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An investigation of student interpretations and internalizations of modeling in a string ensemble classroom

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Dissertation

AN INVESTIGATION OF STUDENT INTERPRETATIONS AND INTERNALIZATIONS OF MODELING IN A STRING ENSEMBLE CLASSROOM

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DEDICATION

For my family, friends, teachers, and students. Yes, you.

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AN INVESTIGATION OF STUDENT INTERPRETATIONS

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STRING ENSEMBLE CLASSROOM

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ABSTRACT

The purpose of this study was to explore the ways in which high school violin students transform and comprehend a teacher's model through the framework of Kolb's (1984) Experiential Learning Theory. Additionally, the Learning Styles Inventory (LSI) results of this study's participants were compared to extant researchers' LSI data. Kolb and Kolb's Learning Styles Inventory 3.1 and a brief survey were administered to participants (*N* = 100) during Phase I of the study in order to gather data regarding three quantitative independent variables—learning style, gender, and grade level. A subset of participants (*n* = 15) representing an array of those variables participated in Phase II of the study wherein participants were shown a video recorded lesson. During that lesson, a teacher modeled an eight-measure melodic phrase for each participant whose responses to the lesson were recorded for later analysis. Qualitative student responses (applied strategy, focus during the lesson, type of response to the model, performance intensity, task complexity) and interview responses were coded and distilled into common themes and compared among independent variables from Phase I.

The high school violinist participants in this study preferred reflective observation and concrete experience orientations more frequently than was the case in extant research. The only significant interaction between independent variables was found between gender and learning preference. The two most frequently applied strategies were derived from Initiating (AE/CE = 24.46%) and Creating (CE/RO = 20.44%) learning styles. Participants largely focused on musical components (77.55%)—e.g., rhythm, pitch, intonation, articulation—by performing with the bow (48.72%) concurrently with the model (57.95%). When provided with practice time, participants largely utilized low (33. 68%) or silent, reflective (24.47%) intensities. Fundamental, two-phase combinations of strategies were applied the majority of the time (57.72%) by participants. Qualitative descriptions of the variety of participant responses were included and contextualized using LSI data. I concluded, based on a synthesis of the quantitative data and qualitative observations, that participants largely prioritized immediate individual needs—such as pitch identification or previous sections of the lesson—over both teacher instruction and their own learning preferences. I also concluded that a single modeling experience often resulted in a diverse array of participant responses—which may or may not adhere to the immediate content of the lesson.

As a result of this study, I suggest that music educators and researchers consider that learners potentially utilize a singular modeling experience in a variety of different ways resulting in an array of potential outcomes. It is important for teachers to be explicit and clear in their instructions surrounding a modeling task in order to better guide students towards desired outcomes. Future researchers might consider learners' viewpoints in response to a modeled experience as a means of framing achievement, outcome, or other research topics. ELT researchers might consider building on the implications of the comparison among KLSI data and qualitative data among learners under the age of 19 with a focus on variables outside the typical factors of gender, age, educational level, educational specialization, and culture.

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CHAPTER ONE: INTRODUCTION AND BACKGROUND

He puts the baton down and waits for the orchestra to settle. They've had this music for two weeks now and are still struggling with the upcoming passage. In fact, they've had to stop twice already because the first violins simply can't make it through. He's ready for this, though. He wrote in his lesson plans that modeling would work well here—the articulations, rhythms, and dynamics would take too long to explain with verbalizations. He asks to borrow the principal player's violin and prepares to model the passage for the first violins. As he demonstrates the passage, he notices the first violin section watching carefully and is optimistic that this will work. He even demonstrates the passage again for the benefit of those who might have missed it. "Now play that back for me," he asks. They do—it is not much better. "Ok, listen to how I'm playing the eighth notes," he recommends and performs the passage again. The second try does not show much improvement on the articulation—though a handful of students have begun to glean the correct rhythm. "Better," he offers, "try it in the lower half of the bow, like this." After modeling it for the fourth time, he asks the section to try it again. The third and fourth attempts show moderate improvement as more students move to the lower half of the bow while continuing to improve rhythmically. He thought it would be going better than this and the rest of the orchestra is beginning to get restless. "We're showing improvement, let's move on. I'd like you to work on that passage for next rehearsal," he says and picks up his baton again. As he guides the orchestra through the passage, he reflects that modeling was not as effective as he had anticipated. What went wrong? Only one or two have gleaned the proper articulation, dynamics, and rhythms. Three more *have finally worked out the rhythms but can't seem to get the articulation under control. The rest have not made any progress after she modeled the passage twice. Looks like it's back to the drawing board…*

The situation described above is, most likely, a very common occurrence in a music education classroom. Rooted in Bandura and Walter's (1963) seminal findings of observation and imitation in learning, researchers have pointed to modeling as a crucial component of music education (Baker, 1980; Puopolo, 1971; Rosenthal et al., 1984, 1988; Sang, 1985, 1987). This has led to authors of teacher training texts to posit that modeling is an effective teaching strategy in the classroom (Campbell et al., 2008; Elliott, 1995; Kohut, 1992; Mark & Madura, 2009). As in the classroom described above, a teacher identifies a problematic passage during a lesson, he decides that the best course of action is to show the section how to perform the passage, he has the section perform back to him, he may or may not deliver feedback, and this sequence repeats until he is satisfied that the passage has been learned. Many educators—pre-service and experienced alike—might agree that this sequence of instruction is an essential tool in the music educator's toolbox. In fact, Matthews (2014) found that many band instructors utilized modeling frequently because of its highly perceived value in ensemble performance classrooms. Linklater (1997) summarized that "imitation of appropriate musical models is an effective method of improving music learning" (p. 403).

After all, music is so complex that words cannot fully depict the necessary instruction. Only a demonstration can convey the artistic nuance and myriad techniques necessary for successful performance (Elliott, 1995). Dickey (1992), in a review of research regarding musical modeling, justified modeling in the music classroom suggesting that

> Music discriminations are not effectively taught through verbal description. For example, students do not learn to discriminate between timbres by being told that sounds are rich or bright or thin; kinesthetic response cannot be improved through discussions of tempo, meter, and subdivision… It is necessary to provide a series of models, and opportunities to imitate those models, in order to facilitate increased music discrimination abilities. (p. 37)

Indeed, it is this very complexity—and potential lack of verbal clarity—that might obscure educational objectives and potentially create a rift between what the teacher intended the students to learn and what those students actually gleaned from the modeled experience.

Modeling—and students' potential responses to that model—is a complex activity that is often conflated by teachers and researchers alike with related study regarding explicit vs. implicit learning, rote instruction, visual-spatial learning theories, and non-verbal learning techniques. Haston (2010) summarized by positing that "modeling is a nonverbal teaching strategy whereby students receive instruction in the form of concept demonstrations by a teacher" (p. 36). Greer (1980) defined modeling simply as learning via imitation. Bandura (1986) also aligned with this concept of learning by imitation and continued by suggesting that modeling can enhance advanced artistic concepts. For the purpose of this study, a synthesis of these definitions is appropriate—modeling is the process of learning by observing and imitating a range of concepts or skills. This definition reconciles the external stimuli of the teacher's model with the internal process of the student's reception and response.

Research Problem

Modeling, the instructional strategy of demonstrating concepts using nonverbal communication, has been proposed as a meaningful and valuable tool in the classroom. Some researchers have shown that recorded musical models can be an effective means of increasing student performance skill (Henley, 2001; Hewitt, 2001; Linklater, 1997; Rosenthal, 1984) while others have also found that live teacher models positively influence student performance skills (Dickey, 1991; Goolsby, 1996; Sang, 1987). Still other researchers have found mixed results about the effectiveness of modeling on student performance (Anderson, 1981; Cribari, 2014; Haston, 2010; Meissner, 2017; Morrison, 2002; Quindag, 1992; Woody, 2006; Zurcher, 1972). Despite the many educators utilizing modeling as a crucial component of their teaching, researchers have yet to agree on how effective it might be in classroom settings.

One potential explanation for the mixed results may be that the effects of modeling extend beyond the ways in which teachers demonstrate, into the ways in which students internalize and transform that model into their own performance. In fact, Matthews (2014) suggested that students may interpret a teacher's modeling very differently than the teacher intended. Essentially, instructional goals may be at the whim of the students as opposed to the teacher. Modeling might be misinterpreted, ignored, distracting, or even detrimental to any number of the students in a classroom. What seems like the clearest, most direct form of instruction might actually impact different students in profoundly different ways.

It is important to note how the above researchers have utilized in their research to determine the effectiveness of modeling on student performance—namely, the researchers were attempting to determine effectiveness based on how the instructor was delivering the model to the students and the potential effectiveness of that technique. A novel approach to modeling research might center on how students react to a model. Researchers outside of the musical field have yielded interesting results when focusing on student responses to models. For example, researchers in the fields of dance and movement (Wuyts & Buekers, 1995), athletic pedagogy (Rink & Hall, 2008), motor learning (Carroll & Bandura, 1982), and observational learning (Gardner, 1995) have yielded clearer positive results on the effectiveness of modeling when focusing on student responses. Instead of investigating how modeling impacts the students, it may be helpful for music education researchers to explore how students react to and interpret those models.

Theoretical Framework

In 1984, Kolb created the Experiential Learning Theory (ELT) that attempted to explain how learners might vary in their preferred response to outside stimuli. Kolb presented the ELT as a cycle of learning in response to an experience that touches on four phases of processing that experience (see Appendix A). Rooted primarily in Dewey's (1938) developmental theories of higher education, Lewin's (1951) methodological approaches to social psychology and organizational behavior, and Piaget's (1971) theories of cognitive development, Kolb based the ELT as a method to conceptualize how individuals experience and process the events in their lives. Kolb's ELT encompasses a cyclical, four-phase depiction of the learning process; a concept for how individuals vary in their learning style or preference; a theory of how individuals might develop their learning; and assumptions that connect learning preference and sophistication to external aspects of life such as higher education and career adaptation.

Learners internalize concrete experiences (CE) via a reflective observation (RO) phase. Learners transform those refined interpretations of external experiences to abstract conceptualizations (AC) before utilizing those concepts through practice in an active experimentation (AE) phase (See Appendix A). While Lewin (1951), Dewey (1938), and Piaget (1950) proposed learning cycle variants, Kolb's (1984) ELT unites the theories into a process-based illustration of how individuals reconcile "the conflict between concrete experience and abstract concepts and the conflict between observation and action" (p. 29). As the learner progresses through the cycle of experiential learning, she processes and internalizes the external world and, in turn, acts on it to create a new experience. In this way, each learner establishes perceptions in unique and meaningful ways that potentially defy sweeping generalizations.

Kolb (1984) also posited that individuals initially prefer one way, or style, of learning, which Kolb initially labeled divergence (CE-RO) assimilation (RO-AC), convergence (AC-AE), and accommodation (AE-CE). Kolb suggested that individual learners gravitate towards at least two specific areas of their learning cycle as a preferred means of interacting with experiences. As they grow and develop, however, individuals tend to gravitate toward one pole, either conceptualizing-experiencing (CE-AC) or acting-reflecting (AE-RO). To determine individuals' learning preference, Kolb (1976a) designed the Learning Styles Inventory (LSI). Kolb designed the initial version of this inventory as a "nine-item self-description questionnaire" (1984, p. 68) that allowed users to determine their learning preference as a way of personal reflection and occupational growth. In subsequent years, other researchers (e.g., Alan, 2006; Armstrong & Mahoud, 2008; Boyatzis & Mainemelis, 2010; Kayes, 2002) have applied LSI data to more specific fields such as business management, nursing, secondary education, law, agriculture, and psychology. Only one researcher to date (Gumm, 2004) has applied the LSI to music education.

Kolb (1984) posited that some individuals become more adaptive, changing their learning style to respond to different contexts. In his Experiential Learning Theory of Development, Kolb suggested three distinct stages of integration with the cycles of the ELT. In this theory, Kolb lays out the process through which individuals incorporate more and more components of the ELT cycle in response to more complex and varied scenarios.

In Kolb's (1984) first stage—Acquisition—learners develop phases of the learning cycle individually: "Development in the acquisition phase is marked by the gradual emergence of internalized structures that allow the child to gain a sense of self that is separate and distinct from the surrounding environment" (p. 142). In the early acquisition phases—ages birth to 11 years—learners begin to develop systems of logic, concrete operations, and inductive reasoning. The final phase of the acquisition stage—ages 12 to 15 years—is marked by the gradual emergence of a dichotomy of internal and external sense of self. It is in this final phase that learners incorporate the full range of the ELT cycle and begin to develop preferences as to which components of the ELT cycle they prefer to apply.

