Journal of Music Theory Pedagogy

Volume 25 Article 5

1-1-2011

A Revised Taxonomy for Music Learning

Deborah Rifkin

Philip Stoecker

A Revised Taxonomy for Music Learning

Deborah Rifkin and Philip Stoecker

Introduction

Among college music teachers, it is commonly lamented that ear-training skills develop more slowly than other kinds of musical knowledge, such as written theory skills. Informally, the "ear" develops more slowly than the "mind." Intrigued by this phenomenon, which suggests that the learning process for aural skills could be different compared to other types of knowledge, we have evaluated our students and our own pedagogy for years with the intent of developing a learning taxonomy for aural development. That is, we sought adaptations that catered specifically to music learning by accommodating the time-sensitive nature of performed arts, rather than the more spatial emphasis that we believe persists with most prior learning theories. This article has two goals: the first goal is to present our revised taxonomy of learning for music classes; the second goal is to demonstrate how our taxonomy can be used to design classroom activities for both tonal and atonal aural skills courses.

A learning taxonomy classifies learning objectives and identifies different levels of learning, which are typically arranged from low-order objectives on the bottom to higher ones at the top. Why develop a new learning taxonomy? It can help a teacher design effective lesson plans and coursework, and it can also inform decisions about better ways to evaluate and assess student learning. One thing that differentiates a good aural-skills teacher from an excellent one is the ability to diagnose a problem in class and improvise an impromptu exercise to address it. A learning taxonomy can help a teacher with this formidable task because it provides categories for types of problems and a framework for advancing learning. A learning taxonomy can also help students by making them self-aware of their own learning process. For example, when a student comes to our office hours for a problem they are having in an aural skills course, it is not uncommon for them to begin the conversation with a self-assessment of the challenge, including which stage of the taxonomy they believe it resides in. This kind of introspection makes it easier for them to self-diagnose and to come up with their own strategies for success.

Although there have been some notable exceptions in the last few years, aural skills pedagogy has been a woefully neglected area of study in modern American colleges, universities, and conservatories. Consider the question: how many music theory textbooks can you name? Now, how many aural skills textbooks? Do you consider the books you named for aural skills as actual textbooks? Some of the most widely used aural skills texts—e.g., Ottman and Roger's *Music for Sight-Singing*—are essentially anthologies.[1] Although there is a pedagogical impetus behind the organization and chronology of excerpts within these texts, the guidance is hidden—implicit, rather than explicit. With the rise of comprehensive musicianship curricula, recent college textbooks take a more integrative approach, providing more structured guidance on aural skills development within theory courses.[2] Our taxonomy is intended as a continuing step toward a pedagogical method for an essential, yet elusive, part of every musician's undergraduate experience—ear training.[3]

---

[1] Robert W. Ottman and Nancy Rogers, *Music for Sight Singing*, 8th ed. (Upper Saddle River, NJ: Prentice Hall, 2010); Gary Karpinski and Richard Kram, *Anthology for Sight Singing* (New York: W.W. Norton, 2007); Thomas Benjamin, Michael M. Horvit, and Robert Nelson, *Music for Sight Singing*, 4th ed. (Belmont, CA: Thomson/Schirmer, 2005); Bruce Benward and Maureen A. Carr, *Sightsinging Complete*, 7th ed. (Boston, MA: McGraw-Hill, 2006); Sol Berkowitz, Gabriel Fontrier, and Leo Kraft, *A New Approach to Sight Singing*, 5th ed. (New York: W.W. Norton, 2011); David Damschroder, *Listen and Sing: Lessons in Ear-Training and Sight-Singing* (New York: Schirmer Books, 1995).

[2] Steven G. Laitz, *The Complete Musician: An Integrated Approach to Tonal Theory, Analysis, and Listening*, 3rd ed. (New York: Oxford University Press, 2011); Jane Piper Clendinning and Elizabeth West Marvin, *The Musician's Guide to Theory and Analysis* (New York: W.W. Norton, 2nd ed., 2010); Michael R. Rogers discusses the advantages and disadvantages to integrated approaches to theory and aural skills. See the second chapter ("Philosophical Orientations," pp. 15–30) of Michael R. Rogers, *Teaching Approaches in Music Theory: An Overview of Pedagogical Philosophies*, 2nd ed. (Carbondale: Southern Illinois University Press, 2004). In this chapter he discusses the strengths and weaknesses of the comprehensive musicianship approach to teaching.

[3] Although we use the word ear training, other terms that could be used interchangeably include aural skills, sight singing, and musicianship.

In 2000, Gary Karpinski published a seminal guide entitled *Aural Skills Acquisition: The Development of Listening, Reading, and Performing Skills in College-Level Musicians.*[4] This book launched aural skills pedagogy to new heights by basing its recommendations on experimental studies in music cognition and perception. His central tenet, grounding aural skills pedagogy with our knowledge of perception and cognition, has been the driving force behind our taxonomy. A few years later, Karpinski published a *Manual for Ear Training and Sight Singing*, which is an aural skills textbook designed according to the research, techniques and philosophies in his first book.[5] This resource demonstrates how to incorporate the abstract principles of *Aural Skills Acquisition* into pedagogical practice. The text is comprehensive, but also linear in its design, which makes it somewhat challenging to use if your school does not adopt the curriculum wholesale.[6] Our taxonomy provides a generalized learning theory based upon Karpinski's recommended techniques. In other words, it provides a framework for designing and implementing best practices in aural skills pedagogy that can be adopted to suit any curricular needs. With the aid of our taxonomy, teachers can develop their own teaching strategies geared for their specific students. In the following paragraphs, we will introduce our taxonomy, comparing it to prior learning taxonomies and describing the evidence-based cognition studies that inspired our revisions for music learning.

---

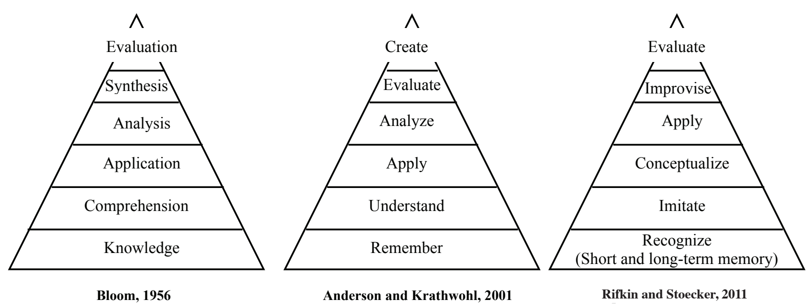
[4] Gary Karpinski, *Aural Skills Acquisition: The Development of Listening, Reading, and Performing Skills in College-Level Musicians* (New York: Oxford University Press, 2000).

[5] Gary Karpinski, *Manual for Ear Training and Sight Singing* (New York: W.W. Norton, 2007).

[6] For instance, Karpinski's text assumes a four-semester tonal sequence, yet many schools use a three-semester tonal sequence with the fourth semester devoted to atonal music.

Taxonomies

In 1956, Benjamin Bloom edited a handbook titled *Taxonomy of Educational Objectives: The Classification of Educational Goals*, which became a seminal document for assessing pedagogical efficacy.[7] In the original conception of the taxonomy, Bloom identified three domains: cognitive (i.e., mental skills), affective (i.e., emotional areas), and psychomotor (i.e., physical skills). Beginning with the cognitive domain, Bloom provided a list of educational objectives or goals followed by a later publication of the educational goals for the affective domain.[8] Taxonomies for the psychomotor domain were completed by other scholars.[9]



Example 1. Comparison of Learning Taxonomies

Our interest is in Bloom's taxonomy for the cognitive domain. As shown in Example 1, Bloom identified a sequence of six cognitive

---

[7] Benjamin S. Bloom, *Taxonomy of Educational Objectives: The Classification of Educational Goals*, 1st ed. (New York: Longmans, Green, 1956).

[8] Benjamin Bloom, Anderson Krathwohl, and Bertram Masia, eds., *Taxonomy of Educational Objectives: The Affective Domain*, vol. 2 (New York: David McKay, 1964).

[9] Ravindrakumar Dave, "Psychomotor Levels," in *Developing and Writing Behavioral Objectives*, ed. Robert Armstrong (Tucson, AZ: Educational Innovators Press, 1970); Anita Harrow, *A Taxonomy of the Psychomotor Domain: A Guide for Developing Behavioral Objectives* (New York, NY: David McKay, 1972); Elizabeth Simpson, *The Classification of Educational Objectives: The Psychomotor Domain*, vol. 3 (Washington, DC: Gryphon House, 1972).

levels that lead from basic to advanced stages of learning. For Bloom, the beginning stages of learning include *knowledge* (recalling specific bits of information), *comprehension* (understanding the meaning of communicated material), and *application* (the use of learned material in different, concrete situations); his later stages are *analysis* (ability to break down material into its component parts to understand its patterns), *synthesis* (the ability to put parts together to form a new whole), and *evaluation* (the ability to judge the value of a product for a given purpose). Although Bloom's *Taxonomy of Educational Objectives* has been translated into 22 languages and is one of the most widely applied and most often cited references in education, the taxonomy was intended for general, traditional classrooms, not necessarily for the specific needs of music students.

