. In addition to this lack of hierarchy, *Dikòbò* also lacks a unified downbeat among its part types. As shown here, the cycles of the four parts in *Dikòbò* begin on different beats: the *Mòtángòlè* on beat 1, the *Òsêsê* and *Dìyèí* on beat 5, and the *Ngúé wà lémbò* on beat 6, and even though the parts become varied as the performance progresses, their respective starting beats remain constant and distinct from one another.

In *Dikòbò*, we thus observe a cyclical musical temporality void of metric hierarchy (in the way we understand it in a Western sense) and unified downbeat. Viewed more broadly, Aka Polyphony offers students an opportunity to learn about a metric phenomenon that is central to this music but might not carry the same centrality in students' own musical practices. Nevertheless, learning about non-hierarchical cyclicity in music encourages students to come to know musical temporality in a way that is possibly new to them. Transferring this knowledge into the können domain using Aka music is difficult, however, without expert guidance.[17] One solution is to use Reich's *Clapping Music* (1972), which can introduce a *können*-style experience to students that explores similar rhythmic and metric phenomena found in Aka polyphony.[18] *Clapping Music* involves a non-continuous type of phasing, where one part periodically migrates away from the other by shifting its looped pattern by one eighth note, as shown in Example 2a. When performing this piece without a score, musicians playing part 2 (the phasing, or moving part) must re-orient their sense of downbeat each time they move to a new pattern by dropping the ultimate eighth note beat from the 12-beat pattern. The downbeat migration in *Clapping Music* is so straightforward that teaching a *wissen*-style knowledge of it would only take a short lecture with several musical examples, but I argue that one only *really* understands phasing once they try performing it.[19]

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to recordings of the piece and its parts (which Fürniss has collected and are available through the publisher's supplemental materials) before viewing any score-based notation.

17   Not to mention the problematic of Western groups "learning" a non-Western musical practice without guidance from an expert of that practice.

18   Instructors could simply leave out any discussion of Aka polyphony altogether. Though more expedient, this approach risks sidelining any discussion of the relationship between Reich's early compositions and his travels in West Africa. In my case, the course for which I developed this lesson plan centered on non-Western musical practices and what they can teach us about rhythmic and metric theory. Therefore, Aka Polyphony was the main topic of the lesson, while *Clapping Music* represented the take-home exercise for students. I have repositioned the relationship of these two topics here, to emphasize the *können* dimension of this lesson plan through a foregrounding of *Clapping Music*.

19   Russell Hartenberger's detailed account of the sensations of phasing can be found in Chapter 9 of

Example 2a
Migrating metric displacement in *Clapping Music* (Reich, 1972).
Part 2 phases by displacing its downbeat backwards (as indicated by the brackets), effectively
moving the pattern one eighth note "ahead" of Part 1.

Clapping Music may look simple in its notated form, but it is difficult to perform confidently and accurately. Introducing phasing to students can begin with a simple method that assigns lyrics to *Clapping Music*'s rhythms, as shown in Example 2b. Instead of clapping, students thus vocalize the rhythm by naming various fruits.[20] While in Reich's version the moving part phases backward by eighth note, in this version the moving part phases forward by adding a quarter note. "Pineapple, apple, pear, orange" thus becomes "pineapple, apple, pear, orange, LIME" any time part 2 elects to phase (part 2 decides how long to remain on each pattern between phases in *Clapping Music*). Once students are comfortable with this task, Reich's version of the piece can be attempted in class.

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his monograph *Performance Practice in the Music of Steve Reich* (2016).

20   English-speaking students often bristle at pronouncing orange with the stress on the second syllable (i.e., *or-ANGE*), which typically happens in this context due to the word's rhythmic placement.

Example 2b

"Fruits" version of *Clapping Music*, where the downbeat is phased
forwards by one quarter note as shown with the dotted line.

Students tend to master the fruits version of the piece quickly. If no time in class remains to try Reich's version, I have students perform part 2 (of Reich's original version) against a pre-recorded part 1, and document themselves doing this on video in a way that ensures they are performing from memory.[21] The rationale behind learning and performing this piece by rote / from memory, rather than reading it, is to foster knowledge transfer from *wissen* to *können*—students know *that* phasing in *Clapping Music* accords to a simple process of downbeat displacement, and their non-reading performance of the work forces them to learn how to effectuate this displacement. It is quite straightforward to simply read each resultant pattern that part 2 creates after each phase action, but this recontextualizes each resultant pattern against the notated downbeat, rather than preserving the pattern's downbeat, which part 2 migrates through all 12 beats of the cycle. Finally, this mode of learning connects the topic back to Aka polyphony, a music that is learned through listening and emulating, and not by reading.