The second stage in Kolb's (1984) Theory of Development—Specialization—takes students into their secondary education and/or early career. In this phase, individuals are often shaped by their "cultural, educational, and organizational socialization forces [to] develop increased competence in a specialized mode of adaptation that enables them to master particular life tasks they encounter in their chosen career" (p. 142). Kolb suggested that as learners continued down their educational and career paths, they began to apply specific phases of the ELT cycle with greater success. Essentially, learners "act on the world (build a bridge, raise the family) and the world acts on me (pays me money, fills me with bits of knowledge)" (p. 142) in a way that reinforces each other in a self-replication cycle. This stage of development sees the true emergence of a learning preference in an individual and its relatively consistent use despite the context in which the individual is placed.

Kolb's final stage of development—Integration—is marked by a new sense of awareness in an individual that forces a novel approach to life's experiences. Kolb (1984) described how learners might choose to break away from their preferred learning tools. In this final stage individuals possess a greater concept of the ELT cycle and use it both more fluidly and to greater success. This stage is achieved by learners who have reconciled their relationship with social, occupational, and individual needs. Kolb referenced Freire (1970), Schiller (1826), and Jung (1923) to demonstrate the transcendence and depth that individuals in this stage have achieved in their journey towards greater integration of the ELT cycle.

These learning preferences and subsequent adaptations are the applicable components of Kolb's ELT wherein individuals can be assessed and guided by the result of the LSI inventory. Specifically, the emergence of a learning preference during the end of the Acquisition stage and the start of the Specialization stage is of particular interest. Kolb et al. (2000) stated that "there is an increasing process of specialization that begins at high school and becomes sharper during the college years" (p. 8). Few researchers, however, have focused on this transitional period wherein individuals develop a learning preference. Those who have (e.g., Baker et al., 2012; Gumm, 2004; Ozgen & Bindak, 2012; Pedrosa de Jesus et al., 2006) have gleaned fascinating insight into how the development of a learning preference impacts specific educational outcomes. Simply put, individual learners, as they develop a learning preference, react differently in educational contexts. Additional research is needed to determine the extent of how students deviate from each other as their learning preferences emerge and how they might differ in their response to educational experiences.

In 2013, Kolb and Kolb updated their learning preference orientation terms (See Appendix B). These new terms—Experiencing (AE-CE-RO), Imagining (CE-RO), Reflecting (CE-RO-AC), Analyzing (RO-AC), Thinking (RO-AC-AE), Deciding (AC-AE), Acting (AC-AE-CE), Initiating (AE-CE), and Balanced (CE-RO-AC-AE)—incorporate adaptive flexibility into the basic learning preference orientation in order to streamline descriptors. These new terms will be used in the current study to delineate nine different learning preferences among participants in order to establish a framework for how they might differ in their educational approaches. Examining how students respond to teacher modeling through the lens of Kolb's learning theories may offer better understanding of the variations in learning among students and the extent to which students' interpretations align with teacher intent.

Purpose of Study

This study intended to explore the ways in which string students transform and comprehend a teacher's model. I designed the following research questions to better understand how students might deviate from a teacher's intended purpose while modeling through the lens of Kolb's (1984) ELT framework as well as how students differ in their approaches and reactions to that model. Additionally, this study investigated how the LSI distribution of high school students compares to extant research regarding LSI profiles.

Research Questions

1. What is the distribution of Learning Styles Inventory (LSI) profiles among high school violin students?
2. In what ways do students attempt to reflect upon and transform a modeled concrete experience?
3. To what extent do students' transformations and comprehensions align with teacher intent?
4. How do students' grasping and transformation of a teacher's model vary in cognitive complexity from one another?

Rationale

The following is a brief overview of the individual practical and theoretical justifications for the current study as well as a how those rationales intersect within the string ensemble classroom.

Personal Justification

A string educator myself, I have the pleasure of working with instrumentalists who range from the beginners in sixth grade to the relatively advanced performers in my high schools. Like many other educators, I use modeling to demonstrate skills ranging from how to curve my pinky finger when holding the bow, to how fast I would like the vibrato during a specific part of a piece. As a novice instructor, I believed I was communicating in a meaningful way without using too much verbal communication to get in the way. As the years went by and I used the same techniques, my focus shifted more and more to how students reacted to my models. I began to notice that not all students reacted the same way to this method—it was, in fact, far from perfect. For example, while some sixth-grade students would flawlessly mirror back my actions and sound, others would only glean part of my demonstration and respond with a flawed performance that required immediate remediation. Still others would only attempt to imitate the sound that I produced regardless of any technique I was modeling.

Because string technique has so many components—the precarious, yet firm bow hold; the relaxed, upright posture in the back and across the shoulders; and the orientation of the instrument to the body to name a few—modeling technical skills for students seemed like the most direct means of producing optimal results in the shortest amount of time for a large group of students. For my beginning students, I would model how to physically hold the instrument and bow. This was in addition to basic musicality skills such as how the bow moves closer to the bridge during a crescendo or the manner in which I would like them to slow down during a *rallentando*. These challenges are summarized by Cribari (2014) as either "executive [or] performance skills" (p. 5) and are so varied and complex in nature that the most logical instructional approach would be a model that adequately addresses all these skills.

As my students progressed in skill, my models would become more complex. I would demonstrate where I would like the apex of a crescendo to arrive in a passage of music or how the eighth notes should be more off the string in a spiccato passage. Although my instructional goal was stated clearly—"Watch my wrist as I make contact with the string"—students were free to observe any aspect about my playing. I noticed that after I would model a passage regarding spiccato height and speed, the notes would suddenly be more accurate for some students. Others might have mysteriously learned the tricky rhythm of that passage. It seemed that when I modeled one skill, students were focused on another component of my performance. Each learner seemed to be focused on a different aspect of my modeling and I had far less control over the instructional outcome than I thought.

Practical Justification

Modeling has been proposed as a crucial component of music education that allows teachers to effectively demonstrate complex technical or musical skills (Barenboim, 1977; Dickey, 1991; Haston, 2010; Linklater 1997; Meissner & Timmers, 2020; Sang, 1987). Modeling has been used by music teachers to demonstrate basic performance technique and more subtle details of music performance, as well as to diagnose and remediate students' technical and expressive problems without the need for verbal dialogue that is potentially misleading or cumbersome (Millican & Pellegrino, 2017; Sang, 1987). Although modeling remains a component of teacher training as a means to convey complex instruction to students, researchers have yet to provide a meaningful and convincing link between teacher modeling and effective student interpretation of that modeling in a music classroom.

Music education researchers have focused on teachers' modeling behaviors (Baker, 1980; Dickey, 1991; Haston, 2010; Jetter, 1978; Quindag, 1992), but there has been a common assumption among such research that students uniformly understand how teachers intend a model to be perceived, reflected upon, and utilized. Through a better understanding of students' learning preferences and adaptability, how and what students internalize would become more evident. Furthermore, presuming students' internalization is not uniform, comparing their internalizations to a teacher's intended utilization of a model could expose misalignments. Music teachers might benefit from this research through an increased awareness of the various ways in which students observe, internalize, and conceptualize a teacher's model, as well as understanding students' learning preferences and adaptability. In turn, teachers would be provided with a better understanding of how to guide students' responses to modeling, and when supplements to modeling were necessary.

Theoretical Justification

ELT research also stands to gain from investigating musical modeling in a music education classroom. Application of Kolb's (1984) ELT to modeling research provides a way to analyze a student's response to a teacher's model in discrete cognitive steps. When those steps are better understood, and one student's learning cycle is compared to another student's learning cycle, variation in students' interpretation of a single model may be understood, in turn.

Building upon the ELT, Kolb posited the Theory of Growth and Development that described how learners respond to experiences in increasingly complex and flexible ways (p. 140). Kolb (1984) created the adaptive style inventory (ASI) as a way to describe "the degree to which individuals change their learning style to respond to different learning situations in their life" (Mainemelis et al., 2002, p. 11). In later years, the ASI and the KLSI were merged into a single inventory that allow researchers to determine subjects' learning preference based on nine orientations that consider the adaptive nature of that learner.

A comparison of high school students' KLSI scores to how they interpret a teacher's model might better describe how learners with various adaptive flexibilities and learning styles differ in their internalization of models. More specifically, KLSI data might provide a way of providing context for how students of various learning types or learning flexibilities interpret and internalize models. Potentially, a breakdown of learning occurs when a student's learning preference or flexibility prevent the effective interpretation or internalization of modeling. KLSI data, when paired with an analysis of individual students' learning processes, might help explain why any such breakdown might occur. KLSI data would also provide high school students with a greater awareness of their own learning preference and flexibility at an age when they are developing a greater appreciation of their own sense of self.

As hypothesized by Kolb (1984), high school learners fall in a transitional period of development and demonstrate much less adaptive flexibility than more advanced learners. This transitional period was referred to by Kolb as the specialization stage and is where learning preference begins to emerge. Kolb asserted that the specialization stage continued well into an individual's adult or higher-education setting. Possibly because the specialization of a learning style is more firmly established in adult or collegiate learners, high school educational environments have been largely overlooked by ELT researchers investigating the specialization stage. However, because of the potentially wide variety of learning preferences and adaptive flexibilities found in high school classrooms, this study has the potential to contribute a greater depth of understanding concerning Kolb's Theory of Growth and Development. Furthermore, the concept of adaptive flexibility in general is underrepresented in ELT research (Akrivou, 2008; Mainemelis et al., 2002; Yeganeh, 2007). Additional investigation is necessary to clarify how the ASI and Kolb's Theory of Growth and Development apply to learners at different stages of development.

Kolb's ELT, Music Education, and Modeling

Additionally, in the context of music education, specifically the context of modeling, Kolb's (1984) ELT functions as a roadmap towards clarifying the stages and subsequent processes of skill development. While Kolb and Kolb (2008) intended for the

ELT to extend beyond performance-based learning into less skill-based settings, the experiential cycle entrenched in the framework lays out an interesting sequence of potential learning events. In short, Kolb's ELT framework has the potential to lay bare the inner workings of how students process learning—such as responding to models.

For example, the initial impetus for learning, be it a formal directive from a teacher or an informally situated observation from that teacher, serves as the starting point for the cycle. This concrete experience (CO) can be as simple as a bowing direction or a more complex teacher-based directive concerning vibrato motion on the violin. From this CO, the student reflects on the observation (RO). In the RO, the student is given the opportunity to create a tension between the CO and their own learning. For example, the student reconciles the difference in bow directions or attempts to understand the component skills required for the vibrato motion. Subsequently, an abstract conceptualization (AC) takes place wherein the student engages directly with the RO in order to develop learning situated within the student's own learning context. This can potentially mean that the student realizes the bowing for this section is similar to a previously rehearsed phrase or that the vibrato motion is roughly equivalent to knocking on a door with one's knuckles. The crucial AC step allows the students to internalize the learning process and individualize for subsequent learning. Once the student has attempted to assimilate the experience through observation via conceptualization, the student must engage in the fourth step of the ELT, active experimentation (AE). Here the student tries out the new bowing or attempts to perform the vibrato motion. Once the AE step has been executed, the basis for a new CE is formed and the cycle is begun anew.

An interesting component of the ELT lies in the internalization—or lack thereof—within the AC step. Specifically, this process could consist of disassembling the task, connecting the task with previous experience, focusing on an incorrect component of the task, narrowing the focus to a handful of objectives, or other attempt to analyze the observation in order to create a viable experimental trial. The AC phase of the learning cycle is relatively vague—most likely to accommodate for the vast approaches used by student to reconcile earlier reflective learning in order to create a new experiment for the student. In a performance context, this cycle would potentially occur very rapidly and frequently though any given lesson as the student attempts to develop component skills towards a musical goal. The extent to which a teacher has control over this process is unclear. Because there are so many variables and potential outcomes within the cycle for a student, the ELT potentially allows for researchers to account for how different students might respond to a model in varying ways.

Definition of Terms

Abstract Conceptualization (AC)—The act of comprehending. Kolb (1984) notes that this is rooted in "conceptual interpretation and symbolic representation" (p. 41). Based on Piaget's (1952) model of constructionism during cognitive development, Kolb's abstract conceptualization stage is when individuals take the components resulting from the RO stage in order to generalize those concepts to past experiences or attempt to discern how other contexts are applicable to the present experience.

Acting—By balancing the AC, AE, and CE steps, these moderately adaptive learners tend to display goal-oriented behaviors through an understanding of how internal generalizations might apply to external events. These learners might excel at problem-solving or identifying personal needs.

Active Experimentation (AE)—The result of the AC stage, this process is the application of any generalizations or conceptualizations that might have resulted from dissecting an experience and imagining potential applications from similar contexts. Generally, Kolb (1984) notes that learners will extend their internal thinking in order to act on the environment resulting in a subsequently new CE phase.

Analyzing—Learners that display this learning style prefer to reflect (RO) and conceive logical, rational abstractions (AC). These learners enjoy more analytical, theoretical learning contexts.

Arco—This string technique is when a performer uses their bow to produce sound.

Balancing—The most advanced, adaptive learning style, learners demonstrating this profile combine all four phases of the learning cycle in a fluid, flexible manner by adjusting to various contexts based on moment-to-moment need. These learners often glean insight in unusual ways or apply resources in a novel and unexpected fashion.