In the past decade, there have been numerous revisions of Bloom's taxonomy based on research in cognitive development and educational psychology. Arguably, the most famous of these is a publication edited by Anderson and Krathwohl (2001), which was the culmination of six years of collaboration between cognitive psychologists, curriculum theorists, instructional researchers, and assessment specialists.[10] The middle column of Example 1 illustrates the changes recommended by Anderson and Krathwhol.[11] One of their most significant revisions is the emphasis on active learning, represented by a switch from nouns, originally listed by Bloom, to verbs in their taxonomy. In addition, Anderson and Krathwohl reverse the order of the last two stages so that *create* becomes the highest learning level above *evaluate*.[12]

In our music taxonomy, shown on the right of Example 1, we have re-ordered and re-named some of Anderson and Krathwohl's learning stages to better represent our understanding of how

---

[10] Lorin W. Anderson and David R. Krathwohl, eds., *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives* (New York: Longman, 2001).

[11] The Anderson and Krathwohl revision had two significant components. The first was to redesign Bloom's original taxonomy; the second was to distinguish between different kinds of knowledge, which they described as factual, conceptual, procedural, and metacognitve. Example 1 only references the first part of Anderson and Krathwohl's revisions.

[12] For an excellent review of Anderson and Krathwohl's revisions of Bloom's taxonomy and its implications for national standards in music education, see Wendell Hanna, "The New Bloom's Taxonomy: Implications for Music Education," *Arts Education Policy Review* 108, no. 4 (2007), 7–16.

information is processed when it is presented aurally. For us, the beginning stages of music learning include *recognize* (remember previous music events), *imitate* (recall and repeat previous music events), and *conceptualize* (analyze and concretize in one's mind); our later stages are *apply* (the use of learned material in different, musical environments and contexts), *improvise* (create music within temporal constraints), and *evaluate* (the ability to judge the value of a product for a given purpose). In each case, our new name for the learning level changes the general verb in Anderson and Krathwohl's taxonomy to a more specific term that accounts for an ephemeral, aural source stimulus. For instance, we have renamed their *remember* stage to *recognize*. When a listener recognizes or recalls that a musical pattern has repeated, this cognitive act is a specialized type of remembering that centralizes the aural event.[13] Our new label emphasizes the idea that there are different types of remembering.[14] We base this revision on experiments that confirm, for example, that the contour of a melody is remembered independently and more accurately than specific pitches.[15] Thus, a contour is recognized, before the pitches of a melody are remembered.

---

[13] Several experiments support the idea that music training affects some kinds of memory and not others. Specifically, studies suggest that musicians have better verbal memory, not visual memory. See, Michael Franklin et al., "The Effects of Musical Training on Verbal Memory," *Psychology of Music* 36, no. 3 (2008), 353–65; Yim-Chi Ho, Mei-Chun Cheung, and Agnes S. Chan, "Music Training Improves Verbal but Not Visual Memory: Cross-Sectional and Longitudinal Explorations in Children," *Neuropsychology* 17, no. 3 (2003), 439–50.

[14] For another implementation of Bloom's taxonomy, see James Caldwell, "Using Bloom's Taxonomy to Develop an Approach to Analysis," *Journal of Music Theory Pedagogy* 3, no. 2 (1989), 223–32. He includes a list of related verbs for each stage. For example, the verbs listed under Bloom's "Knowledge" stage include "list, recall, remember, define, identify, label, [and] recognize."

[15] W. Jay Dowling, "Melodic Contour in Hearing and Remembering Melodies," in *Musical Perceptions*, eds. Rita Aiello and John Sloboda (New York: Oxford University Press, 1994), 173–90; W. Jay Dowling, "Scale and Contour: Two Components of a Theory of Memory for Melodies," *Psychological Review* 85, no. 4 (1978), 341–54.

In addition to modifications at the first level, we have also made changes to higher levels. For example, we have changed Anderson and Krathwohl's *understand* stage to *imitate*. In the earlier study, the *understand* phase includes the ability to classify, identify, or describe events. In music, the main method for classifying, identifying, and describing events is to perform them back, to imitate them. Last, we re-named Anderson and Krathwohl's *create* stage to *improvise*, which is creating music within a time constraint. Our term emphasizes the performance-based context of creating.

One of our significant ordering revisions is shifting the *apply* stage toward a more advanced stage of learning, as a synthesizing level, which is similar to Bloom's original version. This alteration attends to the ephemeral nature of a musical stimulus. *Applying* occurs when a student uses the information in a new way or in a new context. Music students often need some sort of conceptual map, usually a visual or kinesthetic representation before they can apply and synthesize a new musical concept.

To conceptualize a musical event is to analyze it and create a way to concretize it in one's mind.[16] Often, this type of conceptualization is built around musical expectations. In tonal music, pitch expectations are commonly modeled by scale-degree function (e.g., moveable do solfège).[17] Many cognitive studies indicate that expectations play a significant role in musical conceptualization.[18] An especially well-designed experiment was published in 1988 by Yoko Oura and Giyoo Hatano, which not only compares children to young adults, and musically experienced versus inexperienced, but also musical memory versus verbal memory. The study confirmed that knowing what to expect musically was much more important for melody recall than general cognitive development or age.[19]

---

[16] We have not eliminated *analysis/analyze* from our taxonomy but placed it under the umbrella of *conceptualize*.

[17] It is much harder to process, recognize, and recall atonal melodies since musical *expectations* are much less circumscribed.

[18] For a summary of cognitive studies supporting the role of expectation in musical conceptualization, see Lyle Davidson and Patricia Welsh, "From Collections to Structure: The Developmental Path of Tonal Thinking," in *Generative Processes in Music: The Psychology of Performance, Improvisation, and Composition*, ed. John Sloboda (New York: Clarendon Press/Oxford University Press, 1988), 261.

[19] Yoko Oura and Giyoo Hatano, "Memory for Melodies Among

According to Oura and Hatano, grade-school children who had musical experience—years of music study—tended to remember and process melodies better than college-aged students who had considerably better cognitive skills and memory capabilities. Because of studies like this one, we place conceptualization in the middle of our taxonomy; conceptualization affects both low and high stages of learning. Upon reflection, we believe conceptualization plays a role in transferring knowledge from short- to long-term memory. Looking forward, our classroom experience tells us that the mindful mapping of the conceptualize stage needs to happen before a student can "apply" their knowledge to new situations.[20]

Another reason for the centrality of *conceptualization* is that it is the stage that has the most potential for improving real-time sight-singing. When a student sings an unknown pitch pattern, rhythm pattern, or melody for the first time and produces an error, that error can often be corrected by some *conceptual* guidance from the teacher. Indeed, many of the tools used by sight-singing teachers, (e.g., pitch and rhythm solfège, harmonic analysis, registral connection of anchor pitches, resolution patterns, sequential patterns, etc.,) are effective because they encourage some form of conceptual mapping. Often, sight-reading errors can be corrected by simply encouraging an alternate conceptualization of musical events.

Finally, we consider the pinnacle of the learning triangle to be *evaluate*, similar to Bloom's original conception in 1956. We advocate this arrangement because students need to examine and judge their own creative output in order to reinvigorate the learning process for the next learning task. Placing *evaluate* at the top of the taxonomy encourages a circular process in which a student uses the insights from their evaluation stage as the starting point for their next learning objective. In other words, having improvised a musical event a student can advance their learning by identifying its strengths and weaknesses and then *use* these results to inform their next attempt.

Subjects Differing in Age and Experience in Music," *Psychology of Music* 16, no. 2 (1988), 91–109.

[20] For an experimental study that supports a correlation between solfège instruction and successful application in sightreading, see Michele Len Henry, "The Use of Targeted Pitch Skills for Sight-Singing Instruction in the Choral Rehearsal," *Journal of Research in Music Education* 52, no. 3 (2004), 206–17.

Not coincidentally, the reader will notice a strong correspondence between the learning stages of our taxonomy and Karpinski's stages of dictation. Table 1 summarizes the correlations.

Karpinski's Dictation Stages	**Our Corresponding Taxonomy Levels**
Hear	n/a
Remember	Recognize
Understand	Conceptualize
Notate	Apply

Table 1. Correlations between Karpinski's stages of dictation and our stages of learning.[21]

By designing a learning taxonomy similar to Karpinski's outline of the dictation process, we aim to generalize his pedagogical principles so that they can be applied to other pedagogical pursuits in the aural skills classroom.