This *können*-style knowledge of downbeat migration produces a much more fulfilling experience and generates student satisfaction with their performance achievement. Returning quickly to the Kolbs, they write that "positive feelings of
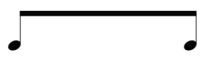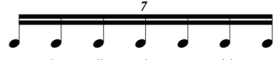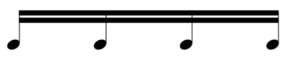
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21   This strategy was used because I initially taught this assignment during a semester affected by the COVID-19 pandemic, and thus did not see students in person each week.

attraction and interest may be essential for learning" (2005, 208). In a general sense, we know this to be true. Students who are interested in a topic are more likely to be receptive to learning about it. But the converse also holds: disinterest in a topic creates barriers to learning motivation. I do not wish to suggest that music theory pedagogy should simply prioritize topics that students are interested in, but rather I invite rumination on how teaching theory topics can better encourage satisfaction from students at what they have learned. I have consistently witnessed such satisfaction from students who successfully completed this *Clapping Music* assignment.

Case Study 2: Performing Syncopation and Polyrhythm

The second case study focuses on rhythmic structure in south Indian Carnatic music, illustrating two short examples of rhythmic skill acquisition based on this musical tradition, and concluding with thoughts on how these skills can be incorporated into the analysis of repertoire in the theory classroom. Carnatic music is a tradition of astounding rhythmic complexity where a system of "rhythmic solfege" called *solkattu* can be applied to the simplest and most complex and demanding rhythms alike. Carnatic music features a drum called the Mrdangam. Students of the Mrdangam often spend years learning and reciting solkattu, a practice known as *konnakkol*, before ever touching a drum, meaning they can recite everything they play. Using solkattu in theory pedagogy thus presents two appealing features. First, no instruments are required—everything can be done with the voice. Second, using solkattu means that students learn by doing, enabling a potential integration of *wissen-* and *können*-style knowledge. Solkattu is also scalable, meaning its basic forms can be recited at different speeds. Example 3 shows some basic solkattu patterns ubiquitous in Carnatic music.[22]

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22   These are drawn from Adler (2016) but are widely used in Konnakkol practice.

Example 3
Basic solkattu sequences commonly used in Konnakkol (Adler, 2016).
(Reproduced with permission from the author)

This scalability of a small set of patterns characterizes Jacob Adler's textbook *Wheels within Wheels* (2016), which uses solkattu as a basis for rhythmic education. Adler uses just these eight patterns throughout the entire book. The utility of these basic patterns is wide ranging. Consider Example 4a, which shows a quintuplet distributed across a measure of 3/4. Many students would find this easy to grasp conceptually—in a *wissen* sense, but perhaps difficult to perform—in a *können* sense. That is, students can easily understand that this polyrhythm means that five attacks must occur isochronously over three beats but might not know how to perform this accurately.

Example 4a
Quintuplet in 3/4 time.

Beat	1					2					3				
step 1	ta	di	ghi	na	ton	ta	di	ghi	na	ton	ta	di	ghi	na	ton
step 2	ta	ki	te	ta	ki	te	ta	ki	te	ta	ki	te	ta	ki	te
step 3	ta			ta			ta			ta			ta		
step 4	ta			di			ghi			na			ton		

Example 4b
Solkattu-based learning sequence for a 5-against-3 polyrhythm.

As Example 4b details, the first step in deciphering this polyrhythm involves subdividing each of the measure's three tacti into five, using the solkattu sequence "ta-di-ghi-na-ton" (step 1). After gaining facility with reciting the measure according to this subdivision, step 2 involves switching to the three-pattern, "ta-ki-te." After this becomes comfortable, the non "ta" syllables are gradually dropped (step 3), and the five-pattern can be reintroduced on the initiating "ta" of each three-pattern (step 4). This process might take time with students unfamiliar with tuplets (beyond the triplet) or otherwise complex rhythms and polyrhythms. And while five-against-three polyrhythms may not be common in students' performance experience, the sense of accomplishment they receive when mastering this exercise sensitizes them to the rhythmic depth in the music they analyze—a depth that often goes unnoticed in wissen-style study of rhythm. Using exercises like this one offers a practical point of entry for studying the complex rhythms in contemporary music. For example, the near-constant polyrhythms in Elliott Carter's later string quartets could be discussed in the classroom in how they create textural stratification but working through these polyrhythms with in-class vocalization exercises enables students to embody such textural stratification, and to understand the tenuousness of the (rare) points of rhythmic synchronization in Carter's musical language. Analyzing complex rhythms in this way nearly always generates a deeper and more comprehensive understanding of them—one that engages multiple ways of knowing.