Concrete Experience (CE)—The "tangible, felt qualities of immediate experience" (Kolb, 1984, p. 41). Grounded in Lewin's (1949) model as an external point of reference while learning, Kolb refined this definition to include a learner's perception of external events.

Deciding—When learners combine the AC and AE steps of the learning cycle, they display this learning preference. These learners most often appreciate applying theoretical models to a course of action.

Experiencing—When a learner prefers to apply the AE, CE, and RO phases to learning contexts, this moderately adaptive learning preference is assigned. These learners "find meaning from deep involvement in experience" (Kolb & Kolb, 2013b, p. 197).

Experiential Learning Cycle—A fundamental component of Kolb's ELT, this cycle consists of alternating steps of prehension/perception and transformation/processing as a learner incorporates external experiences into their internal schemas in order to manipulate those external experiences. "The process of experiential learning can be described as a four-stage cycle involving four adaptive learning modes—concrete experience, reflective observation, abstract conceptualization, and active experimentation" (Kolb, 1984, p. 40).

Experiential Learning Theory (ELT)—A holistic learning and development model designed by David A. Kolb (1984) built on the theoretical groundwork of John Dewey, Jean Piaget, Kurt Lewin, and Carl Jung that bridges the gap between cognitive behaviorist and constructivist theories of learning. Kolb's ELT is built upon the cycle of experiential learning as an ever-changing interaction between a person and their environment as they perceive and process information.

Imagining—The combination of the CE and RO phases, learners that prefer this orientation most often favor observation and reflection in order to seek patterns and relationships within external experiences. Also referred to as the Creating style (Kolb & Kolb, 2013b).

Initiating—The combination of the AE and CE learning steps, these learners prefer to "initiate action to deal with experiences and situations" (Kolb & Kolb, 2013b, p. 195).

These practical learners enjoy real-life contexts and creating new prospects through risk-taking.

Kolb Learning Style Inventory (KLSI)—Developed in 1971 by Kolb to "serve as an educational tool in increase individuals' understanding of the process of learning from experience and their unique individual approach to learning" and "to provide a research tool for investigating experiential learning theory (ELT) and the characteristics of individual learning styles" (2013b, p. 40). The KLSI has undergone multiple revisions—1976a, 1985, 1999, 2005, and 2013b—to better reflect the more nuanced adaptive combinations of learning preferences. A self-assessment tool, the KLSI is results in learning preferences or orientations to reflect "the uniqueness, complexity and variability in individual approaches to learning" (p. 40).

Learning Preference—Also referred to by Kolb (1984) as learning style or orientation, a learning preference is an individual's favored combination of perceiving and processing information during a learning context. This can include two adjacent phases of the learning cycle (e.g., CE/RO, AC/AE, AE/CE), a more adaptive and advanced combination of three learning cycle phases (ac/AE/ce, ce/RO/ac, ro/AC/ae), or a balanced combination of all four phases.

Modeling—The process of learning by observing and imitating a range of concepts or skills.

Pizzicato—Often abbreviated to "pizz," this string technique is when a performer plucks a string.

Reflecting—A three-phase, more advanced learning profile, learners with this orientation combine the CE, RO, and AC steps to make sophisticated relationships between immediate experiences and internal thoughts and emotions.

Reflective Observation (RO)—The process of internally dissecting an external event in order to transform perceptions into comprehension. Built upon Dewey's (1938) model of observation in an education cycle, Kolb (2013b) notes this process is when learners begin to process information received from a concrete experience.

Shadowbow—This practice technique is when a performer mimics bowing rather than actually produce sound on the instrument. There are several methods for this including hovering the bow over the strings of the instrument or placing the bow in the bend of the performer's elbow to mimic the bowing motion—often while utilizing the left hand to follow along with the performed music.

Thinking—The combination of RO, AC, and AE learning steps, these learners prefer abstract reasoning as a means of connecting analysis to technical applications.

Organization of Subsequent Chapters

This chapter began with a description and overview of modeling in a music classroom, a definition of the act of modeling, and a description of my personal interest and experience with modeling. I then laid out the need for the current study by pointing out the tension between how modeling comprises a fundamental component of music education and the lack of conclusive, extant research supporting modeling. A brief overview of the theoretical framework used in the study was then included. I then stated the research questions and defined important terms.

Chapter two is divided into two main sections of literature review: Modeling and Experiential Learning Theory research. The modeling section explores the contributions of notable researchers who investigated modeling music education as well as other fields. The ELT section lays out the field of noteworthy research conducted using Kolb's work as a framework as well as the theoretical basis that Kolb based his ELT upon. This section will also detail contributions for researchers investigating the Learning Styles Inventory and how that assessment applies to individual learners.

Chapter three details the design of the study. I describe participant selection, the research models used, the delimitation of participants from phase one to phase two of the study, the modeling video, the interview process, and subsequent coding procedures. Additionally, I present reliability and validity—with regards to both quantitative and qualitative data collection methods.

Chapter four presents the results of the study. I analyze the results of phase one are and compare that to extant research. I then detail the noteworthy findings of the subsequent phase two with a description of how the significant themes emerged from the qualitative data in reference to the research questions.

Chapter five presents a summary of the study's research problem, design, and findings. I present conclusions based on the identified themes in relation to the research questions and their relationship to previous researchers' findings. I then suggest recommendations regarding the implications of the findings and how they impact music education, ELT research, and future research.

CHAPTER TWO: LITERATURE REVIEW

Modeling

Music educators have utilized modeling as a fundamental component of classroom instruction (Dickey, 1991; Linklater, 1997; Meissner & Timmers, 2020; Millican & Pellegrino, 2017; Sang, 1987). My review of research relating to music modeling revealed mixed results regarding its effectiveness in the classroom. The following review of related literature provides an overview of research into modeling and its impact on student learning and achievement both in and out of the music classroom.

Non-Musical Motor Skill Modeling Research

One of the fundamental components of musical performance, motor skill development is a major factor in a great deal of music education—particularly string education. Modeling relies on transferring complex sets of motor skills from the model to the learner. Kerns (1991) investigated how effective modeling was on the acquisition of motor skills. The author attempted to determine this impact by measuring the motor and cognitive responses to combinations of modeling and physical practice. The study required participants to learn a button pushing sequence by allowing them to either observe a model perform the task, physically practice the task themselves, or combine both modeling and physical practice. Rooted in Bandura's Social Cognitive Theory of Observational Learning, Kerns attempted to support Bandura's theory by comparing these two widely accepted methods of skill acquisition. In the study, Kerns found modeling to be effective when participants performed simple tasks, such as the most basic button pushing sequences. However, when Kerns (1991) looked at the data across all trials and combinations of variables, neither modeling nor physical practice impacted participants' ability to manifest the cognitive components of the task. Essentially, modeling and physical practice yielded similar results.

On a general level, these results indicated that motor skill development is not reliant on modeling to be successful—learners can make similar progress through direct training on a task. Kerns (1991) did come to an interesting conclusion when analyzing the rate of error between the variable groups. The participants that either physically practiced the task or observed a model and subsequently practiced the task had significantly fewer mistakes than did their modeling-only counterparts. Kerns determined that this result, coupled with the above findings of equivalent practice and modeling results, suggested that modeling might have been effective as a means to convey cognitive aspects of a physical task but ultimately lacked the crucial motor components that comprise that physical task. Unless the subject receives a complete picture of the motor skill, modeling will be less effective than physical practice. Essentially, although modeling might have an effect, the observer is receiving incomplete information regarding that task due to a variety of unseen components such as the force exerted or muscle groups used by the model. Kerns' results revealed that modeling, although potentially an effective means of learning a motor skill, might yield imperfect mental representations that result in flawed performances.

Modeling, as a training tool, relies on a cognitive component for learners to translate that model into external manifestations of the task—preferably with as much context as possible. Carroll and Bandura (1987) examined how effective visual observation is for learners attempting to transfer cognitive representations into a motor skill. Participants were asked to observe a model perform complex button pushing sequences without being able to see their own practice motions. Some participants were instructed to perform the button pushing motor task simultaneously with the model. Other participants were asked to observe the model first, and then practice the task. During the test sequences, half of both groups' participants were permitted to see their actions on a video display while the other half performed their task without monitoring their movements. Additionally, Carroll and Bandura measured how the observational variables impacted cognitive representation by testing participants for their memory of the recently performed button order. Participants were shown either (a) four pictures of the button order and asked to select the correct representation of the recently performed task or (b) a picture of the buttons in a random order and asked to correctly sequence the recently performed task.

Carroll and Bandura (1987) summarized their findings by positing that when participants were able to coordinate their motions with an observational model—either simultaneous or recently performed—they were able to learn better. However, this observational learning is not flawless. Without a clear representation of the observed task, participants' accuracy was lower during the initial portions of the trials. As the trials and subsequent tests went on, participants were able to refine their motor skill and cognitive representation. Participants' success, therefore, was a result of internalizations of the specific motor tasks in addition to the repetitions of those motor tasks. Carroll and Bandura suggested that "production proficiency was mediated by representational acquisition rather than being directly forged by accurate performances cued by modeling stimuli" (p. 395).

Learners, therefore, require both an external and internal process of development throughout the modeling process. Carroll and Bandura (1987) expounded upon this translation from external model to cognitive representation by pointing to an increase of cognitive accuracy from participants over the course of the trials regardless of the method of visual monitoring or timing of the modeled action. In short, the participants were able to learn the motor task as a "function of the number of exposures to the modeled information" (p. 396). The combination of error detection or a concurrent model were shown to improve the motor task performance and subsequent cognitive representation. Carroll and Bandura summarized this finding by stating that participants might gain a level of independence from external modeling or visual observations by refining their internal cognitive representation as well as relying on previous experience and tasks. As participants built up an internal cognitive representation of the motor task, they relied less frequently on the model.

Modeling in a Music Classroom

The above researchers posited how learners apply external sources in order to develop internal conceptualizations of the performed task. In turn, learners can then apply that concept of the task to manifest their own externalization of the activity. In the field of music education, this process has been a central component of pedagogy. The research reviewed below demonstrates a tension between music education and modeling regarding effectiveness, application, usefulness, and methodology.

As a core component of music education, modeling has been used as a go-to pedagogical tool to disseminate complex, non-verbal instructional material directly to students. In a crucial study measuring modeling's effect on music learners, Sang (1987) investigated the interaction between a teacher's modeling skill and a student's performance. For the purpose of the study, Sang identified four components of a teacher's modeling skill level: (a) basic technical skills such as tone or articulation on all instruments, (b) more nuanced musical skills such as vibrato or phrasing, (c) basic posture and set-up skills such as bow hold or embouchure, and (d) the ability to model melodic and rhythmic melodies. By observing how these skills interact with pupil performance, Sang aimed to make a connection between teacher modeling ability and pupil performance. Teacher subjects ($N = 19$) randomly selected ten to twelve beginner students ($N = 204$) in their classes and were administered a battery of four diagnostic tests meant to determine the teachers' skills at modeling. The student participants were given a pre-test to determine their performance level. After a year of instruction, the students were administered a post-test using the same criteria as the pre-test.

Overall, the results seemed to vary according to several factors. When Sang (1987) analyzed the teacher modeling skill data and compared it to pupil performance using multiple regression, he found that teachers' modeling skills resulted in a wide variety of learner outcomes. Although Sang was cautious and avoided suggesting a causality between modeling skill and student performance level, he did posit that "a teacher's ability to model…the degree of use of demonstrations in the instrumental class has bearing upon pupil performance levels. Teachers who have stronger modeling skills and apply those skills in teaching are more likely to produce students who perform better than teachers who do not" (p. 158). According to Sang, how a teacher models has an impact on how students, at least at a beginner level, learn.

By identifying the practical outcomes of modeling, Sang (1987) demonstrated a fundamental need for modeling to be included in a music classroom. It is less clear, however, how impactful musical modeling is as compared to other instructional methods. In order to differentiate modeling from other pedagogical techniques, Rosenthal (1984) conducted a study designed to compare modeling to other common musical instruction methods using a tape recorded model. Noting that few researchers had investigated how verbal instruction and teacher modeling interact with student musical performance, Rosenthal set out to determine the effectiveness of teacher modeling, verbal instruction, or a combination of those methods on student learning. Collegiate graduate and undergraduate wind and brass music students ($N = 44$), each of whom were randomly assigned into one of the four treatment groups, were taken into a practice room and shown an obscure piece of music. Depending on their treatment group, participants were then presented with (a) a recording of a guided model consisting of a verbal instruction designed to focus on tempo, style, rhythmic interpretation, phrasing, and dynamics along with a performance of the piece, (b) a recording of three performances of the piece without any verbal instruction, (c) a recording of only the verbal instruction without any performances, or (d) no recording of either verbal instruction or performance modeling. All participants were given three minutes to practice except for the treatment group that did not receive a recording—they were provided with seven additional minutes of practice. Once the practice period was over, the participants made a recording of their own performance which was later assessed by two independent evaluators measure by measure for note accuracy, tempo, rhythm, dynamics, phrasing, and articulation.