We end this introduction to our taxonomy with a brief note on implementation. With the immense amount of data confirming the importance of active learning, we retain Anderson and Krathwohl's use of verbs throughout the taxonomy. When using this taxonomy to develop pedagogical strategies, there should be a strong emphasis on active and cooperative learning. We will now turn our discussion to the role of memory in music learning, a topic that motivated our changes to the bottom stages of our learning taxonomy.

The Role of Memory in Music Learning

Karpinksi writes that musical memory seems to be different than other types of brain functions.[22] Similarly, Howard Gardner classifies musical intelligence separately from other kinds of intelligences,[23] and Diana Deutsch has shown that pitch memory

21 Karpinski, *Aural Skills Acquisition*, 62–103.

22 Karpinski, *Aural Skills Acquisition*, 37.

23 Howard Gardner, *Multiple Intelligences: The Theory in Practice* (New York: Basic Books, 1993).

is coded in a nonverbal way.[24] From a neuroscience perspective, Marin and Perry's findings suggest that musical working memory may be a specialized subsystem of general working memory.[25] Our revisions of the learning taxonomy were motivated by the distinctive role memory plays in music learning. Whereas Anderson and Krathwohl describe their first *remember* stage as extracting information from long-term memory, we include short-term memory in our first stage because it is an essential step leading toward long-term memory for musical information perceived in time. As we will demonstrate, memory is *the* primary element of the learning process for music because without it there is no retention of the stimulus. To emphasize the importance of memory for music learning, we have provided three rhythmic excerpts in Example 2. Consider each of the rhythmic patterns and assess how easy or difficult it would be to memorize the pattern from a *heard* stimulus, i.e., without reading notation.

Example 2. Rhythmic patterns

According to George Miller's seminal article in 1956, an average person can retain five to nine discrete items in short-term memory.[26]

---

[24] Diana Deutsch, "Tones and numbers: Specificity of interference in immediate memory," *Science* 168 (1970), 1604–05.

[25] Oscar S. M. Marin and David W. Perry, "Neurological Aspects of Music Perception and Performance," in *The Psychology of Music*, 2nd ed. (San Diego, CA: Academic Press, 1999), 653–724.

[26] George A. Miller, "The Magical Number Seven, Plus or Minus Two:

In the first pattern there are 16 attacks, which is beyond what most can retain in short-term memory. However, one probably would not have trouble remembering what to clap. There might be trouble knowing when to end the pattern, but using Gestalt principles one would probably recognize that there is a very consistent pattern. In fact, every clap lasts the same duration.

The second pattern has more diversity of rhythmic figures and has a higher number of attacks, but it would probably be easier to remember when to end. The differentiation between long and short notes helps a listener segment the pattern into larger chunks. Karpinski names this cognitive task, appropriately enough, *chunking*.[27] Depending how large a chunk one chooses the second pattern could be conceptualized as three repetitions of a six-note pattern or six repetitions of a three-note pattern. In fact, introducing students to *chunking* strategies like this is one way to help students improve their musical memory. The third pattern uses the same rhythmic figures as the second one and has fewer attacks, yet it would probably be harder to memorize. Because the pattern of long and short notes is not consistent, it is harder to chunk the rhythm into a memorable sequence.

This experiment highlights the close association that exists between our *recognize*, *imitate*, and *conceptualize* stages. The conceptual process of *chunking*, which provided a hierarchy of rhythmic proportions and metrical grouping, helped organize musical entities so that they would be easier to recognize and imitate. Similarly, in the pitch realm *melodic anchoring* can work in conjunction with *chunking* to organize sounds into memorable units. *Melodic anchoring* is a conceptualizing activity that processes melodic pitches into hierarchical relationships according to their relative stability, which is assessed by their consonance-dissonance

---

Some Limits on Our Capacity for Processing Information," *Psychological Review* 63 (1956), 81–97.

[27] Karpinski, *Aural Skills Acquisition*, 73–78. Karpinski is not the first to use the term *chunking*. Generally, George Miller is attributed with coining the term in his 1956 article, "The Magical Number Seven." In the 1970s, Herbert Simon and W. Jay Dowland refined the concept through cognitive experiments. Some of their most-often cited references include the following: Herbert Simon, "How Big is a Chunk?" *Science* 183, no. 4124 (1974), 482–88; and, W. Jay Dowling, "Rhythmic Groups and Subjective Chunks in Memory for Melodies," *Perception and Psychophysics* 14 (1973), 37–40.

status, temporal order, and relative duration.[28] In other words, how one conceptualizes a pattern can influence how one imitates and remembers it. And, vice versa: how one retains information in short-term memory can effect how one conceptualizes the pattern.[29] In music learning, we find that our students do not necessarily progress in a linear fashion through the learning stages. Instead, adjacent (and even non-adjacent) stages can affect one another. This association between conceptualization and memory is strengthened by several studies that show that musical context is an important factor for memory.[30] In sum, a conceptual map can be important for promoting long-term memory retention, as well as serving as the foundation for the next learning level—*applying* musical knowledge to new situations and contexts.[31]

---

[28] J. J. Bharucha, "Anchoring Effects in Music: The Resolution of Dissonance," *Cognitive Psychology* 16, no. 4 (1984), 485–518; Bernice Laden, "Melodic Anchoring and Tone Duration," *Music Perception* 12, no. 2 (1994), 199–212.

[29] For experimental support of this claim, see Nancy Rogers, "Solmization Expertise Correlates with Superior Pitch Memory," *Em pauta: Revista do curso de pós-graduação mestrado em música* 18, no. 30 (2007), 131–52.

[30] For a summary of studies showing the effect of context on memory, see Eric G. Freedman, "The Role of Diatonicism in the Abstraction and Representation of Contour and Interval Information," *Music Perception* 16, no. 3 (1999), 365–87; John Sloboda, *The Musical Mind: The Cognitive Psychology of Music* (Oxford: Clarendon Press, 1985); Kathryn M. Dewar, Lola L. Cuddy, and Douglas J. K. Mewhort, "Recognition Memory for Single Tones with and Without Context," *Journal of Experimental Psychology* 3, no. 1 (1977), 60–67; Lola L. Cuddy, Annabel J. Cohen, and Janet Miller, "Melody Recognition: The Experimental Application of Musical Rules," *Canadian Journal of Psychology* 33, no. 3 (1979), 148–57; Carol L. Krumhansl, "The Psychological Representation of Musical Pitch in a Tonal Context," *Cognitive Psychology* 11, no. 3 (1979), 346–74.

[31] One notable study that links conceptualizing processes to knowledge application is Philip A. Fine, Anna Berry, and Burton S. Rosner, "The Effect of Pattern Recognition and Tonal Predictability on Sight-Singing Ability," *Psychology of Music* 34, no. 4 (2006), 431–47.

Melodic Applications of the Taxonomy

The following discussion will demonstrate how our taxonomy provides a pedagogical framework for an activity in an aural skills class. This activity was designed for a first-semester undergraduate course, and the goal of the lesson plan was to provide students with the skills to understand neighbor notes. To achieve this goal the students were given the seven brief pitch patterns, shown in Example 3. Since the learning objective for this exercise focuses on pitch, we have minimized rhythmic considerations by using the same rhythm for every pitch. This activity works best if the last pitch pattern, (e.g., #7 of Example 3) is revealed only at the end of the activity. Each successive melody is slightly different, and through a process of incremental changes the first pitch pattern gradually morphs into a short excerpt from the music literature.[32] As shown in the example, the exercise concludes with a familiar folk tune that consists of various types of neighbor motion—upper, double, and small and large-scale neighbors. To ensure that the students grasp the neighbor concept, the lesson was coordinated to traverse through our taxonomy of learning. Below is a detailed discussion of each pitch pattern of Example 3 and how it relates to our new taxonomy.