Solkattu patterns can also be used to model and practice rhythmic displacement or syncopation. In his book *The Art of Solkattu* (2010), Trichy Sankaran offers the exercise reproduced in Example 5a.[23] This exercise systematizes rhythmic displacement by superimposing five-divided patterns onto a 16-divided metric grid. While counting the *tala*—or underlying tactus—with their hands (using the clap-wave system common

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23　See Sankaran (2010, 12).

in Indian classical music), students recite the four-divided pattern "ta-ke-di-mi" in sequence, applying a five-divided pattern every fourth iteration (as bolded in the example). Each time a five-divided pattern appears, the grouping pattern of the recited solkattu is displaced by one subdivision against the tala. Gradually, students cease reciting the trailing syllables in the four-divided pattern (Example 5b), leaving only the five-divided pattern and a series of increasingly displaced "ta" syllables. Through this exercise, students learn how to syncopate (*können*), and how it feels to syncopate (*kennen*). This experience facilitates a more visceral understanding of syncopation in repertoire—be it through accent displacement in hip-hop vocals, extended tresillo patterns in EDM, or the complex rhythmic surface of funk music.[24] Using solkattu exercises when studying the rhythmic landscape of these genres thus gives students a chance to develop new ways of experiencing, understanding, and appreciating popular music, or to effectively articulate ways they already know this music through listening to it both live and via recordings.

1				2				3				4			
ta	ke	di	mi	ta	ke	di	mi	ta	ke	di	mi	**ta**	**di**	**ghi**	**na**
ton	ta	ke	di	mi	ta	ke	di	mi	ta	ke	di	mi	**ta**	**di**	**ghi**
na	**ton**	ta	ke	di	mi	ta	ke	di	mi	ta	ke	di	mi	**ta**	**di**
ghi	**na**	**ton**	ta	ke	di	mi	ta	ke	di	mi	**ta**	**di**	**ghi**	na	ton

Example 5a
Solkattu-based rhythmic displacement exercise (Sankaran, 2010).
The beats can be counted using a clap-wave system common in Carnatic music.

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24   Syncopations derive their affective or emotive power in how they play with our sense of time—Maria Witek's (2016) work aptly displays this through her triangulated theory of groove involving rhythm, embodiment, and derived pleasure. Witek invites us to think of syncopation in the *kennen* domain—how it *feels* to experience syncopation on the dance floor. This notion complements the *können*-based exercises presented here.

1				2				3				4			
ta				ta				ta				ta	di	ghi	na
ton	ta				ta				ta				ta	di	ghi
na	ton	ta				ta				ta				ta	di
ghi	na	ton	ta				ta				ta	di	ghi	na	ton

Example 5b
Continuation of sequence with intervening syllables dropped (Sankaran, 2010).

Using solkattu as a learning tool in the theory classroom engenders feelings of satisfaction and accomplishment in students. There is a palpable joy in being able to master the above exercises. Furthermore, there is already evidence that application of solkattu has more wide-ranging potential in music theory education. Rafael Reina, Jos Zwaanenburg, Jonas Bisquert, and David de Marez Oyens at the Conservatorium van Amsterdam have developed a solkattu-based curriculum for advanced rhythm analysis in contemporary and other musics but it is, at present, not integrated into the Conservatorium's general theory curriculum.[25] And Richard Hoffman and his colleagues have championed the *takadimi* system for rhythm training, scalable for use anywhere from primary school to college theory or aural skills courses.[26] Whatever the source and method, introducing solkattu early in an undergraduate theory curriculum offers students a common language to analyze rhythms of any musical genre. Solkattu can be then applied at will throughout the course sequence, offering a practice-based experiential learning environment and empowering students to apply a learned skill in a variety of musical contexts.

Case Study 3: Performing Complex Rhythm

While the first two case studies focused on non-Western musical traditions and an application of their principles of practice to Western repertoire, the third case study involves contemporary Western art music. Rhythm has served as a primary frontier of exploration in 20th and 21st century composition; this is not to say that it is any

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25   See Reina (2015) for a complete overview of how the author applies solkattu to the analysis and performance of complex rhythms in post-tonal music.

26   See Hoffman, Pelto, and White (1996). The *takadimi* system extracts various syllabifications from both North- and South-Indian rhythmic traditions and "provides tools for unraveling and simplifying the complexities of the notation and promotes the execution of the rhythm in a highly accurate and musical fashion" (28). As such, this system is not strictly solkattu-based.

more important to composers of these centuries than it was in others but rather that its musical function has begun to supersede melody and harmony in importance. One such composer for whom this can be argued is Brian Ferneyhough. Known as a chief exponent of the so-called *new complexity* aesthetic, Ferneyhough's works are famous for their impenetrable rhythms and polyrhythms. But studying them, learning them, and attempting to perform them gives students a chance to better understand their nuance, and explore students' own rhythmic confidence.