The treatment variables—verbal instruction, a recorded model, or a combination of both—impacted performance outcomes. Rosenthal (1984) found significant differences among the treatment variables only on a measure-by-measure basis by comparing the mean score of subjects in each variable. This was only true for the categories of note accuracy, rhythms, dynamics, and tempo. Rosenthal reported that participants in the model-only treatment group scored the highest on all variables determined to be significantly different. Furthermore, participants in the verbal instruction only and practice only treatment groups scored notably lower than other participants. Rosenthal concluded that the "results of this demonstrated that different modeling conditions can affect subjects' performance" (p. 269). Rosenthal found that an aural model is stronger absent any verbal guidance. "The guide may have hindered subjects' musical performance, although it may have helped then to describe the selection verbally" (pp. 269–272). While the duration of the treatment in this study was short and only focused on collegiate level musicians, Rosenthal pointed to the effectiveness of modeling and, to a lesser extent, modeling paired with verbal instruction over verbal or practice only settings.

Rosenthal's comparison of modeling in conjunction with verbal instruction and practice variables yielded significant results. Meissner (2017) further explored modeling's effectiveness when teaching expressive musical performance compared to other, detailed pedagogical strategies such as inquiry, discussion, explanation, singing, movement, mental practice, and reflection. When gathering data from 14 private instruction students aged 9–15 and playing a variety of instruments, Meissner conducted interviews, questionnaires, notes from the nine teachers' meetings, observations from lessons, and assessments from participants' culminating concert performances. Final performances were assessed and scored based on expressiveness by a third-party adjudicator.

Throughout the data collection process, the nine teachers utilized a wide array of pedagogical methods in an attempt to convey musical expressiveness. Meissner (2017) was able to compile a list of both typical pedagogies, such as modeling, inquiry, and imagery, as well as more unusual and innovative approaches that included mental practice and improvisation. Ultimately, analysis of all instructional strategies and final performance expressiveness did not yield significant results—including modeling. Meissner concluded that expressive performance was a complex musical skill and most likely required a combination of pedagogical approaches unique to each student. "It could be that the effectiveness of these methods [modeling, imagery, gestures, inquiry, and mental practice] is dependent on musical style…, students' age, level of playing or perceptual learning style" (p. 130). Meissner observed a wide variety of detailed, applicable instructional strategies among younger musicians performing on a variety of instruments but was unable identify modeling as a significant factor leading to a more expressive musical performance in response to live lessons. In contrast to Rosenthal's (1984) findings regarding modeling, Meissner's lack of significant differences among more complex expressive techniques suggest that modeling might be more effective as a tool to convey more fundamental musical components of rhythm, note accuracy, and dynamics.

Researchers seeking to demonstrate modeling's effectiveness within the context of a music classroom often used a recording to create a standardized model as a stand-in for the teacher (Baker, 1980; Cribari, 2014; Dickey, 1991; Guerriero, 2011; Haston, 2004; Henley, 1999; Hewitt, 2000; Linklater, 1997; Matthews, 2014; Morrison, 2002; Quindag, 1992; Rosenthal, 1984; Sang, 1987). This is a particularly salient concept when modeling a string instrument—there are many more visual focal points as compared to wind or band instruments. As such, a recording would—at the very least—provide a stable, consistent model for learners to utilize as an exemplar of both technical and musical components. String classrooms, where the external movements combined with aural stimuli create incredibly complex instructional targets, would be the most susceptible to variance among student interpretations of a model. Indeed, Quindag (1992) found no significant effect between modeling and beginning string participant performance achievement in a rare modeling study conducted in a string education setting. Prior to any treatment, prospective string students ($N = 23$) were administered music aptitude and learning style inventories. Quindag then randomly divided the participants into three groups and applied either guided aural modeling, guided aural-visual modeling, or no modeling to the respective groups. All groups received identical instruction for the first four weeks of the study. After the four-week introductory period, Quindag began a ten-week treatment of the modeling conditions. At the conclusion of the ten-week treatment period, the students completed a posttest performance that was evaluated by adjudicators based on components of aural skills—intonation, tone, tempo, bowing, rhythm, and dynamics—as well as physical skills—posture, left hand positioning, bow hand shape, and bow arm motion.

After controlling for student differences in musical aptitude, Quindag found no significant differences of performance achievement between each of the modeling treatment groups. Additionally, learning modality, grade level, and instrumentation variables yielded no significant relationships among overall aural, visual, and composite scores. However, the individual composite mean scores for the two modeling treatment groups were higher than the no-modeling group. Though not empirically conclusive, modeling for certain learners yielded positive results. This led Quindag to suggest that the "modeling conditions used in this study could be considered a viable supplement to traditional practice procedures for beginning string instrumentalists" (p. 82). Quindag's findings were consistent with extant research of the time demonstrating contradictory findings—namely, that modeling is effective but not statistically so as compared to other pedagogical methods.

Few researchers have addressed the visual-aural conditions that might impact string learners. In fact, Quindag (1992) addressed this in the adjudication component of the posttest—the visual and aural components were separated. Quindag's results suggested that the visual and aural components of string playing might be transferable via modeling, though was unable to demonstrate statistical significance within the study. Although Quindag also found no significant effect on students of different learning styles—in this case, aural, visual, and tactile—other factors might potentially impact students' perception of a string model that contains a wealth of aural and visual information. It could be that different students interpret this wealth of stimuli in different ways leading to mixed results.

The systemic tension between researchers such as Rosenthal (1984) and Quindag (1992) is pervasive when comparing whether or not modeling is an effective tool within the music education classroom. The key difference between Rosenthal's and Quindag's results might be a result of their target participants—wind and brass students as compared to string students, respectively. Also investigating a sample of string participants, Guerriero (2011) found mixed results in a study that looked at how students react to different types of observational learning contexts. These contexts included observational learning (simply viewing a model), forced-choice learning (verbalizing if something is right or wrong in response to a model), and goal-shaped learning (being coached by a teacher in response to a model). While looking at beginner violin students' responses to observation, forced-choice, and goal-shaped learning contexts, Guerriero found that observational and goal-shaped learning contexts showed gains in executive scores (e.g., posture, hand shape, bowing motion) but failed to show significant results for any of the other component areas such as right hand technique, rhythm, and tone. Although goal-shaped learning scores for right hand and rhythm increased, the results were not statistically significant. None of the learning contexts showed significant gains in the rhythmic and tonal accuracy components. Guerriero suggested that these results implied a "sequence or hierarchy of learning relating to complex tasks such as violin playing" (p.

71). Specifically, the task of violin playing includes so many visual and aural tasks that learners may be challenged to learn them all simultaneously. Instead, learners may compartmentalize these skills and attend to them individually. Although Guerriero suggested that learners might focus on fundamentally important skills first—such as posture and hand shape, it is unknown how these approaches might differ within different student ability levels and learning styles.

Quindag (1992) and Guerriero (2011) were unable to identify significant findings as a result of modeling in a string classroom. Guerriero, building on Rosenthal's understanding of how string students might utilize a variety of focal points because of a single model, shifted the focus of the research to the method of modeling. As a result, Guerriero was able to demonstrate that the way string learners process a model—and all its inherent complexity—yield differing outcomes regardless of the modeling methodology. By varying the context of modeling, Guerriero found that violin students differ in how they react to a model on a fundamental level resulting in divergent internal processes. Building on this concept of decentralized, constructivist modeling research, Hewitt (2001) sought to compare the effectiveness of self-evaluative methods and external tape-recorded models. Hewitt studied woodwind, brass, and percussion band students ($N = 82$) in grades seven, eight, and nine from a junior high school in a southwestern state suburb. Hewitt (2001) randomly split students into one of eight treatment groups that combined the variables of modeling, self-listening, and self-evaluation strategies (e.g. Modeling—Self-Listening—No Self-Evaluation or No Modeling—Self-Listening—Self-Evaluation, etc.). Over the course of nine weeks, pre-treatment, treatment, and post-treatment phases were administered. During the two-week pre-treatment phase, students received training regarding self-evaluation, were introduced to the musical excerpts, and were administered a pre-test. During the five-week treatment phase, students applied their combination of variables according to their assigned treatment group. Students in groups containing the modeled variable received an audiotape containing an ideal recording of the musical excerpt. Students assigned to self-listening groups received weekly recordings of their own performance. An evaluation form was given to students in self-evaluation treatment groups with instructions regarding how to complete the form. A two-week post-treatment phase occupied the last two weeks where students underwent assessment to compare their pre-test scores and determine validity of the procedures.

Recorded modeling was an effective method of increasing performance scores in high school instrumentalists in categories of tone, technique/articulation, rhythmic accuracy, tempo, and interpretation as compared to non-modeling instruction. Hewitt (2001) found that intonation and melodic accuracy components were not significantly impacted by the recorded models when compared to the non-modeling treatment groups. Furthermore, when modeling was combined with the self-evaluation tools found in the study, students showed significant gains in tone, melodic accuracy, rhythmic accuracy, and musical interpretation components as well as overall performance when compared to non-modeling treatments. Hewitt concluded that learners might draw inaccurate conclusions regarding playing ability without a model for comparison. Without a model for comparison, learners' performance goals might be negatively impacted. Hewitt suggested that modeling and modeling coupled with self-evaluation was an effective means of learning. The results, while mainly in favor of modeling, were tempered by some unusual findings. For example, Hewitt found that students who did not self-evaluate but did listen to a model performed as well as those who did no listen to a model except in the categories of technique and tempo. In short, Hewitt posited that modeling is often effective but not in all situations and not for all musical components.

Modeling is, therefore, dependent on context in addition to the individual learner. Hewitt's (2001) and Meissner's (2017) tempered results again highlight the tension between what music education researchers can demonstrate with regard to modeling's effectiveness and how modeling is highly dependent on context—including both the target learner and the application methodology. Teachers and researchers can—and often do—control the application methodology of modeling within a music classroom. Even when comparing modeling with other teaching modalities, researchers have sought to clarify how effective modeling can be on specific components of music education. Henley (2001) studied how modeling interacts with musical practice strategies relating to tempos using empirical methods to compare modeled and non-modeled learning outcomes. High school-aged woodwind and brass students ($N = 60$) from the American Midwest and South were given a melodic etude appropriate to their playing ability. Students were then grouped into one of six treatment groups using a 2 x 3 experimental design. Students were presented with either a model or no model and practiced using a steady increase in tempo (bpm = 42, 49, 56, etc.), only at performance speed (bpm = 84, 84, 84, etc.), or alternating between slow and performance speeds (bpm = 84, 42, 84, etc.). Practicing for approximately 20 minutes using either modeling or non-modeling conditions as well as the practice tempo conditions, students concluded their session with one final post-test performance. Judges then analyzed the student performances for accuracy in pitch, rhythm, articulation, and tempo.

Students in the modeling treatment groups produced moderately greater results than did the non-modeling treatment groups in regard to rhythm and percentile increases in tempo accuracy. Model and non-modeling groups showed no significant differences in gains related to pitch percentile gains or overall tempo differences. Henley (2001) summarized the outcome of the study stating that modeling's impact was mixed. Modeling might have yielded improved rhythmic or tempo accuracy. Participants' pitch discrimination, however, was less impacted by modeling and was overall unclear. Henley also presented anecdotal evidence gathered during the study suggesting that the model used might have been used by students in unintended ways. Several participants seemed to utilize the model as a non-specific teaching tool that allowed those learners to glean additional information not immediately salient to the study. For example, though participants were guided towards rhythmic performance components, several learners noted faults in their own playing tangential to the instructed rhythmic task. Again, although modeling was used effectively by some students in some contexts, Henley was unable to determine its widespread effectiveness on a variety of musical components.

As seen with studies by Quindag (1992) and Guerriero (2011), modeled musical contexts often encompass skills and concepts that are complex enough to be interpreted differently by individual learners regardless of whether students are string or wind and brass players. Morrison (2002) sought to isolate the effectiveness of visual and aural components of modeling in order to determine modeling's impact on large ensemble instrumental students' learning. Using a pre- and posttest research format, Morrison divided seventh-grade band students (*N* = 64) in an experimental treatment group that received a recorded model during their band classes twice a week for a five-week period while the control group received no additional modeling instruction. In addition to the pre- and posttests, each group was assessed on pitch accuracy, tone quality, musicality, and rhythmic accuracy four more times. Morrison found that use of an aural model showed no significant results concerning the degree of achievement in any of the measured categories—pitch, tone, rhythm, or musicality—as compared to the no-modeling group.