<u>Pitch Pattern #1</u>

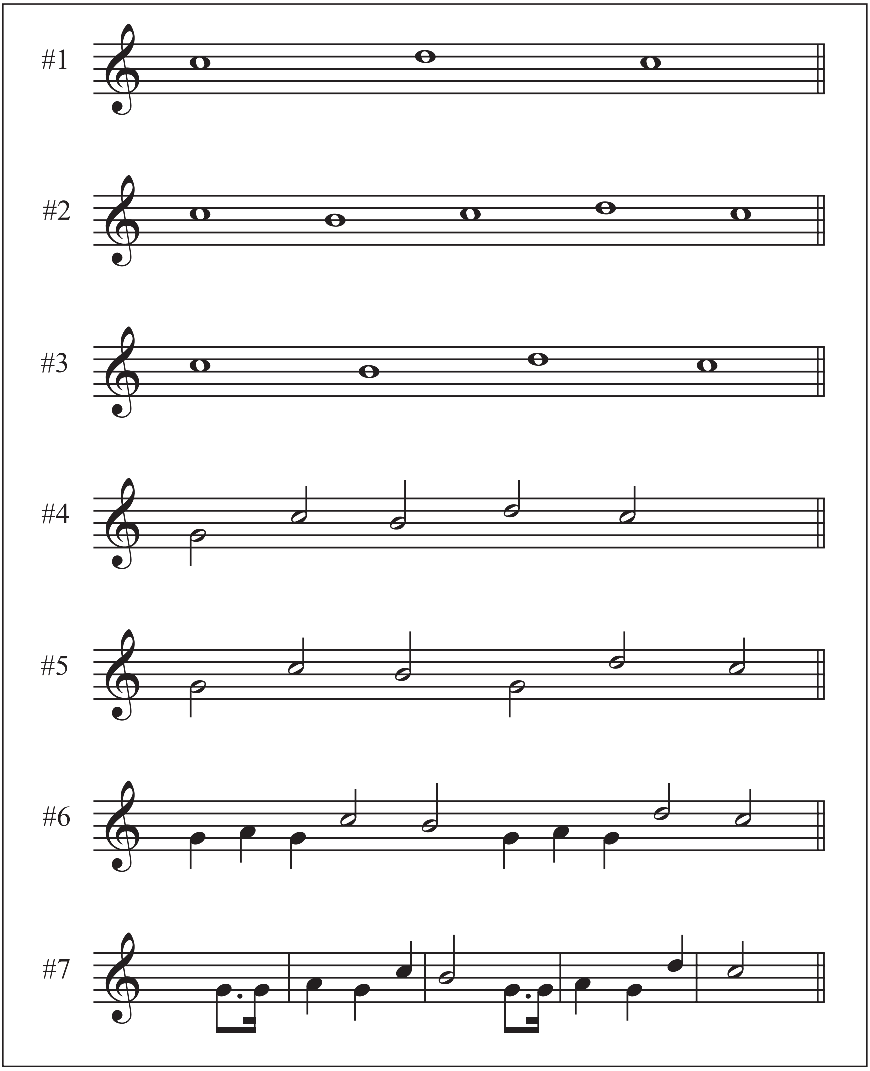
- The first, three-note pitch pattern includes an upper neighbor. We have the students sing this pitch pattern and use this opportunity to define the concept of an upper neighbor note.

<u>Pitch Pattern #2</u>

- The lowest stage of our taxonomy, *recognize*, is invoked when students recognize that the upper neighbor note that they sang from the first pitch pattern is included here.
- *Imitate*, our second stage, occurs when students sing the upper neighbor note, thus imitating the first pitch pattern.

---

[32] Our pitch pattern exercises are similar to David Damschroder's "Quick Switches" in his textbook *Listen and Sing*. Unlike our approach, Damschroder does not end his exercises with music from the literature. Additional differences between our pitch patterns and Damschroder's Quick Switches will become more apparent as our discussion unfolds.



Example 3. Pitch patterns

Pitch Pattern #2 *(continued)*

- *Conceptualize*, our third stage, occurs when students grasp the concept of a neighbor note and then generalize this idea to include lower neighbors. *Conceptualize* occurs when a student analyzes and organizes the musical material in his/her mind. Some students will learn neighbor notes visually by analyzing the notation, taking into consideration the contour, harmony, and meter. Other students may *conceptualize* by listening, singing the neighbor motion, or even using a kinesthetic approach, such as hand gestures, to physically show the neighbor motion.

<u>Pitch Pattern #3</u>

- The lowest stage of our taxonomy is invoked when students recall that both the upper and lower neighbor notes they sang from the first two pitch patterns are also included here.
- Our second stage occurs when students *imitate* and sing the upper and lower neighbor notes.
- *Conceptualize*, our third stage, occurs when students comprehend the concept of a neighbor note and then generalize this idea to establish the double neighbor note that appears in this exercise.

<u>Pitch Pattern #4</u>

- Like the previous pitch patterns *recognize* and *imitate* are invoked here. By introducing the idea of a compound melody, the students must analyze and organize the material on their own, using the best strategy that works for them, such as singing the music, using a visual cue, or a kinesthetic hand gesture to show the different registers.
- Once the students feel comfortable with the idea of a compound melody, we then ask them to transpose this melody to different keys or modes. By asking the students to produce the same melodic shape in a different context—e.g., minor instead of major—they are invoking our *apply* stage.

<u>Pitch Pattern #5</u>

- Again, the lower and middle stages of our taxonomy are invoked here when the students recall previous material.
- Once the students sing this pitch pattern, we then ask them to *improvise* by adding the lower pitch anywhere in this pitch pattern.
- Next, we ask them to *improvise* neighbor notes of their choice—upper, lower, or double—to the pitch in the lower register.

<u>Pitch Pattern #6</u>

- This pitch pattern may resemble an improvisation performed by a student.
- We have added upper neighbors to the lower voice, but the student could have used lower or double neighbors.

Pitch Pattern #7

- The final pitch pattern is the familiar tune "Happy Birthday." Here, students see the context of the resultant pitch pattern in a score from music literature, incorporating other musical parameters such as meter and rhythm. In our exercises, the final pitch pattern will always be a passage of music from the literature or a folk tune, which we reveal only after students have navigated the prior patterns. Ending with an excerpt from the literature is important: it is essential for students to make a connection from the abstract pitch-pattern exercises to real music, and it is crucial for students to realize that an infinite number of melodies can be derived from a few melodic gestures.
- We now ask our students to *evaluate* by comparing their own improvised melodies to the Happy Birthday tune.
- In our taxonomy of learning, *evaluate* is the highest of our learning stages. Once a student performs their improvised melody, they do not walk away. They will *evaluate* by comparing their improvised melody with the folk tune. Some of the questions they may ask themselves during the evaluation stage include: "Did I actually sing neighbor notes?" or "Did I add too many neighbor notes?" or even "That was really cool, how I added a double neighbor that began with the lower neighbor note before I sang the upper neighbor note." And so on.

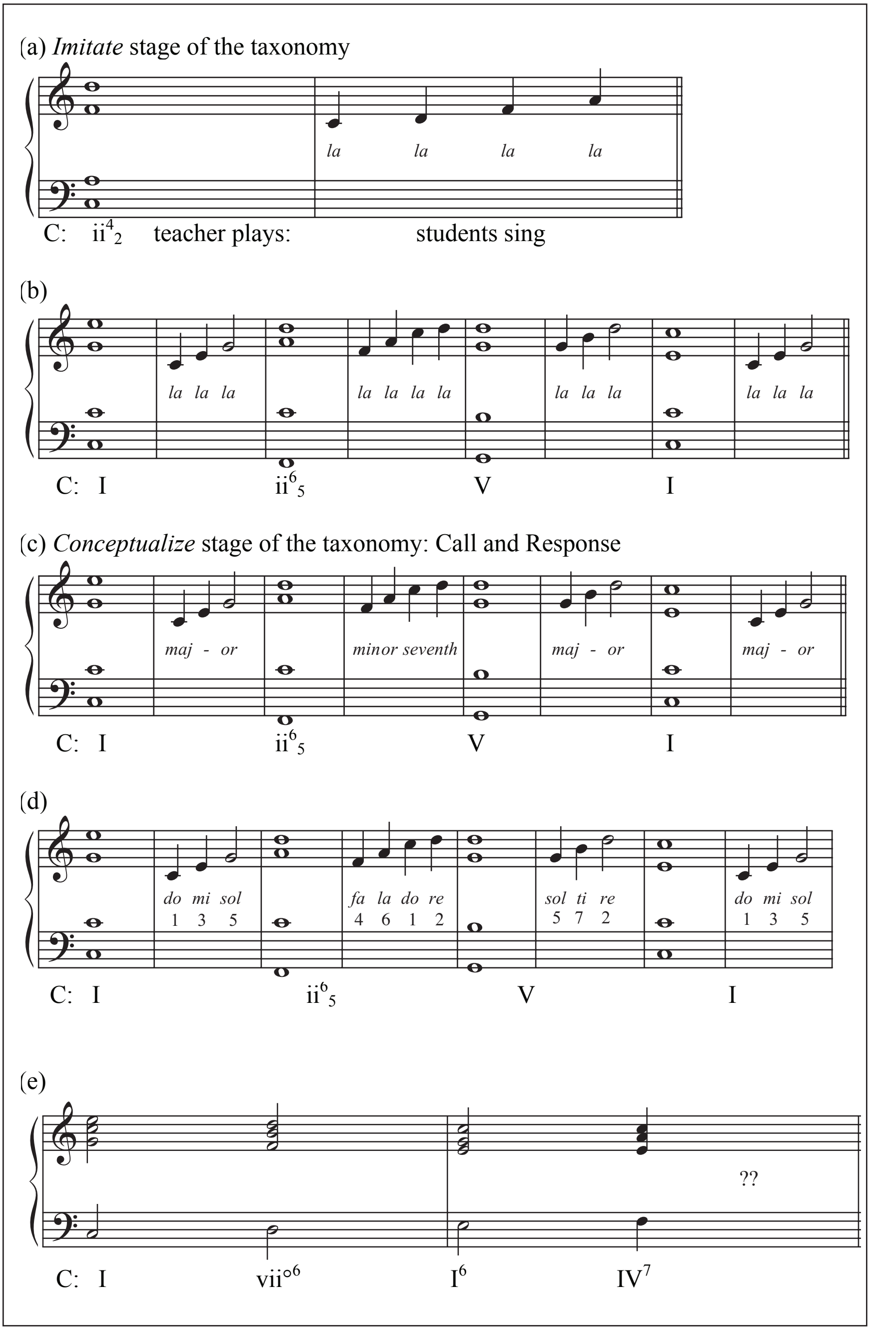
After singing and discussing the pitch patterns and the structure of the folk tune, we provide students with a new pitch pattern, "Twinkle, Twinkle, Little Star." This familiar folk tune includes an upper neighbor note pattern ($\hat{5}$-$\hat{6}$-$\hat{5}$) and contains a new musical device, passing tones. We then ask the students to create their own pitch patterns that they will share with their peers for the next class session. By creating their own pitch patterns, students will *evaluate* their processes, and, as a result, our learning taxonomy begins again.