In teaching complex rhythm to theory students, I use Ine Vanoeveren's presentation of "lollipop" and proportional notation described in her textbook *Tomorrow's Music Today* (2018). Lollipop and proportional notation are strategies for representing complex rhythms and polyrhythms so they are more clearly and accurately legible, and ultimately, more easily performable. Many of the examples Vanoeveren details could also be approached using principles of Solkattu as described above. I relay lollipop/proportional notation here as an alternative approach; one that prioritizes visual information usefully for situations of extreme rhythmic complexity. Example 6a shows a seven-against-five polyrhythm in 3/4 time. This notation is not particularly useful for performers wishing to execute the passage accurately. Lollipop notation is generated by representing each rhythm so it is easily legible in the subdivision structure of the 3/4 meter (Example 6b). True proportional notation would involve graphically representing this polyrhythm in a system that uses a common sub-tactus denominator for each rhythm (Example 6c). In this case, with a septuplet and quintuplet, the lowest common denominator would be 35 (not shown). By consequence, proportional notation would mean dividing each quarter note into 35 subdivisions, to represent each rhythm in the same system. Such precision is only useful as a practice waypoint—slowing down the excerpt and counting it in 35 is laborious but enables something of a precise embodiment of the rhythmic relationship between the two voices. Finally, the passage can be sped up and performed (with the understanding that a student's gestural embodiment of the rhythms will change as they are performed at progressively faster tempi) beginning with a rendering that preserves the graphic representation made possible by the 35-fold subdivision and arriving at the example notated again in 3/4 (Example 6d).
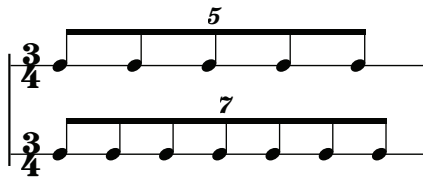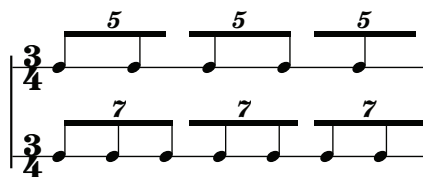
Example 6a
Seven-against-five polyrhythm in 3/4 time.
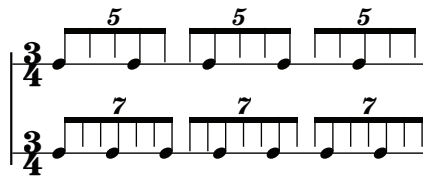
Example 6b
Lollipop notation of the polyrhythm.

Example 6c
Reduction of proportional notation (graphic approximation).

Example 6d
Re-notated in 3/4 time.

This procedure of rhythmic re-representation is especially helpful for the complex rhythms found in Ferneyhough's music. I have students draw, at random, a measure from the composer's 1992 work *Bone Alphabet*, a percussion solo composed for Steven Schick.[27] Students are tasked with rewriting this measure in lollipop and proportional

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27   I first performed this assignment as a student, albeit without explicit recourse to lollipop notation, in a seminar taught by Aiyun Huang, a former student of Schick's.

notation, learning it to the best of their ability, and submitting as a recording their attempt at performing it, along with a brief verbal reflection of their process. Example 7a details one such measure, followed by an excerpt of a student's rough work using proportional notation (Example 7b). The top part of the student's work illustrates their understanding of the nested 7:6 rhythms in the top voice of the notated measure. The student's first system (A) plots out where the beats of the 7:6 polyrhythm would fall, and below this (B) where the beats of the nested 7:6 polyrhythm would fall—these are the actual attacks played by the performer. (Note that the student's subdivisions in line (B) are seven in the space of six.) Ideally this work would be done with a ruler on graph paper to ensure accuracy, but this student is, in effect, using proportional notation to plot these rhythms. After also plotting the lower line's rhythms (C), the student rationalizes these at the bottom of the page (D), where the passage is re-plotted in a 7/8 measure. There are a few errors in the final plotting, but evidence of the student using proportional notation is abundant.

The Kolbs (2005) suggest that learning models should be organized to facilitate knowledge transfer and application to other contexts. This case study demonstrates such knowledge transfer and resolves any apprehension about assigning repertoire / rhythmic content that might seem beyond students' ability, or worse, irrelevant to their education. The goal is not necessarily for students to appreciate the complexity of Ferneyhough's music, nor is it for them to master the demanding rhythms therein. In my experience, having also completed a version of this assignment as a student, students rarely perform their measures accurately (if memory serves, I also did not), and never at tempo, but the important thing here is the process—students are thinking deeply about the *how*, not only the *that*, and they are reflecting on what they tried to do in their reflection.[28] They know *that* it is difficult, just as much as they know *that* in this excerpt, septuplets across six eighth notes interact with three groups of four-against-three polyrhythms. But thinking about the *how* engages them with a learning strategy that can be applied to other repertoire, giving them a transferrable skill, and encouraging them to understand rhythm as a broad phenomenon across repertoires, rather than one particular to a specific work or style. Furthermore, mandating a post-performance reflection from students on this process provides further insight into their process, and in my experience, reveals a diligence and attention to detail that some students might not be compelled—or capable—to pursue in written-only work.