Morrison (2002) did make an unusual conclusion by comparing progress that the modeling and no-modeling treatment groups made during the study. Although the final posttest did not reveal statistically significant results, Morrison posited that modeling instruction created an impact on the rate of improvement. The modeling group demonstrated the most progress after two weeks of instruction while the non-modeling group made slower gains across the five-week data collection. The modeling group, however, did not continue their rate of improvement beyond the initial two weeks of the trial. Morrison's unexpected findings pointed to the potential variance of effect that instructional modeling creates in learners.

Although several researchers (Cribari, 2014; Guerriero, 2011; Morrison, 2002; Quindag, 1992) remain divided on modeling's impact on student achievement, perhaps the impact that modeling leaves is less homogenous than previously predicted and requires an individual approach to pinpoint how students might be using that method. Further highlighting the need for an individualistic lens when studying modeling is Dickey's (1991) mixed findings regarding modeling effectiveness across four different measures of musical achievement. Dickey studied band students (*N* = 128) from three middle schools in a suburban Southeastern Michigan school district. Students were divided into four groups: Verbal instruction (control)-Schools 1/2, Modeling instruction (treatment)-Schools 1/2, Verbal instruction (control)-School 3, Modeling instruction (treatment)-School 3. Four assessments were used as pre- and post-tests to determine gains in categories of musical achievement—e.g., rhythmic coordination, application of a melody over a steady beat, musical discrimination, and Gordon's Musical Aptitude Profile measuring tonal and rhythmic imagery as well as musical sensitivity. Over the course of 45 lessons, band students were presented with music from a method book and repertoire. In the study, the instruction centered around primarily verbal communication for the control groups and primarily modeling activities for the treatment groups. As an example of the different responses to student performances, the teacher in the verbal/control group might have responded to a poor tone in a performance by describing the technique necessary for playing with an acceptable tone quality. The instructor in the modeling/treatment group would have responded to the same problem by modeling various tones and asking students to compare good and sub-optimal tone qualities.

Live modeling—perhaps the most common form of instructional modeling—was shown to have some specific benefits. Dickey (1991) found that modeling was an effective method of instruction as compared to verbal methods in specific musical performance areas, but not general musical performance. Subjects in the modeling treatment groups performed significantly better on rhythmic coordination and application of a melody over a steady beat but did not demonstrate a significantly increased ability to make musical discriminations as compared to the verbal control groups. Furthermore, Dickey pointed out that musical discrimination was crucial to all aspects of performance success. Though modeling strategies did not yield empirically significant results with regards to general musical discriminations, those same participants clearly demonstrated adequate enough discriminations to make significant gains in the other measured tests. Dickey suggested that because the subjects were able to demonstrate improvement on specific components of musical discrimination, perhaps those subjects were unable to transfer general musical discriminations from classroom experiences to the test measures. Dickey's explanation of the outcomes, though contextually valid, still suggested inconclusive results when comparing verbal instruction to modeling techniques.

Dickey (1991) was able to demonstrate modeling's variance among learners within several components of musical education. These results support the emerging theme that modeling is a context-driven, often student-centered activity that impacts learners in different ways according to myriad variables. Other researchers (Guerriero, 2011; Morrison, 2002; Quindag, 1992) have, at the very least, determined that modeling is not a detriment to students as compared to other pedagogical techniques. Haston (2010), in an attempt to differentiate how effective models are in comparison to solely visually instructional methods, placed beginner wind instrumentalists ($N = 24$) into two treatment groups for 15 weeks. Students in the aural-visual treatment group participated in vocal, rote, call and response, and modeling activities while students in the visual-only treatment group used only written print music. After the trial period, participants performed a prepared piece and were scored as a posttest. Although participants in the aural-visual group did score higher on the posttest, Haston found no statistically significant differences between visual-only and aural-visual treatment groups. Haston summarized by stating that modeling's effectiveness can be presented as a beneficial teaching tool, or at the very least, not inhibitive to the instructional process. Haston, faced with non-significant findings, was unable to draw a statistically grounded conclusion that modeling is superior to other instructional methods.

Researchers studying modeling in the context of a variety of frameworks (Guerriero, 2011; Hewitt, 2001), pedagogical applications (Dickey, 1991; Henley, 2001; Meissner, 2017; Morrison, 2002), and subject content areas (Quindag, 1992; Rosenthal, 1984) have been unable to arrive at a consensus regarding modeling's effectiveness. The overall uncertainty regarding modeling from an empirical viewpoint—as compared to modeling's classroom utility—has resulted in a continual expansion of research methodologies and participant samples. In a pseudo-longitudinal study format using elementary aged learners, Linklater (1997) found that modeling had both short- and long-term results. Fifth- and sixth-grade beginning clarinet students ($N = 118$) were divided into groups and given recordings with accompaniment and either video/aural models, aural-only models, or no models. Prior to the treatment period, students' musical aptitude was measured. Students then participated in the study for eight weeks and, upon the conclusion of this treatment period, given a posttest rating visual/physical criteria—embouchure, positioning, and posture—and aural/musical criteria—tone, intonation, rhythmic and melodic accuracy, and intonation. To determine how the type of modeling might impact retention, participants were also given the posttest twice more—20 and 32 weeks after the conclusion of the study.

Linklater (1997) found that immediately after the treatment period, students in the video/aural modeling group scored significantly higher than did students with no model on visual/physical criteria. The same group demonstrated significantly higher scores on the tone and intonation subset of the aural/musical criteria in the delayed posttest trials. Though Linklater was unable to point to significant results between the other modeling treatment variables and performance criteria, there were noteworthy differences between treatment groups and their respective average posttest scores. "An examination of the [posttest] mean scores for the three tape groups also showed that the modeling-videotape group tended to have the highest [posttest] mean scores, followed by the modeling-audiotape group, with the nonmodeling-audiotape group having the lowest [posttest] mean scores" (p. 411).

Though not a statistically significant driven reporting measure, the difference in the mean scores suggested that the degree of modeling might have had an impact on student performance criteria. Linklater (1997) also noted that musical aptitude might have impacted how students applied the various model treatments. While noting that parental involvement might have been a contributing factor, students with a higher musical aptitude used all modeling tapes more frequently. However, Linklater speculated that perhaps learners require a foundation of adequate musical discrimination in order to benefit from musical modeling—either visually or aurally. More specifically, students with greater musical aptitude might have been able to direct their focus towards salient aspects of the model more effectively than students with lower musical aptitude. Linklater's noteworthy distinction in this matter lent credence to that although modeling might be an effective means of generally impacting student performance, it might have yielded different results for different students according to—in this case—musical aptitude.

The detailed depictions of modeling posited by Linklater (1997) further suggested that individual participants' responses to modeling might be highly dependent on variables that are difficult to quantify. Building on these findings, Cribari (2014) attempted to clarify whether aural or aural-visual modeling is more effective in the development of performance and technical skills of third-grade beginning recorder students using a long-format study similar to Linklater's methodology. Prior to any instruction, students completed Gordon's Intermediate Measures of Music Audiation assessment designed to determine music aptitude and were randomly assigned into two classes. Cribari instructed those two classes of recorder students from either the back of the classroom—aural-only—or from the front—visual-aural. In each of the classes, Cribari modeled instruction and skills needed to learn the instrument, but the back-of-the-classroom group did not receive visual modeling—only aural. After five months of lessons, the students were evaluated based on their performance and technical skills.

Using an ANOVA to determine the effects of modeling and aptitude on students' recorder skills, Cribari (2014) found no significant differences among performance skill, technical skill, or overall recorder skill among visual-aural or aural-only variables. Though Cribari concluded neither modeling condition impacted student performance or technical skills, musical aptitude was determined to impact how well students learned from those models. Significant differences were revealed among students with high and low musical aptitude when evaluating performance skills. Furthermore, students with a lower musical aptitude developed greater technical skills regardless of the modeling condition. These differences in how students of different musical aptitudes respond to models suggest that students vary in their approach to musical development when utilizing a model based on multiple factors. In discussing how students potentially fail in their application of a teacher's model, Cribari noted that learners who paid too much attention to the physical or technical components of recorder performance might have been more likely to create less musical performances. Cribari tempered that observation by noting that visual modeling of basic recorder skills is a definitive starting point for many beginners. Indeed, learners who fail to acquire the basic technical skills of performance will likely be unable to make much progress with or without a model regardless of other more advanced music discrimination skills. The low aptitude students might be focused on more basic, visual concepts and are unable to progress within the teacher's modeled sequence of instruction that both yields and requires more complex reflection and conceptualization of the modeled task.

Modeling, according to Cribari (2014), was more effective for some learners based on skills they may or may not have developed in other contexts. Cribari's participant sample—third-grade beginner recorder students—could be viewed as an attempt to isolate individual learners' external variables as much as possible. Several variables—such as executive skills and musical aptitude—were important components for participants to best learn in response to a model. A modeling study conducted by Baker (1980) using similar participant grade levels found more positive results. Baker compared inappropriate and appropriate performance models on third- (n =39) and fourth-grade (n = 36) music students' song type preference and ability to discern performance accuracy. Students in the study were engaged in identifying soft/loud dynamics and fast/slow tempi during the treatment period. Students in the inappropriate treatment group were exposed to a tape-recorded model and performed lullabies performed too quickly and loudly as well as chanties performed too slowly and quietly. The appropriate treatment group heard and rehearsed the pieces at the correct tempo and dynamic level. Pre- and post-test assessment involved students listening to appropriate and inappropriate performances and indicated that the recordings were correct or incorrect.

The young students in the study demonstrated that a performance model has a great deal of influence over how those students potentially perceive a performance's subsequent accuracy. Baker (1980) found that participants' concept of performance accuracy was impacted by the manner in which songs were performed in class—a sort of cumulative effect over time. Additionally, individual participants' performances might have been impacted by general in-class performances. The model, regardless of its accuracy, serves a large role in student learning. When given a model within a classroom setting, Baker showed that young students identify the model as a starting point for subsequent rehearsals. Essentially, the appropriateness or accuracy of a modeled performance allows students to establish a baseline against which they can potentially compare their own performance regardless of the quality of that model.

Although Cribari (2014) and Baker (1980) studied similar age groups' learning processes—and made largely contradicting conclusions regarding modeling's effectiveness—they measured modeling in interestingly disparate fashions. Cribari's results highlighted the need for a better understanding of learners' divergent internalizations in response to a model by analyzing how participant performance. Baker utilized a non-performing format designed to gather data based on how participants internalize and utilize a musical model outside of a performing context. By removing executive and performing skills, Baker was able to isolate the process by which learners apply a model to their own context and experience. Using a similar non-performance research methodology, Matthews (2014) attempted to analyze how music teachers model in practical contexts by examining how teacher performance and modeling impacts teacher effectiveness. Specifically, Matthews studied students' perceptions of teacher models, the effectiveness of a teacher's model among students on a variety of instruments, and how teachers incorporate specific musical components into their models. To do so, Matthews applied a mixed-method approach to gather self-reported quantitative responses via a questionnaire and qualitative long-form written and interview responses. Undergraduate wind or percussion music students at a university (N = 275) participated in the first phase of the study. Based on their results, Matthews contacted band teachers mentioned in their responses (*N* = 109). Students' and teachers' responses were then compared.

Although researchers such as Dickey (1988) and Linklater (1988) found results supporting modeling effectiveness—at least with specific, concrete skills, Matthews (2014) concluded that student interpretations—and therefore outcomes—often differed. Matthews found both students and teacher participants indicated that modeling was a frequent occurrence in the ensemble classroom. However, that frequency merely suggested that modeling was a valued instructional technique—a conclusion drawn by several other researchers (Meissner & Timmers, 2020; Millican & Pellegrino, 2017). In fact, many student perceptions regarding modeling's intent differed from their teacher's anticipated instructional goal. Specifically, many students reported that they assumed their teacher was modeling rhythmic accuracy far more frequently than was reported by teachers. "A teacher may model to demonstrate a musical phrase using dynamics and articulation, but the student uses the model to learn or improve the rhythm while missing the teacher's intended goal" (p. 74). This tension between how students perceived their teacher's model and the teacher's goal suggested a fundamental misalignment between teacher intent and what learners might have actually been learning. Although Matthews found that teachers value modeling in the musical classroom, how students interpret that model might be out of the teacher's hands.

Researchers' shift away from modeling's impact on specific musical and technical skills in a classroom and towards a better understanding of how individuals might utilize models in different ways—as seen in Matthews (2014)—is indicative of how modeling's effect on learners is highly contextual. Rather than comparing modeling to other pedagogical techniques or measuring its practical, tangible outcomes, Matthews was able to identify that participant interpretations differed on a fundamental level between learner and the teacher/model. The overall mixed results from the above researchers regarding modeling's effectiveness as compared to other pedagogical techniques suggests that studies measuring modeling outcomes are impacted by student-centered variables outside of the researchers' considerations. Research into modeling should consider if and how individual learners utilize models according to their own unique contextual needs.