Harmonic Applications of the Taxonomy

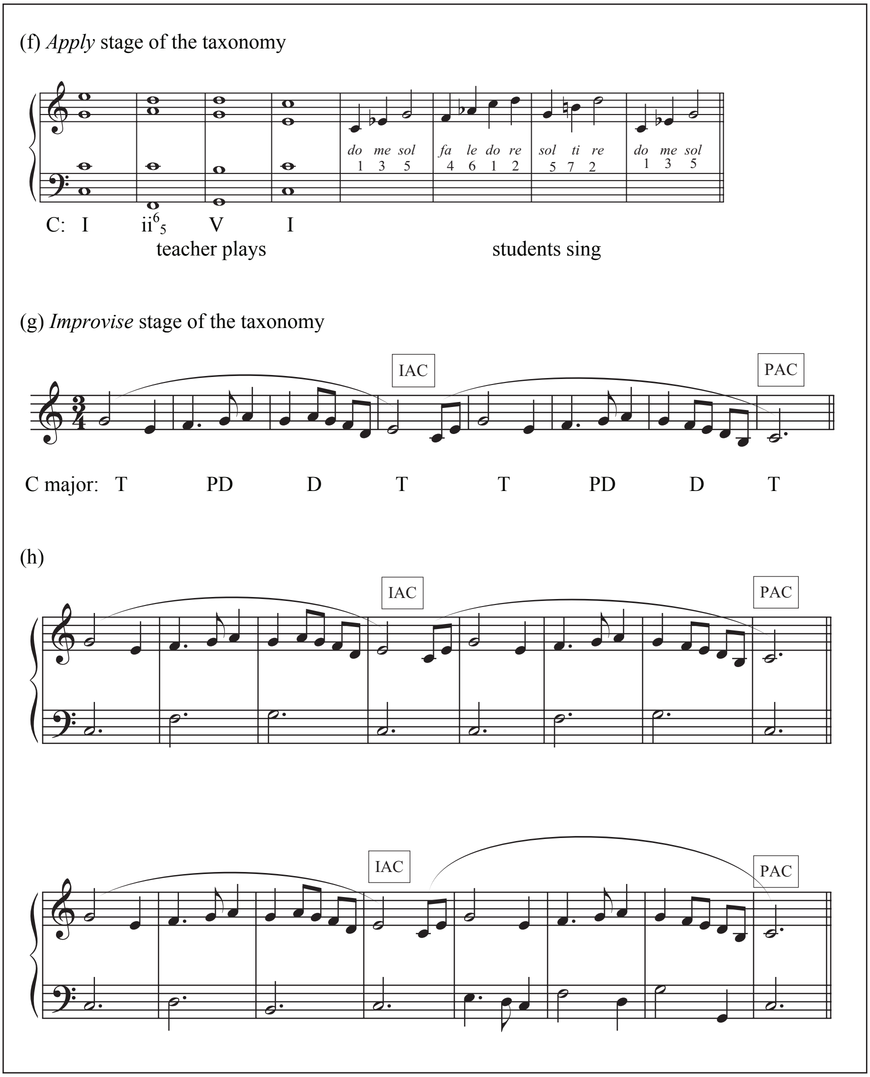
We now turn to the harmonic realm, demonstrating how our taxonomy can provide a pedagogical framework for harmonic activities in an aural skills class. This exercise is designed for a second-semester aural skills course, and the goal of the lesson plan is to provide students with the skills to understand pre-dominant seventh chords.

We begin with the *recognize* stage: A teacher establishes a key and then plays a root-position pre-dominant seventh chord, such as ii^7. Next, the instructor plays a series of four-chord progressions (T–PD–D–T, which we refer to as "paradigms"), which may or may not include the ii^7 chord. For each paradigm that includes a ii^7, the student writes a tick mark on their page. The teacher then describes the quality of the pre-dominant seventh chord, which in this case is a minor-seventh harmony, and the solfege / scale degrees affiliated with the bass note of each inversion of the supertonic seventh chord. On the second round of recognition of the paradigms, students are asked to recognize whether the ii^7 chord is present in either root-position or inversion. Throughout this phase of the exercise, students not only learn to recognize the ii^7 chord, but they also recognize the typical context of the pre-dominant chord as a connecting harmony between tonic and dominant. A similar procedure can be used to introduce the IV^7 chord. In the last part of the recognition exercises, a teacher plays paradigms with ii^7, IV^7, their inversions, or none of the above. Students are asked to determine whether a pre-dominant seventh chord was used and to recognize whether it was a supertonic or a subdominant harmony.

Moving on to the *imitation* stage of our harmonic activities, the teacher plays an isolated pre-dominant seventh chord on the piano, and students sing it back on a neutral syllable. When arpeggiating chords in this call-and-response activity, students should imitate the bass note as played by the teacher and then fill in the rest of the chord in singing the next closest note of the harmony. For instance, if the teacher plays the chord in Example 4(a), students would sing C–D–F–A as shown. This method of arpeggiation preserves the proper inversion of the chord, but minimizes the difficulty of hearing the exact register of the inner voices that a teacher performs. Next, the teacher performs a four-chord paradigm, pausing after each chord for the students to respond with their arpeggiations. Example 4(b) shows what one round of this activity would look like.



Example 4. Harmonic applications



Example 4. Harmonic applications *(continued)*

The *conceptualize* stage is where students analyze information and organize it into a conceptual map. For harmonic purposes, chord quality and solfège are important components of the *conceptualize* stage because they are both means of analyzing and organizing musical relationships into a useful framework. To begin this stage, students sing back the chord qualities of each harmony they had just finished imitating in the previous exercise, as shown in Example 4(c). Continuing, the students are asked to assign solfège syllables to the paradigm, as shown in Example 4(d). By assigning scale-degree function to notes within each chord, students build a map of how the chords function within the tonal system. For example, they may discover that *fa* and *la* (or $\hat{4}$ and $\hat{6}$) are shared between most pre-dominant-seventh chords. If students have difficulty assigning solfège syllables from an aural stimulus in this call-and-response fashion, an easier, intermediary *conceptualize* exercise would be to provide Roman numerals and figures of various paradigms that include pre-dominant seventh chords. While reading Roman numerals and figures, students can arpeggiate the chords on solfège.

Another useful exercise for the *conceptualize* stage is for the teacher to play a bass line and ask students to identify the most likely Roman numerals and figures that could harmonize that bass line. For pre-dominant harmonies, a teacher might play *do–fa–sol–do* ($\hat{1}$–$\hat{4}$–$\hat{5}$–$\hat{1}$) bass line and students could identify ii^{6}, ii$^{6}_{5}$, IV, or IV^{7} as the likely pre-dominant choices for the second chord. One positive outcome of this exercise is that students realize for themselves the limited harmonic possibilities, constrained by a well-formed syntax. Alternatively, a teacher could play the beginning part of a progression, but stop midway through a harmonic succession. After the abrupt stop, the teacher would call on an individual student to arpeggiate the next chord, making sure it preserves a well-formed syntactic flow. For example, a teacher might perform the incomplete progression shown in Example 4(e), and then call on a student to arpeggiate the next chord after the IV^{7}. In this case, a student might choose to prolong the pre-dominant function by arpeggiating a IV$^{6}_{5}$ chord, or they could move on to the dominant function of the phrase. In either case, the student had to *conceptualize* the proper function of the IV^{7} chord in relation to its context. Class discussion might revolve around metric considerations, for example how a prolongation of the pre-dominant function across the next bar line from weak to strong beat would be contrary to common-practice principles.