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28   If, however, one wishes to run a similar assignment to this one where mastering the excerpt is the desired goal, easier excerpts—not necessarily from pieces by Ferneyhough—could be used.
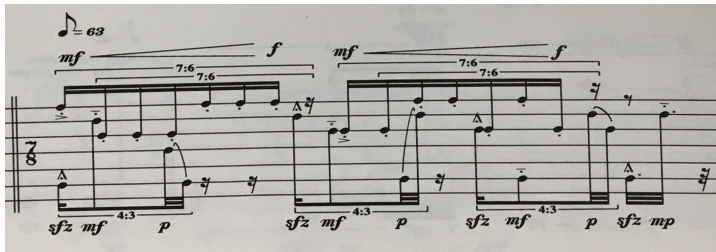
Example 7a
Excerpt of *Bone Alphabet* (Ferneyhough, 1992)

Example 7b
Student's rough work (used with permission)

### Case Study 4: Rhythm and Hip-Hop Beat Creation

The final two case studies focus on hip-hop music. In hip-hop terminology, the beat commonly refers to the instrumental, sampled, or synthesized elements that together support the main vocalizing (rapping, singing, chanting, and ad-libbing), commonly known as the *flow*. Though hip-hop music originated, and is largely practiced, without any formal use of music notation, technological and performative evolutions in the genre inform the way musical time is conceptualized. Early hip-hop beats were created with turntables, where producers (then known as DJs) looped breakbeats—drums-only sections of 1960s and 1970s soul and funk songs—to create a constant, cyclical rhythmic base. By the 1980s, however, producers had the technological means to sample single drum hits and build their own beats using sequencers—digital tools that organize and playback sounds in a looped arrangement. These earliest sequencers, such as the Akai MPC60, displayed limited visual information. But as technology improved, sequencers were introduced as computer software applications.

Nowadays, powerful sequencers are accessible, online, and quite often free; this makes them potent tools for creative assignments involving rhythm. One such application is the online software *Patternsketch*, a versatile, free, and accessible beat creation tool that also allows users to save their work (ideal for student assignments). Like musical scores, today's drum sequencers represent time horizontally and orchestration vertically, but unlike musical notation, sequencers use a grid-like sequence of "steps" (sub-tactus pulses) to plot rhythmic patterns. As shown in Example 8a, Patternsketch's interface is oriented like many other sequencers: time is measured from left to right, and the available sound options are organized vertically. Users can change the drum kit, adjust tempo, step quantity (up to four measures of 16 steps), and shuffle ratio (the degree of swing the beat expresses). The interface, in short, is easy to learn and quite versatile considering its cost-free accessibility.

While the previous case studies have foregrounded how students can intersect theoretical, *wissen* knowledge with performance-based, *können*, knowledge, hip-hop music presents a different angle to this intersection. Undergraduate music students studying a Western art music curriculum are unlikely to have the ability, confidence, or interest to perform hip-hop music in class (this also risks being culturally problematic), but *können* knowledge here can assume an equally creative form—recomposition—and can lead to non-musical performative learning outputs as described below. Students can cultivate skills in transcription and use software like Patternsketch to, as Kolb puts it, "put out an expression of what is learned" (208) through recomposition or recreation of drumbeats lifted from real songs in the hip-hop repertoire. It should be

noted that analyzing popular music in the music theory discipline often requires some familiarity with transcription, and this case study assumes some familiarity with drum notation, basic components of the drum kit, and general facility with transcriptions of rhythmic patterns. Resources for drumkit instrumentation and notation are widely available online.[29]

After introducing Patternsketch to students, an assignment plan can proceed as follows. Students are assigned a hip-hop song—a list of songs with relatively straightforward drumbeats has been included in Example 8b. They identify the mensural length of the looped drumbeat in their song, which they transcribe by plotting it as a step grid (like Patternsketch's interface) on graph paper. The beat for the song "Shook Ones, Part II" (Mobb Deep, 1995) has been recreated in Example 8a. Students can then orchestrate this beat on Patternsketch, with the goal of having it sound as close to the original as possible. This may involve selecting the most appropriate drum kit from the ones available, or slightly adjusting the mix levels, or the shuffle function. In so doing, students are not only approaching this topic from a theoretical angle—they learn about rhythm, meter, and timbre—but they also gain valuable transcription skills and explore their creativity in reorchestrating the beat on Patternsketch. Students are thus again intersecting *wissen* and *können* knowledge. Most importantly, they are approaching the analysis of hip-hop music by considering its creation, or manifestation in practice.
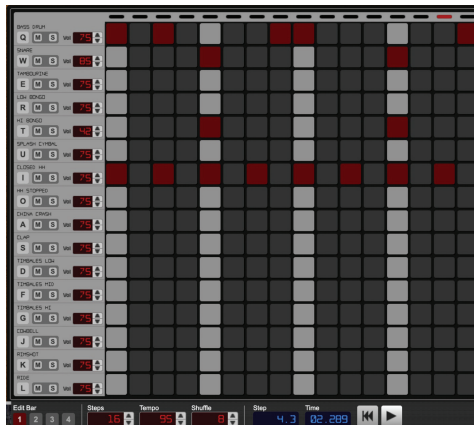
Example 8a
Screenshot of Patternsketch, a free, online drum sequencer, showing a rudimentary transcription and orchestration of the drumbeat from "Shook Ones, Part II" (Mobb Deep, 1995).