Learning by Imitation and Experiential Learning

The skill of modeling is rooted in learning by observation and imitation. A context-driven activity, modeling via observation and imitation allows learners to glean both the process and the outcome of a specific activity. "Observation can be a very efficient learning process. Through modeling, one can learn not only how to perform a behavior, but also what will happen in specific situations if one does perform it" (Hickcox, 1991, pp. 99–100). Modeling—as a fundamental form of observational learning—can function as a clear starting point for an individual's learning cycle. The following literature review will detail the development of theoretical frameworks involving observational learning in an educational context and how they holistically intersect in Kolb's (1984) Experiential Learning Theory.

Dewey's Educational Reform

The interaction of observational learning and motor skills can be traced back well before the contributions of John Dewey. Dewey (1897) set in motion educational reform for a great many components of modern education—including utilizing school as a place for social change and individual fulfillment. One such pivotal contribution includes an approach to cognitive understanding wherein learners might integrate formal education, work or vocational training, and personal development into a cycle of experiential learning. Dewey (1938) cited the importance of the "intimate and necessary relation between the processes of actual experience and education" (p. 20). In short, Dewey posited that students should be actively involved in the learning process rather than passively taught theories absent any practical application. Indeed, the ongoing process of education is a constant shift of contexts that yield fundamentally new and ever-evolving experiences. Essentially, Dewey stated that education ought to arise from connecting learning to concrete, actual experiences and not learning for its own sake.

Dewey's concept of education was rooted in the manifestation of internal states in order to create external results. In discussing the method of education, Dewey (1897) suggested:

> I believe that the active side precedes the passive in the development of the child nature; that expression comes before conscious impression; that the muscular development precedes the sensory; that movements come before conscious sensations; I believe that consciousness is essentially motor or impulsive; that conscious states tend to project themselves in action. (p. 79)

Dewey made it clear that there is a dichotomy between internal consciousness and external motor functions when learning. Furthermore, Dewey placed an emphasis on the active components of learning that create a result. Learners must do something before they can establish a contextual framework for that outcome. Experience can, therefore, be the impetus for thought or subsequent action. By integrating the application of learning into the educational process, Dewey laid the early groundwork for experiential learning and a better understanding of how modeling might fit into that framework. Miettinen (2000) summarized Dewey's concept of outcome-based learning by suggesting that contexts are often immediately shaped because of an action's outcome. Learners thereby increase their control over subsequent contexts by experiencing actionable outcomes yet also may gain conceptual resources to address future contexts. Dewey's individual-focused concepts of learning as a result of experiential outcomes function as a recursive cycle of development. The theory of external actions influencing internal processing which in turn creates novel external actions serves as the basis for a greater understanding for why learners interpret experiences in different ways.

Lewin's New Psychology

A major contributor to the evolution of learning via observation and experiential learning, Lewin (1936) attempted to reconcile the fields of psychological research by suggesting an interaction and interdependence between environmental and internal factors when determining the reasoning behind individual behaviors. Lewin stated:

> If one represents behavior or any kind of mental event by *B* and the whole situation including the person by *S*, then *B* may be treated as a function of *S*: $B = f(S)$. In this equation the function *f*, or better its general form, represents that one ordinarily calls a law. If one substitutes for the variables in this formula the constants which are characteristic for the individual case one gets the application

to the concrete situation. (p. 11)

Essentially, a behavior, state of being, or event is the product of an individual and the context in which they are situated. Lewin suggested that the above equation is equal parts internal cognitive representation of a context and the manner in which that individual understands and interprets that context. The equation, by extension, yielded an understanding of constructivist approaches regarding how individuals might be internally impacted by an experience and how that experience is shaped by an individual's interaction.

Understanding the tendencies of how a person might react or should act in a situation is only half of the problem. The other component is the context—including the individual—involved in the situation. Here, Lewin laid the groundwork for a single, unified theory that unifies the multiple fields of psychology. In doing so, he created a balance between the influences of nature and nurture on the outcome of a person's actions, summarized by the equation $B=f(P, E)$. In this holistic approach to psychology, Lewin stated that the P represents the inner state of a person while the E represents the external factors. These two factors interact and results are further impacted—but not dominated by—the laws or rules that govern how people should act in a context—or f. These components result in a behavior, B. Lewin (1939) stated that it is important "we no longer seek the 'cause' of events in the nature of a single isolated object, but in the relationship between an object and its surroundings" (p. 11).

Lewin's equal emphasis on personal and environmental factors laid the groundwork for a great deal of innovation and action research in the field of psychology and motor learning. Lewin (1936) suggested that researchers looking to describe individual behaviors must depict physical environments (both immediate and larger, regional or geographical contexts) as well as social environments (both interpersonal and societal contexts). Lewin continued to account for other factors stating that internal goals, emotions, and other intrinsic and often overlooked factors might shape the effect of an experience on an individual. Lewin summarized by stating that when considering these multitude of internal factors, observers must consider the measurable outcomes in order to determine how each individual learner manifests their internal factors. “What is real is what has effects” (p. 19). It is here that Lewin’s distinction between internal and external factors is a crucial component of observational learning. How individuals observe or experience an external phenomenon must be distinguishable from their internal states.

Although the interaction between the external and internal components is noteworthy, the distinction is crucial when attributing behavioral outcomes to these factors. Background factors may impact the same experiential context differently for individual learners—a singular situation may yield vastly different outcomes for two or more individuals. This dichotomy of how external environmental factors and internal states coexist suggests a cycle between the two states—a concept later utilized by Kolb (1984) as a fundamental component for the Experiential Learning Theory cycle. Lewin further suggested that the manner in which the environment interacts with the inner states of an individual is via the motor or perceptual regions. Here, the internal states of being—emotion, past experience, and thought— could be externalized via these motor or perceptual regions. It is, therefore, the motor region that acts as the barrier between external and internal factors. An individual can only exert influence on their environment through motor regions and can subsequently observe that influence via their perceptual regions.

Furthermore, Lewin (1936) laid the groundwork for variations in how individuals' sensorimotor mechanisms might differ according to a variety of factors. In short, Lewin suggested that individual motor or sensory regions differ according to continually shifting factors such as age and disposition. However, Lewin did not go into greater depth regarding factors other than age. Instead, he suggested that as an individual grows older, their psychological growth is often reflected in the depth and integration of their various intellectual regions. This concept would also later serve as a basic element of Kolb's (1984) Theory of Development. The way that a learner utilizes their motor-perceptual region becomes increasingly integrated with other inner processes while also becoming more differentiated within the structure of their external interactions.

Piaget and an Operational Theory of Development

As stated above, Dewey (1938) instigated a philosophical theory towards intellectual development and learning though Lewin (1936) later established increasingly scientific methodologies towards understanding how individuals incorporate and reconcile external events into internal mechanisms. Piaget's (1950) depictions of intellectual development and the stages therein are crucial to approaching a holistic theoretical approach towards how learners interact with their environment from an external and internal viewpoint. "As much an epistemological philosopher as he is a psychologist" (Kolb, 1984, p. 12), Piaget attempted to detail the developmental cognitive mechanisms from birth to the end of adolescence. Less interested in the intelligence tests that began to be popularized in the early 20th century, Piaget focused on analyzing the rationale used by children to arrive at the responses to those intelligence tests. As a result, Piaget suggested the possibility that age is a determining factor in fundamental cognitive processes and that intelligence is a dynamic system of experience and thought.

More specifically, Piaget (1950) aimed to describe and analyze the process of how intelligence develops in children starting from birth. Intelligence, according to Piaget, is an equilibrium of assimilation and accommodation. Whereas assimilation is the process of applying external experiences to existing internal cognitive operations, accommodation is comprised of applying existing operations to new experiences. Piaget (1950) continued one step further: “Intelligence constitutes the state of equilibrium towards which tend all the successive adaptations of a sensori-motor and cognitive nature, as well as all assimilatory and accommodatory interactions between the organism and the environment” (p. 12). This balance of internal and external input on cognitive development—and by extension behavior—lays the groundwork for a potential cycle of learning to occur. Each intelligent operation is built upon previous environmental and cognitive building blocks—each act of assimilation and accommodation layering on another. Piaget (1952) summarized assimilation stating that the manner in which learners internalize an experience is the foundation of subsequent cognitive activity. An individual’s dissonance between novel experiences and their own understanding may be a product of how that individual interacts with their respective contexts. As such, Piaget summarized that assimilation is the result of how a learner combines their own experiences into their existing understanding the current context. Dichotomously opposed to assimilation, accommodation relates to how individuals create external reality. Accommodation is always a factor due to the impossibility of pure assimilation as a result of the dynamic state of internal conceptualizations of a learner's context. Piaget posited that the constant process of experience impacts the way that learners might subsequently interact with a context. As individuals adapt and eventually create an equilibrium with their internal and external states, the process of assimilation and accommodation become increasingly complex and intertwined. Piaget suggested that accommodation and assimilation are inseparable due to cycle of experience and thought that dictate an individual's moment-to-moment understanding of the world.

The manner in which individuals structure and organize these accommodations and assimilations come to impact the way in which their higher cognitive operations can be brought to bear on experiences. In both accommodating to the universe while also assimilating it, the beings with organized intelligence exist in a series of escalating interactive relationships. Piaget (1952) stated accommodation equates to the manner in which a learner experiences a context whereas assimilation is their inherent judgement of both the context and their existence within that context. Even from two years of age, Piaget suggested that individuals aim for this balance of experience and judgement in order to extend their existing operational structure. Piaget summarized the earliest developmental phase describing the conflicting states of internal and external assimilation and accommodation. The earliest learners might struggle to reconcile the self-centered nature of assimilative processing while being subjected to external accommodative events. Specifically, early learners' experiential cycle may be slower than and increasingly subject to interruption by either internal or external stimuli.

Piaget (1950) summarized this balance of accommodation and assimilation as a process of adaptation: "Adaptation must be described as an equilibrium between the action of the organism on the environment and vice versa" (p. 8). Piaget used this observation of continually emergent adaptation as the basis for a more fluid, operational theory of intelligence. In this theory, intelligent operations such as mathematics or logic lie in the transaction between a person and their experiments—or experience—with reality. These transactions potentially extend beyond previous theories laid forth by Dewey and Levin by accounting for the fluid nature of internal states of being present in different developmental stages. To Piaget, the impetus for development was demonstrated by the ever-mounting adaptions caused by experiences. Cognitive operations are, by nature, a system of often rapid dynamic interactions that continually build on each other to create a shifting, holistic reality of internal and external states of being.

Kolb's Experiential Learning Theory

Drawing heavily from previous researchers, theorists, and psychologists such as Vygotsky, Freire, Jung, Dewey, Piaget, and Lewin, Kolb (1984) put forth a theory of experiential learning summarizing that "learning is the process whereby knowledge is created through the transformation of experience" (p. 38). Kolb's interpretation of experiential learning is a holistic incorporation of constructivist and psychological viewpoints regarding human development. Focused chiefly on adult development and learning, Kolb's Experiential Learning Theory (ELT) provides a grounding to better conceptualize how learners interact with experiences and subsequently create new experiences.

The Learning Cycle

The centerpiece of Kolb's ELT is the cycle of experiential learning—a four stage sequence of internal and external steps that reflect how a learning accommodates and assimilates experiences. Grounded in the continual cycle of tension and resolution caused as a result of interacting with the external world, learners acquire new ways to accommodate and assimilate within their environments through experience. Kolb (1984) cited three models that contribute to this holistic approach towards experiential learning. Dewey's conclusion of the importance between impulse and reason—internal and external stimuli—served as the foundation for Kolb's ELT. Kolb then built on that fundamental dichotomy with two of Lewin's conflicts—that of concrete experience opposed with abstract understanding and that of reflection opposed with accomplishment. Kolb finalized the ELT model using Piaget's understanding of the cyclical process of accommodation and assimilation as the driving force behind an individual's context within an experience. Kolb summarized these models into a model of cyclical experiential learning (see Appendix A).

The cycle of experiential learning involves a creative tension between four learning modes: Concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). Kolb (1984) identifies the two main sources of conflict as that of prehension or transformation. The conflict of prehension represents “two different and opposed processes of grasping or taking hold of experience in the world—either through reliance of conceptual interpretation and symbolic representation… or through reliance on the tangible, felt qualities of immediate experience” (p. 41). Kolb referred to these two diametrically opposed methods of prehension as comprehension (AC)—an internally centered means of abstracting an experience—and apprehension (CE)—the hands on, felt qualities born of interacting with an experience. This conflict represents the concrete north (CE) and abstract south (AC) poles of the experiential learning cycle. Kolb referred to the other source of conflict as an act of transformation. When internally reflective, the process is called intention (RO) whereas external manipulations are referred to as extensions (AE).