The *apply* stage involves utilizing concepts in new environments, *applying* them to new situations. Typical exercises for this stage involve re-contextualizing prior material, such as converting a paradigm that had been sung in major to the minor mode. After playing the major-mode progression in the first four measures of Example 4(f), students would respond with the minor-mode version shown in the next four measures. Thus, a student would navigate the different chord qualities found in the minor mode. Not only does this activity invoke the apply stage, but it also relies heavily on *imitation* because students would *imitate* all the scale degrees inflected by modal mixture. This kind of interconnection between taxonomy levels is not uncommon.

A more complex activity within the *apply* stage would entail asking students to identify pre-dominant seventh chords within a longer harmonic progression, one that included nested T–PD–D–T progressions, e.g., i–iv^{7}–V–i–ii^{ø7}–V– i. In this progression, the iv^{7} is part of the first T–PD–D–T, which prolongs the initial tonic. The ii^{ø7}, on the other hand, is the structural pre-dominant of the phrase.[33] Understanding both of these chords as pre-dominant sevenths that have different contexts, and thus different meanings, within the phrase would fall within the *apply* stage of our taxonomy.

Dictation is another common tool for the *apply* stage of our taxonomy because it involves translating an aural stimulus (one form of information) to a written configuration (a different form of the same information). Thus, the typical harmonic dictation exercises used in aural skills classes, in which students write outer voices, Roman numerals and figures of a performed progression are instances of *applying* knowledge.

Improvising is a high-order learning stage in which students build facility by spontaneously creating musical utterances that feature their new knowledge, in this case the new harmonic category of pre-dominant seventh chords. For this stage to be productive, students need clear constraints on their improvised compositions so that they focus on the topic at hand and so that the teacher can know for certain that they are pre-planning their work and not just haphazardly coming upon a possible solution. For instance, a teacher could ask a student to improvise a four-chord arpeggiated progression that includes a pre-dominant seventh chord and that ends with a half cadence. These specific directions will lead to better results compared to more general directions, such as, "include a predominant-seventh chord in an improvised phrase."

One improvisation exercise that is very effective, which students enjoy because they can see the real-world relevance of the endeavor, is to ask for improvised bass lines to a given melody. The melody itself provides the necessary constraints to the creative process, with its defined cadence points, established harmonic rhythm, and

---

[33] Laitz would refer to the opening T–PD–D–T progression at the beginning of this phrase as an "embedded phrase model," which prolongs the tonic before the structural pre-dominant (ii^{ø7}) and dominant (V) arrives. See Laitz, *The Complete Musician*, 251–54.

a sketch of harmonic options. For example, if students were asked to improvise a bass line to the melody in Example 4(g), they would first need to know that there are two cadences (an IAC in m. 4 and a PAC in m. 8), that the harmonic rhythm is likely to be one-chord per measure, and that the melody traverses a predictable T–PD–D–T progression. When first attempting improvisatory exercises like this one, it is useful to allow students time to analyze the melody and write out their own framework, such as identifying locations of tonic, predominant, and dominant structural harmonies. Once a harmonic framework is agreed upon by the class, the teacher can sing the melody as all students try out their improvised bass lines simultaneously. While everyone is busy improvising, students feel less self-conscious about their individual attempts, and all of the improvisations are likely to sound consonant with one another due to the shared framework. After several run-throughs, it can be useful to have the class sing the melody and call upon individuals to improvise a bass line, which allows students to share their accomplishments.

The last step of our taxonomy is the *evaluate* stage, in which students examine and judge their own creative output. A good evaluative exercise is to notate on the board some of the improvised bass lines just performed by the students and to discuss their qualities. Example 4(h) compares two possible bass lines. Whereas the first bass line conforms to harmonic expectations and syntax, it is repetitive and the downbeats in mm. 2–3 and mm. 6–7 introduce parallel octaves between the bass and melody. In the second improvisation, the student implies an inverted dominant in m. 3, creating a smoother, more melodic bass line. Also, the increased rhythmic activity in the consequent phrase avoids the parallels, helps build momentum towards the PAC, and incorporates a rhythmic motive from the antecedent. By evaluating these options, students will be better prepared to improve their next attempts, which will be informed by the harmonic, melodic, and rhythmic considerations deliberated upon at the *evaluation* stage.

In summary, we have provided examples of both melodic and harmonic activities that traverse the six stages of our taxonomy. Although you may find these specific exercises helpful in your classroom, it is hoped that the reader will extrapolate from them to create one's own activities according to the taxonomy. Put another way, we hope the reader aspires to the later stages of learning, beyond recognition and imitation, and *applies*, *improvises*, and *evaluates* new exercises uniquely suited to their teaching needs.

Post-Tonal Applications of the Taxonomy

The lag between the "mind" and the "ear" (or visual vs. aural learning) is most pronounced with post-tonal repertoire, which many students find challenging to perform as the resources and tools from their tonal aural-skills classes become less relevant.[34] One of the objectives in our post-tonal aural-skills course is to provide students with strategies to better familiarize them with 20th-century music and techniques. An effective way to accomplish this goal is to use repeated pitch patterns. These exercises are designed to lead students from the familiar (diatonicism) toward the unfamiliar (post-tonal music) in a gradual and systematic fashion.[35] In addition, the pitch patterns include sight-singing, transcribing melodies, detecting pitch errors, and improvising melodic fragments.

---

[34] To cite just one example, Karpinski's methodology in his *Manual for Ear Training and Sight Singing* assumes a four-semester tonal sequence and does not address post-tonal music.

[35] This procedure of starting from a diatonic melody and incrementally changing pitches to create extended chromatic and then atonal patterns is similar to a technique used in Ronald Herder, *Tonal/Atonal: Progressive Ear Training, Singing and Dictation Studies in Diatonic, Chromatic and Atonal Music* (New York: Continuo Music Press, Inc., 1973). Although the concept of using short pitch patterns that progress gradually from the familiar to the less familiar is the same, the conceptual reasoning behind the transformations from one pattern to the next is very different. Herder's pedagogy is founded on isolated intervallic relationships, (e.g., he organizes his exercises from small intervals to large ones), and he recommends deriving dissonances from projected consonances. In contrast, our transformations are designed to encourage melodic chunking, pitch-class set identification and manipulation, and the use of anchor pitches. Another distinction is that Herder begins with a tonal excerpt from music literature and then "breaks down" its diatonicism, while we start with a diatonic pattern and move toward the post-tonal excerpt from the literature.

Example 5. Pitch pattern exercise

This exercise was designed for a fourth-semester or upper-level undergraduate course solely devoted to post-tonal music. The goal of the lesson plan is to help students sing Bartók's "From the Island of Bali," which appears in the fourth volume of *Mikrokosmos*, given in Example 5(b). Without question, the large leaps, non-functional melodic design, and the dissonant clashes between the right and left hands are challenging to sight-sing. Students are given the seven brief pitch patterns shown in Example 5(a). Once again, each successive melody is slightly altered, and through a process of incremental changes the first pitch pattern gradually morphs into the opening of Bartók's piece. In other words, the repeated pitch patterns are designed to make the challenge of sight-singing post-tonal music less daunting by leading a student from the familiar (tonal) toward the unfamiliar (post-tonal) in a gradual and systematic fashion. Below is a detailed discussion of each pitch pattern of Example 5(a) and how it relates to our new taxonomy.

<u>Pitch Pattern #1</u>

- The first pitch pattern is a straightforward, diatonic melody that begins on scale-degree $\hat{5}$ of A minor and descends by step to the leading tone before concluding on the tonic.
- We start diatonically to build associations from familiar territory.

<u>Pitch Patterns #2 and #3</u>

- The lowest two stages of our taxonomy—*recognize* and *imitate*—occur when students recall details from previous melodies and sing the new pitch patterns.

<u>Pitch Pattern #4</u>

- This pitch pattern includes a tritone (D4/G♯3), which is a structural element of the piece.
- Our third learning stage, *conceptualize*, occurs when we highlight the presence of the tritone (ic6) and the [016] trichord (D4, A3, G♯3).

<u>Pitch Pattern #5</u>

- This melody, which begins with a chromatic pitch (D♯4) and is less tonally stable, is saturated with [016] trichords.
- *Conceptualize* and *apply* are invoked even more when the students are asked to identify and discuss instances of [016].