29   See for example Thompson (undated), Brown and Ley (2014–2023), and Audio Graffiti (undated).

The attacks on the "hi bongo" are included as an attempt to match the timbre of the snare drum in the original song, as the available snare drum on this drumkit setting is substantially lower pitched.

"South Bronx" (Boogie Down Productions, 1987)
"The Bridge" (MC Shan, 1986)
"Paper Thin" (MC Lyte, 1988)
"Can I Kick It?" (A Tribe Called Quest, 1990)
"The Choice is Yours" (Black Sheep, 1991)
"U.N.I.T.Y." (Queen Latifah, 1993)
"Slow Down" (Brand Nubian, 1990)
"It Ain't Hard to Tell" (Nas, 1994)
"OPP" (Naughty By Nature, 1991)
"Juicy" (The Notorious B.I.G., 1994)
"Shoop" (Salt-n-Pepa, 1991)
"Rock The Bells" (LL Cool J, 1985)
"Ego Trippin'" (Ultramagnetic MCs, 1988)

Example 8b
Songs with relatively straightforward drumbeats that
can be used for the beat mockup assignment.

Case Study 5: Segmentation, Phrasing, and Hip-Hop Flow

The final case study concerns hip-hop flow. Flow is also occasionally conceived by its creators in grid formation; the MC Rakim, for example, uses a bespoke system of dots and lines to plan out his flow rhythms, and many others graphically position rhymes in a grid-like manner when composing their verses.[30] A formalized version of this grid-like system is often used in transcriptions by journalists and researchers and can be a powerful visual tool in pedagogy.[31] Example 9 shows how grid notation can incorporate both beat and flow, again using "Shook Ones, Part II." The count and sixteenth-note subdivision for a basic 4/4 measure is displayed across the top of the grid with a common short-hand notation: *1-e-and-a*, etc. Since hip-hop songs normally involve a constant, cyclical metric structure (see above), successive "measures" of flow can be notated below one another as done here.[32] The drumbeat, which might

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30   See Marrow and Baybutt (2012). In Rakim's interview in this film, he describes and shows his flow notation system.

31   Adams (2008) illustrates an early example of using grid notation to notate flow rhythms, based on the pioneering work done by Adam Krims (2000).

32   MCs often discuss formal organization of their flow in terms of "bars." See especially Edwards (2009).

58   Journal of Music Theory Pedagogy Volume 37 (2023)

1	e	+	a	2	e	+	a	3	e	+	a	4	e	+	a
Flow															
													I	got	you
stuck	off		the	real-		ness			we	be	the	in-	fa-	mous	you
heard	of	us			of-	fi-	cial	Queens-		bridge		mur-	der-	ers	the
Mobb	comes	e-	quipped			for	war	fare		be-	ware			of	my
crime	fa-	mi-	ly	who	got	'nough		shots		to	share				
Beat															
HH		HH		HH		HH		HH		HH		HH		HH	
				SD								SD			
Kick		Kick					Kick	Kick							Kick

Example 9
Lyrics (as printed on genius.com) and grid-notated transcription
of an excerpt of "Shook Ones" (Mobb Deep, 1995).

loop in one or two measure iterations, can be shown once below the flow.[33] Here I have shown only the patterning of the kick, snare, and hi-hats.

    In cultivating flow styles unique to them, MCs (rappers) use rhyme, rhetoric, syntax, rhythm, meter, articulation, pitch, and breathing to organize their rapped lyrics. Mitchell Ohriner (2016) and I (Duinker, 2021) have noted that rhyme, syntax, and breathing are usually the most prevalent markers of such organization, with Ohriner suggesting that each of these markers on their own would generate different segmentations of the same passage of flow (158) and my own work applying segmentation analysis to matters of phrasing in flow.[34] "Shook Ones, Part II" presents a clear example of how segmentation and phrasing analysis can be used in the classroom.