The learning cycle is the process in which a learner continually causes and resolves the conflicts of prehension and transformation. The process is recursive wherein experiences (CE) could result in a reflective or observational process (RO). As a result of these observations, a learner might form their own conceptualization (AC) of how this experience would fit into their understanding of the specific context and perhaps how other contexts might be similar to this context. When that learner interacts (AE) with the context using this dynamic conceptualization, they create a new experience that begins the entire cycle again. These four different fundamentals of knowledge form the structural basis of the adaptive process of learning. Kolb (1984) suggested that the dichotomous tension between the external and internal—e.g., the act of comprehension and apprehension—act as the foundation for subsequent growth and higher order thinking.

In the context of music education—specifically that of teacher modeling methods—Kolb's (1984) learning cycle functions as a potential roadmap towards clarifying the stages and subsequent processes of skill development. A teacher might control the modeled experience (CE) but cannot control the resulting internal conceptualization of that experience (AC). Instead, the teacher can only observe the resulting externalization of that conceptualization and attempt to guess at how the learning might have utilized their model. The learning cycle might act as an adequate lens as a basis for better understanding and describing how learners might engage with an experience. Although Kolb (1984) intended the learning cycle to extend beyond performance-based learning into descriptions of highly developed and sophisticated cognitive structures, the experiential cycle portrays out a salient sequence of potential learning events both externally and internally situated.

The initial impetus for learning, be it a formal directive or an informally based observation, can serve as the starting point of the cycle. In a string ensemble classroom, this concrete experience (CE) can be as simple as observing a bowing direction or start as a more complex modeling directive concerning the vibrato motion on the violin. From this impetus (CE), the learning might reflect on the observation (RO). During the internalization of the observation, the student is given the opportunity to create a tension between the observation (CE) and their own previous understanding (AC). For example, the student might reconcile the difference in bowing directions or attempt to grasp the component skills required for a fluid, relaxed vibrato motion. Subsequently, an abstract conceptualization (AC) takes place wherein the student directly engages with the reflective observation (RO) in order to develop learning situated within the student's internally based learning context—e.g., how they might have performed the passage previously, their previous performing experience in general, etc. This can potentially mean that the student realizes the bowing for this section is similar to a previously rehearsed phrase of that the vibrato motion is roughly equivalent to knocking on a door with their knuckles. The act of abstract conceptualization is a crucial step and is the most difficult step to discern. It is the process wherein the student internalizes the learning process and individualizes the experience for their own personal application. Once the student has attempted to assimilate the experience through observation via conceptualization, the student must engage in the fourth of the learning cycle—active experimentation (AE). Here, the student tries out the new bowing or attempts to perform the vibrato motion using the conceptualized schema created in the AC step. Once the active experiment step is executed, the basis for a new concrete experience is formed and the cycle begins again. Each turn through the cycle reinforces or corrects previous attempts at creating accurate internal constructs or external performance of the activity or concept.

The act of abstract conceptualization (AC) is a particularly interesting component of the learning cycle. Specifically, this step could consist of disassembling a task, connecting the task with previous experience, focusing on an incorrect component of the task, narrowing the focus to a handful of objectives, or other attempt to analyze the observation in order to create a viable or successful trial. The AC step of the learning cycle is understandably vague—most likely to accommodate the vast, unseen methods that various learners utilize to reconcile the reflective observation. In a performance context, the cycle might occur incredibly rapidly and frequently throughout any given lesson as a student attempts to develop component skills towards a musical goal.

Learning Styles and Increasingly Complex Combinations

The interaction and relationships of prehensive and transformative structures describe the manner in which individuals adapt to their surroundings. Kolb's (1984) four learning modes—CE, RO, AC, and AE—form a cycle of learning while allowing for more advanced, higher-level combinations of adapting to experiences. All potential variables—genetic, past experiences, and current context—potentially yield a preferred style of learning. Though one person might choose to respond to an experience by relying primarily on the tactile apprehension of an experience (CE) whereas another might prefer to extend their understanding of the context with some experimental trials (AE). Kolb noted the applications of, and subsequently preferences, of prehension and transformation are not mutually exclusive. In fact, a more sophisticated cognitive structure exists wherein a learner utilizes a component of both the transformative and prehensive dimensions. This advanced combination of two or more learning modes is referred to as a learning preference or style.

Each learner has a preferred response to most experiences that utilize a relatively fixed pattern of learning modes. Specifically, an individual's recursive and dynamic process of learning often yields a favored emphasis on apprehension (CE) or comprehension (AC). At the same time, they might also develop a preference of extension (AE) or intention (RO). Kolb noted that this is a cyclical process wherein the most successful learning mode is reinforced by that success and subsequently implemented with greater frequency to other experiences—regardless of its appropriateness in relation to the experience. Kolb admitted that an individual's learning preference is not a static, habitual response; it can instead be viewed as the equilibrium created when environmental and intrinsic individual characteristics result in beneficial outcomes. Neither variable is a static point—the dynamic exchange between an internal state influences external reactions and vice versa.

Four principal types of learning styles form the basis of Kolb's (1984) ELT. Each of these four learning styles is comprised of a dominant form of both prehension and transformation. As such, Kolb described an individual's learning preference as either CE or AC and either RO or AE insomuch that these dialectics become the dominant forces in response to most contexts. Kolb posited that learners who display these consistencies share traits with others that also display these same consistent learning styles. Diverging learners (CE/RO) tend to understand multiple points of view and possess the ability to create a meaningful whole out of many observations. Converging learners (AC/AE), on the other hand, prefer to transform internal, hypothetical schema into practical solutions. Assimilating learners (AC/RO) prefer to manifest theoretical models based on information gathered from reflection—e.g., inductive reasoning, etc. Accommodating learners (CE/AE), however, prefer to instigate action or experience in order to determine the best course of action.

Several intrinsic and external factors contribute to how individuals develop a learning preference—personality/behavioral types, emerging educational specialization, overall career field, current occupational role, and immediate task or undertaking. An individual's learning preference develops as a result of each of these individual component factors. Rooted in social psychology, Kolb (1984) considered multiple external and internal facets of a learner's developmental process. Although personality is a component of this process, learning styles are predominantly derived from specific contexts.

Intrinsically, the personality or behavioral types of factors align with theories put forth by Dewey, Lewin, and Piaget. Notably, however, the definitions of introversion and extraversion described by Jung (1923) correlate with the prehension dichotomy of the ELT. Additionally, the Briggs-Myers Type Indicator (Myers, 1962)—often used as a comparison to Kolb's learning preferences—can be similarly correlated to learning preference descriptions. This initial contributor to learning preference is the starting point for subsequent influencing external factors. Learners utilize their initial personality as a foundation on which they might build increasingly complex and specific responses to external experiences.

The first notable external factor, how learners respond and adapt to informal and, more notably, formal educational experiences can be viewed as a seminal process contributing to the development of a learning preference. Kolb and Kolb (2013b) noted that early educational experiences—such as primary or secondary school—are relatively generalized. Specialization begins to emerge during the end of high school and becomes increasingly poignant in the years following high school. Absent professional or sophisticated adaptive capabilities, early learners manifest the rudiments of a learning preference as a result of a simple combination of intrinsic personality and external stimuli in a learning context. Specifically, learners develop preferences based on internal and external feedback in response to their education environment. Notably, Kolb and Kolb (2013b) posited that a learning preference emerges in high school as learners develop an equilibrium with their learning environment that was previously founded. This equilibrium correlates and originates with the end of Piaget's (1952) terminal stage of development—formal operations. Kolb implied that, upon emerging from this stage of cognitive development, learners are now capable of adapting and transacting more fluidly with their environment in a way that begins to create lasting impressions in the way those learners subsequently manage experiences.

The subsequent external factors—professional career, current occupation, and immediate project or task—comprise various levels of detail centered on how vocational and advanced environmental factors impact the development of a learning preference. General professional problems, such as those presented in the business field, might shape the manner in which a learner responds to everyday, non-occupational experiences. Furthermore, a learner's job role in their field, such as human resource manager or customer service, might further shape their interactions with experience. Finally, a specific, immediate task has the potential to impact how a learner might manifest a learning preference. More accurately, "the effective matching of task demands and personal skills result in an adaptive competence" (Kolb & Kolb, 2013b, p. 12). These competencies function as feedback relative to the immediate environment a learner might occupy. Kolb and Kolb (2013b) noted that the fluid nature of a learning style suggests that increasing complex combinations of preferences might occur. These three specific external factors, though extremely relevant to the broader understanding and development of Kolb's learning styles, lie outside the scope of the current study.

Kolb (1984) initially defined learning styles as a system of "possibility-processing structures" (p. 97) that are the outcome of both the typically occurring interactions with experiences in addition to the dynamic state of an individual's cognitive processes. Although learners initially develop states of adaptation to their environment via a cycle of internal and external reinforcement, these states of adaptation begin to expand as more diverse experiences are incorporated. Initially classifying this expansion of learning preferences as an indicator of increasingly sophisticated adaptive development, Kolb and Kolb (2013b) further refined their four initial learning preferences into nine learning styles. Specifically, Kolb and Kolb posited that as learners adapt to more and more experiences, their learning preference—accommodating, assimilating, converging, or diverging—begin to incorporate stages of the learning cycle outside the initially predisposed combinations. For example, an individual exhibiting a converging learning preference might primarily utilize the abstract conceptualization and active experimentation stages of the Kolb's learning cycle. However, as their adaptive flexibility expands, it might incorporate the reflective observation stage of the learning cycle and begin to demonstrate a unique and more refined pattern of responses to external and internal experiences.

This expansion beyond one of the four fundamental learning preference—diverging, assimilating, converging, and accommodating—is indicative of Kolb's theory of development utilizing the ELT. The increasing level of adaptive flexibility—that is, the tendency for learners to prioritize stages of the ELT cycle outside their preference—is the key component leading to greater integration between an individual and their environment via experiences. Kolb (1984) summarized this process as an increase in the specific complexity with which a learner might interact with a specific dialectic. For example, when a learner begins to notice more complex elements of an experience, they might be able to create more sophisticated observations (RO). Alternatively, a learner that is able to conceptualize (AC) more complex representations of an experience might be able to make more elaborate or intricate understandings. As these modes increase in relative interaction with each other, they result in increasingly complex cognitive skills as a result of an expanding fluidity in how a learner might interact with their external and internal states of being.

More specifically, the integration of one or more learning modes outside of an individual's previously established learning preference is emblematic of higher-order learning. Although Kolb (1984) referred to a fundamental combination of two learning modes as an elementary learning mode, the combinations of three or more learning cycle phases are referred to as second-order learning. "This second order learning includes not only some goal-directed behavior such as deriving a hypothesis from a theory or garnering observations form a specific experience, but also some process for testing out how adequately that goal-directed activity has been carried out" (pp. 65–66). Second order combinations of learning represent increasingly fluid and dynamic means for individuals to interact with an experience—often resulting in more sophisticated outcomes for that individual.

Though these complex combinations of greater integration are difficult to portray due to the exponential variety within their manifestation, general patterns can be noted. For example, Kolb (1984) noted that learners demonstrating either the assimilating (RO/AC) or the converging (AC/AE) learning preferences engage with experiences primarily through the comprehension dialectic. That is, those learners both utilize the act of internal abstraction and generalization to respond to external stimuli—they both prefer to internally process their experiences. The difference between the learning types is that the assimilating learner might prefer to spend more time reflecting on and integrating ideas generated internally. The converging learner, on the other hand, might prefer to apply a theoretical model in order to determine a course of action. A learner utilizing a second-order learning combination would combine these two learning preferences by emphasizing the comprehension (AC) learning modality. As a second order combination of the learning cycle, the learner would increase the development of their comprehension cycle due to the reconciliation of the adjacent cycle phases. Essentially, a learner exhibiting this second-order combination of elementary learning modalities applies two of the ELT stages in order to yield greater returns on a third ELT stage.

Learners who display a preference for these higher, second-order combinations are labeled according to the stage of the ELT that is reinforced. Experiencing (AE/CE/RO) learners balances active experimentation and reflective observation in order to gain deeper insight when involved in experiences. Reflecting (CE/RO/AC) leaners emphasize the reflective observation stage by "connecting experience and ideas through sustained reflection" (Kolb & Kolb, 2013b, p. 15). Learners with a Thinking (RO/AC/AE) learning preference prefer to connect reflective observation to practical applications via a manifestation of abstract and logical conceptualizations. Finally, Acting learners (AC/AE/CE) prefer practical outcomes while incorporating internal and external processes. Each of these second-order learning preferences demonstrate a strong primary inclination towards a single component of the ELT cycle while incorporating the two adjacent dichotomous learning modalities.

In regard to the highest level of adaptive fluidity within the ELT cycle, Kolb (1984) suggested that some learners might have reached an equilibrium wherein they are able to draw on any and all components of the ELT stages. Leaners able to demonstrate no significant dependence on any experiential learning modality possess the ability to balance the prehension (CE/AC) and transformation (RO/AE) dimensions and apply each of the learning cycle stages as needed depending on the context provided by the environment. These learners express a Balanced learning preference "characterized by the ability to adapt; weighing the pros and cons of acting versus reflecting and experiencing versus thinking" (p. 15).