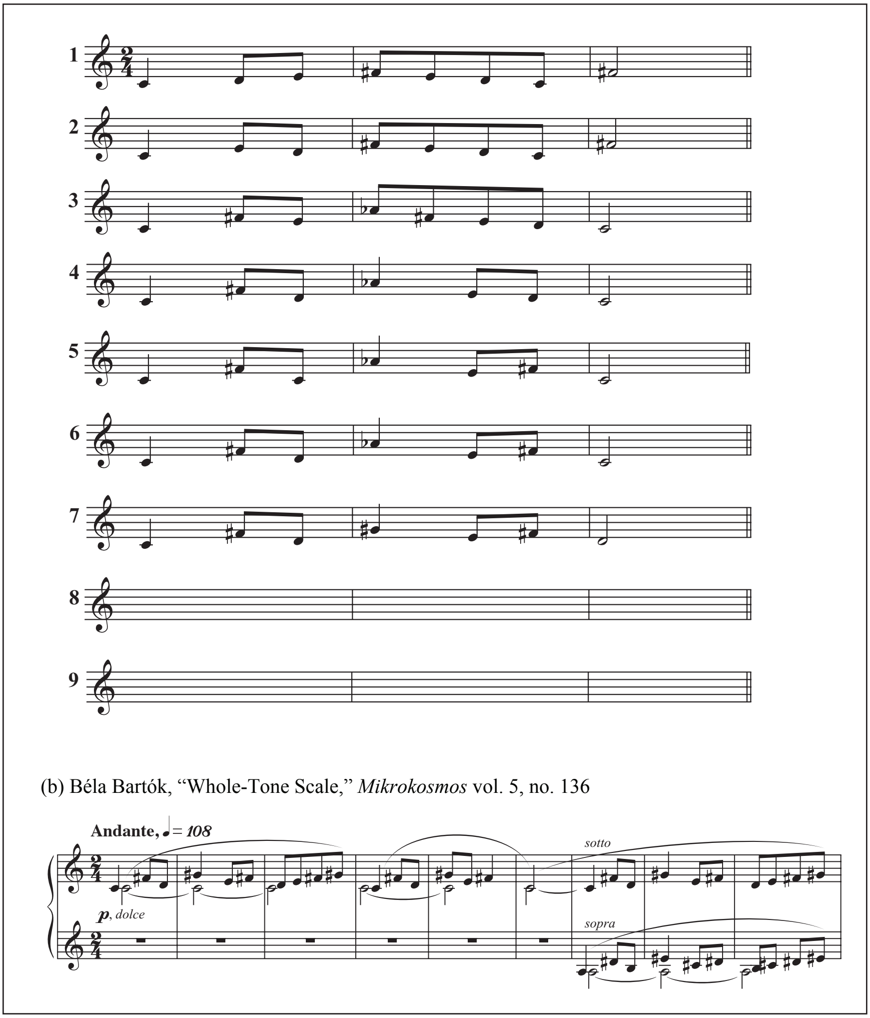
<u>Pitch Pattern #6</u>

- This pitch pattern is the opening phrase for Bartók's "From the Island of Bali."
- A different kind of *conceptualize* occurs here with an orthography switch; D♯4 is now notated as E♭4.

Although the sixth pitch pattern is the last exercise given, we now ask the students to *apply* and *improvise*, thus reaching the upper-level stages of our taxonomy. To begin the *application* stage, we invite students to transpose the final pitch pattern by a semitone (T1) and a perfect fourth (T5); these transposition levels are derived from the intervals within the [016] collection, which helps students move from *conceptualization* toward *application*. We also require students to invert this pitch pattern about its initial pitch. In anticipation of Bartók's passage, we have our students transpose the inverted form down four semitones.

Before the students are exposed to Bartók's score, we ask the students to *improvise* their own pitch patterns, requiring them to use their own versions of [016]. Some students will sing the inverted form while others favor transposed forms of the original. And some students will improvise a version of [016] that begins with the middle pitch of the collection, rather than singing high to low or low to high. The blank staves of Example 5(a) are provided for students to dictate some of their peers' improvised melodies. Once the students evaluate their own dictations and improvisations, the students then sing "The Island of Bali," tying together all the learning stages by performing the music.

We would like to mention a few points about this particular pitch pattern exercise as it relates to Bartók's melody. Notice that the opening motive consists of a [0167] tetrachord that highlights a perfect fourth (A–D) with neighboring notes. Thus, one may hear the D as the pitch center for this gesture with A–D functioning as scale-degree $\hat{5}$ to $\hat{1}$. (Compare this to the A centricity of the six pitch patterns presented in Example 5.) We can certainly create a different set of pitch patterns that lead toward the left-hand Bartók melody with D as the pitch center. It can also be argued that the tonal references within Bartók's melody stem from the octatonic collection that is used to organize the pitch material. Thus, another repeated pitch pattern to consider here is the octatonic scale. As will be shown in the next example, these repeated pitch patterns can be based on collections other than diatonic, major and minor scales.



Example 6. Pitch patterns based on the even whole-tone scale.

More Post-Tonal Examples

The pitch patterns shown in Example 6 are slightly different from our previous examples in that we use a whole-tone scale—not diatonic—as the underlying pitch pattern. Our pedagogical approach is the same as before—sight sing, dictate, detect pitch errors, and improvise—with the goal of eventually singing Bartók's "Whole-tone Scale," shown at the bottom of the example. While we started "The Island of Bali" with diatonic pitch patterns, we would not necessarily recommend the same strategy for this whole-tone piece. The octatonic subset within "The Island of Bali" contains more tonal references, which are absent from Bartòk's "Whole-Tone Scale."

(a)

(b) Béla Bartók, "Chromatic Invention (2)," *Mikrokosmos* vol. 3, no. 92

Example 7. Pitch patterns based on ics 1, 2, and 5 only.

Once the students were relatively comfortable with exercises that contain six or seven pitch patterns, we provided more complicated versions. Example 7 offers a more complex pitch pattern, and the composition from which the exercise is derived is shown in Example 7(b). In this exercise, the number of pitch patterns has increased to 16. In addition, some of the two-measure motives are left blank for dictation or improvisation, and we use completed pitch patterns for error detection. This particular pitch pattern exercise is restricted to major and minor seconds and perfect fourths.[36] In addition to an intervallic approach to this exercise, we encourage the students to focus on a number of strategies that might help them sing these post-tonal pitch patterns, such as anchor pitches, a diatonic background (in this case E major), and compound melodic lines.[37]

After a few weeks of using our pitch patterns we have found that our students were able to quickly advance through an entire exercise. The advantage to using a larger number of pitch patterns (16, 17, even 18) is to give *each* student within a single class session an opportunity to sing or improvise a brief motive in front of their

---

[36] The intervallic impetus for this pitch pattern follows the pedagogical framework of Lars Edlund, *Modus Novus: Studies in Reading Atonal Melodies* (Stockholm: Nordiska musikförlaget, 1964). At the beginning of his text, he restricts his focus to major and minor seconds and the perfect fourth. He then introduces the perfect fifth followed by major and minor thirds, the tritone, minor and major sixths, minor and major sevenths, concluding with compound intervals.

[37] In addition to an intervallic-based approach and a diatonic framework to learn post-tonal music, Michael Rogers also suggests using "trichords," "recurrent nontonal patterns" and modes. According to Rogers, the "recurrent nontonal patterns" can be "memorized, transformed, varied, inverted, displaced by an octave, elided, and combined in limitless ways to cover most atonal possibilities" (140). See Rogers, *Teaching Approaches in Music Theory*, 138–43. William Thomson, *Advanced Music Reading* (Belmont, CA: Wadsworth Publishing Company, Inc., 1969) advocates the " … need for referring pitches to a contextual [tonal] frame—either a frame that is made explicit by the patterns of the melody itself or … a frame that is imposed by the reader when the melody does not clearly project its own." (x) For Thomson, using a framework approach to sight sing chromatic and modulating melodies is more helpful than relying on an intervallic based approach. Thomson suggests that for atonal melodies where the tonal framework approach is not the most appropriate, it is helpful to " … improvise your own set of relationships as a guide to accurate pitch recall." (160)

peers. As a class, dictation and error detection can be successfully and quickly implemented. We also found that the students enjoyed having the opportunity to improvise their own pitch patterns; oftentimes, the improvisations lead to spirited class discussions about what did or did not work. And the students were generally excited to find out which piece each exercise was based on. Because of the repeated pitch patterns, the students were able to better perform the *entire* composition that was linked with each exercise. Overall, we were pleased with the engagement, the participation, and the amount and depth of learning that took place when we used these pitch-pattern exercises.

As is obvious from our examples in this essay, many of the pieces from Bartók's *Mikrokosmos* can easily serve as the foundation for a number of different pitch patterns. We have successfully used many songs from Schoenberg's *Book of the Hanging Gardens*; the post-tonal melodies found in *Modus Novus*; and the chromatic, atonal, and twelve-tone melodies found in the later chapters of Ottman's *Music for Sight Singing*. Designing pitch-pattern exercises is a matter of identifying the key characteristics of a musical passage and composing different motivic and melodic patterns that incrementally exploit those characteristics.

It has been our experience that these pitch-pattern exercises, both tonal and post-tonal, are effective because they include a lot of imitation and recall of musical material. Consequently, students use the lower end of our learning stages—*recognizing* and *imitating*—for much of the exercise. Higher stages of learning are invoked only for new musical events. This isolates the new issue, allowing students to focus their attention on *conceptualization* and *application* only for the new event. In sum, our use of recurrent pitch patterns promotes development of a variety of musical skills by traversing deliberately through a well-planned progression of learning stages.