    Students are given the lyrics shown in Example 10a, which open the first verse of the song, rapped by Mobb Deep member Prodigy (b. Albert Johnson, 1974–2017). The lyrics here are formatted as they appear on the open-source lyric annotation website genius.com, which loosely, though by no means rigidly, organizes lyrics according to the measure (in this context the looped 4/4 drumbeat) in which they are rapped. Students' first task involves identifying all the rhyming syllables and syntactic breaks in the verse. As Examples 10a and b suggest, we can see right away that these lines

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33   If the drumbeat forms a two-measure loop, two grid rows may be used to represent it.

34   I have proposed that MCs' organization of flow into phrases can be understood in five contexts: rhyme type (end v. internal), rhyme quantity (couplet v. chain), syntax, breathing, and rhythmic disruptions and groupings (Duinker, 2021).

are punctuated (and thus segmented) by end rhyme, while some joined by syntax. For example, lines 3 & 4 can be read as a complete two-part sentence: "The Mobb comes equipped for warfare/beware of my crime family who got 'nough shots to share." But here the rhyme suggests a different segmentation than the syntax: the line breaks after "beware," while the internal syntactic break arrives after "warfare"—this indeed reflects how it is performed in the song. The first two lines project even more nuance. First, the rhymed syllables are all embedded in the second line only: on "heard of us" and "murderers." Second, the syntax is also complex. The "you heard of us" might be read as a syntactic interruption: "We be the infamous (you heard of us) official Queensbridge murderers."

1.   "I got you stuck off the realness, we be the infamous

2.   You **heard of us**, official Queensbridge **murderers**

3.   The Mobb comes equipped for war**fare**, be**ware**

4.   Of my crime family who got 'nough shots to **share**"

Example 10a
Lyrics (per genius.com) excerpted first verse of "Shook Ones, Part II." Rhymes are bolded.

1.   "I got you stuck off the realness, we be the infamous (you heard of us) official Queensbridge murderers

2.   The Mobb comes equipped for warfare; beware of my crime family who got 'nough shots to share"

Example 10b
Same lyrics, organized by syntactic structure.

Students are tasked with evaluating the rhyme and syntactical structure of the lyrics by rewriting them according to syntactic structure, which might look as shown in Example 10b. Using grid notation, they then transcribe the lyrics as Mobb Deep performs them, shown in Example 11.[35] This work step may take some time, especially if students are unfamiliar with transcription, but introducing this activity/assignment after having built the beat for "Shook Ones, Part II" in Patternsketch might help, because then students have familiarized themselves with the metric structure of this song. Once the transcription is complete, students annotate rhymes, syntactic breaks, and breath points (if audible) right on their notation, using any sort of consistent

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35   Students could also be instructed to situate the lyrics graphically according to their performance in time, following the work of John J. Mattessich (2019, specifically Example 3).

1	e	+	a	2	e	+	a	3	e	+	a	4	e	+	a
													I	got	you
stuck	off		the	real-		ness		we	be	the	in-	fa-	mous	you	
heard	of		us		of-	fi-	cial	Queens-		bridge		mur-	der-	ers		the
Mobb		comes	e-	quipped		for	war		fare		be-	ware		of	my
crime		fa-	mi-	ly	who	got	'nough		shots		to	share			

Example 11
Lyrics (as organized on genius.com) and grid-notated
transcription of an excerpt of "Shook Ones" (Mobb Deep, 1995).

annotation system. In the annotations used here, the shaded boxes indicate related rhymes and the vertical lines indicate syntactic breaks.

So far, this case study has resided primarily in the *wissen* domain and could easily remain there and still constitute an effective and engaging approach to rhythmic analysis in hip-hop music.[36] But several intersections with *können* knowledge are possible. I find the most effective means to ensure transcription accuracy is to try privately performing the transcription as notated to see if it a) matches what we hear, and b) matches what we feel, when we listen to the recording. The hearing element here is self-evident; if one vocalizes or taps their transcription along with Prodigy as he raps, they will hear whether they made any mistakes. But the feeling is more nuanced and highly personal. For me, syncopated passages like '*nough shots to share* have a specific feel to them if I vocalize along with the recording; that feeling does not transfer when I vocalize the rhythms incorrectly (this sensation is much more pronounced in passages with more complex rhythmic and syncopation structure).[37] Students could also try recomposing this passage, using their understanding of syntax, rhyme, and meter to propose alternate flow rhythms. Simple recomposition exercises like these give students an embodied sense of rhythm and its connection to speech and music; they understand on a deeper level what feels "right" and "wrong" in flow, and

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36   For example, students could use their multi-parameter analysis of the flow surface to develop a phrasal analysis of the excerpt. What constitutes a musical phrase in hip hop? Surely some element of initiation, continuation, and conclusion, and the way these phenomena play with listener expectation, would figure here. Any discussion of phrases might also involve consideration of the song's beat, and the Patternsketch assignment could be combined with this flow analytical work.