Conclusion

In this article, we have introduced a taxonomy of learning for college music classes and demonstrated how it can be used to design effective aural-skills exercises. We want to stress that the pitch-pattern exercises we describe above are not prescriptions of what needs to happen in an aural skills class. Instead, we offer these exercises as one possible way to implement and think critically and thoughtfully about our taxonomy. Or to put it another way, we offer a music learning taxonomy as a pedagogical framework to help re-think and re-evaluate the learning process that unfolds in a music class.

Having demonstrated how our taxonomy can be applied to design in-class activities, we would also like to encourage some more global interpretations. Our taxonomy can also be used to promote more in-depth learning for goals spanning a week, a module or unit, and even an entire semester. We hope our approach will help us, as instructors, to continually explore and evaluate our educational goals.

Finally, though our revised taxonomy might be considered as a pedagogical mold or a set of stair steps on a triangle to get from bottom to top, there is a great deal of flexibility built into our framework. We like to think of it as a teaching and learning *cycle* that ends precisely where it begins—imagine the triangle shown in Example 1 wrapping around onto itself to create a kind of spiral. Because each student has his/her own individual strengths and weaknesses, we find that we constantly traverse the different stages at different times to address the many different needs of our students. There is a continuous ebb and flow, which creates a dynamic means of assessing, teaching, evaluating, and, most importantly, enhancing student understanding and learning.

Bibliography

Anderson, Lorin W., and David R. Krathwohl, eds. *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. New York: Longman, 2001.

Benjamin, Thomas, Michael M. Horvit, and Robert Nelson. *Music for Sight Singing*. 4th ed. Belmont, CA: Thomson/Schirmer, 2005.

Benward, Bruce, and Maureen A. Carr. *Sightsinging Complete*. 6th ed. Boston, MA: McGraw-Hill, 1999.

Berkowitz, Sol, Gabriel Fontrier, and Leo Kraft. *A New Approach to Sight Singing*. 5th ed. New York: W.W. Norton, 2011.

Bharucha, J. J. "Anchoring Effects in Music: The Resolution of Dissonance." *Cognitive Psychology* 16, no. 4 (October 1984): 485–518.

Bloom, Benjamin S. *Taxonomy of Educational Objectives: The Classification of Educational Goals*. 1st ed. New York: Longmans, Green, 1956.

Bloom, Benjamin, Anderson Krathwohl, and Bertram Masia, eds. *Taxonomy of Educational Objectives: The Affective Domain*. Vol. 2. New York, NY: David McKay, 1964.

Caldwell, James. "Using Bloom's Taxonomy to Develop an Approach to Analysis." *Journal of Music Theory Pedagogy* 3, no. 2 (1989): 223–32.

Clendinning, Jane Piper, and Elizabeth West Marvin. *The Musician's Guide to Theory and Analysis*. 2nd ed. New York: W.W. Norton, 2010.

Cuddy, Lola L., Annabel J. Cohen, and Janet Miller. "Melody Recognition: The Experimental Application of Musical Rules." *Canadian Journal of Psychology* 33, no. 3 (September 1979): 148–57.

Damschroder, David. *Listen and Sing: Lessons in Ear-Training and Sight-Singing*. New York: Schirmer Books, 1995.

Dave, Ravindrakumar. "Psychomotor Levels." In *Developing and Writing Behavioral Objectives*, edited by Robert Armstrong. Tucson, AZ: Educational Innovators Press, 1970.

Davidson, Lyle, and Patricia Welsh. “From Collections to Structure: The Developmental Path of Tonal Thinking.” In *Generative Processes in Music: The Psychology of Performance, Improvisation, and Composition*, edited by John Sloboda. New York, NY: Clarendon Press/Oxford University Press, 1988.

Deutsch, Diana. “Tones and numbers: Specificity of interference in immediate memory.” *Science* 168 (1970): 1604–1605.

Dewar, Kathryn M., Lola L. Cuddy, and Douglas J. K. Mewhort. “Recognition Memory for Single Tones With and Without Context.” *Journal of Experimental Psychology* 3, no. 1 (1977): 60–67.

Dowling, W. Jay. “Melodic Contour in Hearing and Remembering Melodies.” In *Musical Perceptions*, edited by Rita Aiello and John Sloboda, 173–90. New York: Oxford University Press, 1994.

———. “Scale and Contour: Two Components of a Theory of Memory for Melodies.” *Psychological Review* 85, no. 4 (January 1, 1978): 341–54.

———. “Rhythmic Groups and Subjective Chunks in Memory for Melodies.” *Perception and Psychophysics* 14 (1973): 37-40.

Edlund, Lars. *Modus Novus: Studies in Reading Atonal Melodies*. Stockholm: Nordiska musikförlaget, 1964.

Fine, Philip A., Anna Berry, and Burton S. Rosner. “The Effect of Pattern Recognition and Tonal Predictability on Sight-Singing Ability.” *Psychology of Music* 34, no. 4 (2006): 431–47.

Franklin, Michael, Katherine Sledge Moore, Chun-yu Yip, John Jonides, Katie Rattray, and Jeff Moher. “The Effects of Musical Training on Verbal Memory.” *Psychology of Music* 36, no. 3 (2008): 353–65.

Freedman, Eric G. “The Role of Diatonicism in the Abstraction and Representation of Contour and Interval Information.” *Music Perception* 16, no. 3 (1999): 365–87.

Gardner, Howard. *Multiple Intelligences: The Theory in Practice*. New York: Basic Books, 1993.

Hanna, Wendell. “The New Bloom’s Taxonomy: Implications for Music Education.” *Arts Education Policy Review* 108, no. 4 (2007): 7–16.

Harrow, Anita. *A Taxonomy of the Psychomotor Domain: A Guide for Developing Behavioral Objectives*. New York, NY: David McKay, 1972.

Henry, Michele Len. "The Use of Targeted Pitch Skills for Sight-Singing Instruction in the Choral Rehearsal." *Journal of Research in Music Education* 52, no. 3 (2004): 206–17.

Herder, Ronald. *Tonal/Atonal: Progressive Ear Training, Singing and Dictation Studies in Diatonic, Chromatic and Atonal Music*. New York, NY: Continuo Music Press, Inc., 1973.

Ho, Yim-Chi, Mei-Chun Cheung, and Agnes S. Chan. "Music Training Improves Verbal but Not Visual Memory: Cross-Sectional and Longitudinal Explorations in Children." *Neuropsychology* 17, no. 3 (2003): 439–50.

Karpinski, Gary. *Aural Skills Acquisition: The Development of Listening, Reading, and Performing Skills in College-Level Musicians*. New York, NY: Oxford University Press, 2000.

———. *Manual for Ear Training and Sight Singing*. New York: W.W. Norton, 2007.

Karpinski, Gary, and Richard Kram. *Anthology for Sight Singing*. New York: W.W. Norton, 2007.

Krumhansl, Carol L. "The Psychological Representation of Musical Pitch in a Tonal Context." *Cognitive Psychology* 11, no. 3 (1979): 346–74.

Laden, Bernice. "Melodic Anchoring and Tone Duration." *Music Perception* 12, no. 2 (1994): 199–212.

Laitz, Steven G. *The Complete Musician: An Integrated Approach to Tonal Theory, Analysis, and Listening*. 3rd ed. New York: Oxford University Press, 2011.

Marin, Oscar S. M., and David W. Perry. "Neurological Aspects of Music Perception and Performance." In *The Psychology of Music*. 2nd ed., 653–724, San Diego, CA: Academic Press, 1999.

Miller, George A. "The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information." *Psychological Review* 63 (1956): 81–97.

Ottman, Robert W., and Nancy Rogers. *Music for Sight Singing*. 8th ed. Upper Saddle River, NJ: Prentice Hall, 2010.

Oura, Yoko, and Giyoo Hatano. "Memory for Melodies Among Subjects Differing in Age and Experience in Music." *Psychology of Music* 16, no. 2 (1988): 91–109.

Rogers, Michael R. *Teaching Approaches in Music Theory: An Overview of Pedagogical Philosophies*. 2nd ed. Carbondale: Southern Illinois University Press, 2004.

Rogers, Nancy. "Solmization Expertise Correlates with Superior Pitch Memory." *Em pauta: Revista do curso de pós-graduação mestrado em música* 18, no. 30 (2007): 131–52.

Simpson, Elizabeth. *The Classification of Educational Objectives: The Psychomotor Domain*. Vol. 3. Washington, DC: Gryphon House, 1972.

Simon, Herbert. "How Big is a Chunk?" *Science* 183, no. 4124 (1974): 482–88.

Sloboda, John. *The Musical Mind: The Cognitive Psychology of Music*. Oxford: Clarendon Press, 1985.

Thomson, William. *Advanced Music Reading*. Belmont, CA: Wadsworth Publishing Company, Inc., 1969.