37   With these suggestions I do not mean to imply that students perform recomposed raps in class, or even for assessment. Any vocalizing students do is done privately as a personal engagement with one's own analytical work. Reflections on vocalizing, however, are a valuable part of this process, and students can be prompted to reflect on their experiments performing their transcriptions and recompositions.

why it feels that way. This knowledge is difficult to acquire without doing.

A more substantial performative extension of both the Patternsketch and flow-grid case studies involves students applying their knowledge—at this point a blend of *wissen*, *kennen*, and *können*—in a group project that mimics copyright lawsuit proceedings. Musical borrowing has been an important stylistic feature of hip-hop music since its nascency, and numerous copyright lawsuits have plagued many of the genre's top MCs, record companies, and producers. These lawsuits often involve the plaintiff accusing the defendant of replicating a riff, timbre, sample, or rhythm without permission. Forensic musicologists are often called as expert witnesses in these suits, and as such, sharp critical listening and analytical skills often influence the legal outcome. A mock legal proceeding in the classroom allows students to "lawyer up," serving in small groups (legal teams) that argue real-life copyright cases as plaintiffs or defendants. Students are required to analyze the song(s) in question, assess their purported similarity in the eye of copyright law, and argue their assigned position (plaintiff or defendant). The concept for this group project was designed by Claire McLeish, and together we administered its first iteration in the classroom in 2019. In a class filled with students who were not music majors, we were stunned at their ability to cogently argue complex analyses within an imposed time limit—many of them knew very little about music theory at the beginning of the semester.[38] These students had mobilized their analytical, *wissen* knowledge of rhythm into a performative, rhetorical, *können* domain. They were putting out an expression of what was learned. Taken as a whole, the complex rhythmic surface of hip hop beats and flow performances provides rich fodder for close readings of rhythm in the music theory classroom and their application beyond *wissen*-gaining analysis.

Conclusion

Using performance and analysis together—more specifically, the dialogue between *wissen* and *können* knowledge—as a common plane for experiential learning of rhythm provides a path around any issues of continuity in rhythm pedagogy. Students know *that* rhythmic durations mean something in a certain tempo and metric structure, and *that* these durations interact with one another in an ostensibly systematic way (allowing, of course, for performance-based timing idiosyncrasies). But thinking about

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how these meanings and interactions sound, and about how performers bring them into sound, and about how slippery this task can be in its organicity and flexibility, invites students to form a deeper connection with rhythm.

I have summarized five pedagogical case studies that encourage experiential learning of rhythm and engage Leong's three ways of knowing: *wissen*, *kennen*, and *können*. This approach contrasts with the largely *wissen*-based knowledge acquisition that commonly occurs in the theory classroom. The repertoire in these case studies is all traditionally peripheral to undergraduate theory course sequences: contemporary art music, non-Western music, and hip-hop music. As I have endeavored to argue here, rhythm, experiential learning, and non-canonical musical repertoires can intersect in compelling ways in the theory classroom, creating meaningful learning experiences for students. To give just a bit of tangible evidence of this: when I first worked with students on downbeat migration in Reich's *Clapping Music*, very few could make it through a memorized performance of the piece, even in a group performance setting where I helped them along. The experience witnessing their initial struggles made the smiling looks of satisfaction on their faces upon completing a solo, memorized performance for graded assessment, even more meaningful. Some students reported having practiced the piece 30 times before feeling confident enough to record and submit it for grading. This type of repetitive, experiential skill acquisition is the common thread uniting the musical cultures I have discussed here, whether they stem from Africa, India, or North America.

I began this article by identifying a gap between the content of undergraduate theory curricula and undergraduate students' professed vocations, supported by statistics from two institutions where I presently or have recently taught. In conclusion, I wish to address one potential criticism of this rationale: that there is simply less need for integrating theory and practice in undergraduate music education than I argue for here. The presence of such publications as *Engaging Students* suggests an appeal for developing pedagogical practices that increase student engagement and maximize their retention of material.[39] I argue here that one way of achieving these goals is by orienting theory pedagogy to serve students' practical pursuits. By doing so, I do not believe that this should be the *only* goal of students' education. But in an environment where students actively question the utility of their theory education, in its relevance both to their performance practice and in a world increasingly aware of issues of marginalization, the appeal of incorporating experiential learning and non-canonical repertoire is perhaps greater now than ever before. I hope to have

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39   See www.flipcamp.org and https://engagingstudentsmusic.org/.

highlighted that appeal through these case studies, proposing ways for performance issues, rhythm, and music traditions exterior to the Western art music canon to permeate undergraduate theory pedagogy, empowering students and broadening their appreciation for diverse ways of learning, and ultimately, knowing.

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66   Journal of Music Theory Pedagogy Volume 37 (2023)