In 2013b, Kolb and Kolb updated the titles of the four elementary learning preferences to better depict their preferred adaptive response to an environment. The Divergent learning preference became the Imagining learning style (CE/RO); Assimilative learners were retitled Analyzing learners (RO/AC); individuals with a Convergent learning preference are referred to as Deciding leaners (AC/AE); and the Accommodative learning preference was renamed the Initiating learning style (AE/CE).

ELT Research

Research in Support of Kolb's ELT

Researchers investigating the ELT developmental model have primarily sampled students and professionals in specific vocations such as marketing, engineering, nursing, accounting, economics, and the sciences. Kolb's (1984) ETL model is drawn directly from the field of accounting and marketing—specifically, studies conducted by Clarke et al. (1977) and Gypen (1981). Clarke et al. performed a cross-section analysis of professionals and students in the marketing and accounting vocation. Clarke et al. found that as professionals gained experience in those respective fields, their learning preference grew more and more specialized. In particular, although students and entry-level accountants demonstrated balanced or slight tendencies towards convergent (AC/AE) learning styles, the technical demands of the field yielded increasingly convergent profiles in more experienced accountants. Clarke et al. found that the most experienced accountants and marketing professionals, however, demonstrated a shift away from convergent learning specializations and began integrating more accommodating learning preferences (AE/CE).

By identifying trends among learning preferences within a vocational expertise, Clarke et al. (1977) laid the groundwork for specific components of the ELT. Further establishing the significance of learning styles, Gypen (1981) found similar results investigating engineering and social workers. A cross-section and comparison of individuals in these fields yielded a shift similar to the one Clarke et al. (1977) found. Gypen found that engineers generally supplemented their initial convergent (AC/AE) strengths with those of the opposite, divergent (CE/RO) orientations later in their career. Social workers, as their careers progressed, performed a similar development in reverse. Though Gypen correlated this shift in learning orientation with a movement from direct service to administrative duties, the evolution of an individual's learning preference remains a constant across several occupational fields. The interaction between environmental context and an individual seemed to be the driving force behind development rather than any specific, individual factor. Kolb and Kolb's depiction and application of these early studies as a reflection of the transaction between an individual and their environments is a natural extension of Lewin and Piaget's developmental theories—albeit extended to adults in the workplace.

Although Clarke et al. (1977) and Gypen (1981) are cited as seminal researchers investigating ELT, subsequent researchers have branched out into a variety of fields including biology, economics, education, law, marketing, medicine, psychology, and social work (see Hickcox, 1991 for a historical review; Iliff, 1994 for a meta-analysis; Kolb, 2013b for a broader overview of research). These researchers have largely sought to apply the ELT model to their respective fields. Of note, however, are the contributions in the field of education—which Kolb and Kolb (2013b) suggested comprises the largest field of research addressing ELT. Svinicki and Dixon (1987), in an early study in the field of education incorporating Kolb's (1984) ELT, addressed the all-too-common means of instruction by lecture, discussion, laboratory, and audio-visual aids in post-secondary educational settings. Although these common instructional methods have pervaded the majority of collegiate classrooms, Svinicki and Dixon cited that many students and faculty reported a desire to explore other teaching methods. In order to address the potentially diverse classroom learning styles, Svinicki and Dixon applied Kolb's ELT to a variety of educational disciplines. They posited suggestions for how instructors in the fields of pharmacy, public policy, history, architecture, and engineering might incorporate educational opportunities using the CE, RO, AC, and AE cycles of Kolb's ELT. Specifically, the researchers suggested that academic activities correlate to the phases of the ELT cycle in order to engage students in a more diverse manner. Furthermore, Svinicki and Dixon suggested a means to circumvent the natural ELT proclivities of fields such as science—which emphasize RO and AC phases of the ELT cycle. In order for fields such as science to incorporate authentic educational activities outside the typical strengths inherent to the discipline, the authors suggest that the student take on a more active role in the educational cycle. Svinicki and Dixon summarized the potential application of the ELT to typical instructional methods stating that the cyclical model might be an adequate framework for building specific classroom activities. The constructivist nature of the cycle potentially situates the learner as a central figure when considering the nature of pedagogical approaches and strategies. As such, Svinicki and Dixon posited that the ELT cycle might allow for more freedom of choice when guiding learner behaviors within a variety of contexts.

The holistic framework described above serves as an excellent starting point for understanding how individuals vary in their interactions with specific learning contexts. Svinicki and Dixon's (1987) application of Kolb's ELT led to a wide variety of similar, more detailed applications of the ELT cycles to almost all aspects of education. In higher education, for example, Healey and Jenkins (2000) and Brock and Cameron (1999) applied similarly applied cycles of Kolb's (1984) ELT to the activities comprising courses in geography and political science respectively. Digital and eLearning educational contexts have also been the focus of researchers applying ELT cycles to academic activities and the unconventional contexts inherent to the discipline (Dorca et al., 2012; Hwang et al., 2012; Westera, 2011). Like the majority of researchers seeking to apply the ELT cycles to their discipline's pedagogical activities, these researchers investigated higher educational contexts. There was, as Kolb and Kolb (2013b) pointed out, a scarcity of research investigating and applying the ELT to K–12 education.

The relative dearth of ELT research among K–12 education has been addressed by several researchers, however. Baker et al. (2012) attempted to reconcile some of the challenges facing conventional agricultural education in a high school context by applying Kolb's (1984) ELT. The authors cited the need to move beyond standard models of classroom learning to engage with content material in both an experiential and educational manner. Specifically, Baker et al. sought to enrich the agriculture curriculum with a focus on intentionality. In an apt summary of ELT learning cycles and their application to developmental theories, the authors posited that higher order combinations of experiential learning are possible—and most likely already aligned—with the agricultural classroom. These higher order concepts suggested a developmental theory that integrated the various learning modes and becomes more complex, even within the narrow and initial context represented in the high school classroom. Baker et al. (2012) continued by describing an agricultural curricular model that incorporated meaningful experiences and correlated with the ELT cycles. For example, formal instruction might directly relate to abstract learning (AC) in an agricultural classroom. By contrast, the practical applications inherent to FFA—the youth organization designed to prepare students for careers in the multitude of agriculture-related fields—might embrace more of the concrete (CE) or reflective (RO) components.

Most importantly, Baker et al. (2012) suggested that the comprehensive model for secondary agricultural education relies on medium-level ELT models as well as a macro-level application of ELT cycles. The authors' model emphasized higher order combinations of the learning cycle throughout the developmental learning process. Interestingly, the authors suggested that the learner begins by experiencing exposure to the agricultural program and culminated by disseminating the exposure to new learners. Essentially, the learner eventually becomes the purveyor of experiential learning by exposing learners new to the cycle. This application of Kolb's ELT is salient to a broader scope of secondary education non-traditional or performance-based classrooms—e.g., music, technology, theater, driver's education, etc.—wherein lecture-based contexts might have limited use. By portraying late-stage goals of Kolb's (1984) developmental theory within a secondary context, the authors proposed that "self-actualization, independence, pro-action, and self-direction" (Kolb, 1984, p. 140) can be manifested in high school students.

Research in Support of Kolb's LSI

Kolb's Learning Styles Inventory (LSI) was initially created to fulfill two purposes: (a) as a self-reflective, intrinsically analytic tool designed to provide learners with a greater appreciation of their own distinctive learning process and (b) as a research tool to explore and test the overall ELT theory as well as individual learning styles. Kolb and Kolb suggested that meta-cognition might allow for learners to exert greater control over both their own internal processes and their externalization. Kolb and Kolb posited that when individuals complete the LSI, the processes of self-exploration and identification is more important than the results of the inventory itself. Kolb and Kolb suggested, therefore, that an interpretation of the individual learning styles accompany the results explaining how the profile is merely “a starting point for exploration of how one learns best” (p. 40).

As a research tool, Kolb intended the LSI as a means to expand the field of experiential learning research by addressing validity in regard to individuality amongst learning style profiles. Specifically, the LSI was designed to explore how individuals might orient themselves to a variety of learning contexts and enhance researchers’ ability to compare one learner’s profile to another’s. Kolb (1984) described the LSI as a series of nine questions that require the learner to rank the manner with which they agree with a statement. Each question has four such statements that align with one of the four ELT phases. The final tabulation of the inventory allows researchers to determine an individual’s relationship with each of the four ELT phases as well as the way they balance the dialectic directions (AC-CE and AE-RO). The results of the LSI create a two-item profile for each participant. The first item is a two-dimensional kite-like shape in an x-y axis. The various lengths of each side of the “kite” indicate individually relative strengths in that mode of the learning process. Visually, it offers a qualitative snapshot of how an individual might emphasize the phases of the learning cycle. The second item is a result of the combination scores. This result is a coordinate on an x-y axis that indicates the specific learning style classification. It is also the quantitative data point with which a researcher can compare larger groups of participants.

Kolb (1984) was careful, however, to avoid conflating the LSI with predictive or treatment-based tests. The strength of Kolb's LSI is in identifying individual uniqueness when approaching learning. "The danger lies in the reification of learning styles into fixed traits, such that learning styles become stereotypes used to pigeonhole individuals and behavior" (Kolb, 1981, pp. 290–291). As such, the LSI should be used only as a tool for individual assessment and ELT construct validation. For the purposes of the current study, LSI data was used as an independent variable designed to differentiate and disaggregate individual participants in order to better compare their unique responses and interactions with a modeling scenario. Because Kolb's construct of a learning cycle encapsulated the totality of how learners might respond to a learning context, samples of individuals representing each of the nine learning preferences can be compared to each other in order to determine patterns or themes.

Four external variables have been identified by researchers (Iliff, 1994; Kolb, 1976b; Kolb & Kolb, 2005) in regard to the validity of LSI—age, gender, level of education, and educational/vocational specialization. Researchers found that age and level of education impacted the LSI results along the prehension axis (CE-AC). Specifically, Kolb (2005) and Kolb and Kolb (2013b) found that as participants increase in age or level of education, they preferred to indicate increasingly prehensive learning preferences as opposed to the more transformative RO-AE axis. This increase is the largest between participants under the age of 19 and those grouped in the 19–24 age range (Kolb & Kolb, 2013b). Additionally, Kolb and Kolb found that students at the secondary level—high school—demonstrated equivalent preferences for the prehensive and transformative dimensions of the learning cycle. This equivalency is not seen at any other level of education.

The final external variable shown to impact LSI results is gender. Similar to age and level of education variables, the prehensive dimension is impacted. Kolb (1976b, 1985) found that males indicated more abstract learning preferences than did females. Kolb and Kolb (2013b) and Belenky et al. (1986) posited that this variable is due to fundamental epistemological differences in how individuals approach knowing in either a fundamentally connected (CE) or separate (AC) manner according to their gender.

ELT Research in the Field of Music Education

Very few researchers (Hanson et al., 1991; MacLellan, 2011; Mixon, 2007) have gathered data regarding student learning preferences of any theoretical framework. These researchers chose inventories such as the Myers-Briggs personality inventory or VARK modalities. Even fewer researchers have applied the KELT or LSI framework to music education contexts. The most noteworthy study involving Kolb’s framework to a music education classroom was Gumm’s (2004) research investigating how middle and high school vocal students’ learning styles and motivations impacted their perception of their instructor. Specifically, Gumm sought to determine how any variability in students’ perceptions towards their teacher’s instructional style were accounted for by individual differences in learners' LSI preferences. However, Gumm also looked at whether certain learning styles were more likely to participate in chorus. Gumm gathered participants' (*N* = 273) data via measures based on Asmus's (1986) motivation for music, Kolb's LSI, and Gumm's Music Teaching Style Inventory. Although Gumm found that the LSI was less reliable in this music classroom context than in previous classroom research, the LSI was an acceptable research tool despite extending the LSI to students enrolled in middle school. Gumm posited that any decrease in LSI reliability might have been a result of pairing the LSI—which asks participants to rank sentence stems in an ipsative manner—with two other inventories that had dissimilar point scales and methods. When trying to account of variability in student perceptions of teacher instruction, LSI data was found to predict only a specific teaching style—Assertive Teaching. Otherwise, there were no significant differences among learning styles and overall student perceptions of music teaching style. Gumm also found that 47% of the participants demonstrated Accommodative (AE/CE) learning preferences. Another 25% of the participants preferred Convergent (AC/AE) learning styles. Learners that indicated Divergent (CE/RO) and Assimilative (RO/AC) learning preferences made up 14% each. Furthermore, when Gumm compared LSI data across grade levels, participants demonstrated greater rates of active experimentation learning preferences as they progress from middle to high school chorus and throughout high school.

Gumm's (2004) research is crucial in demonstrating that Kolb's LSI and ELT can be applied to a music classroom. Gumm, by attempting to attribute variability in student perceptions, applied the LSI as a means to make connections that have not been previously explored. In short, Gumm applied the LSI as a means to better capture the dimensions of student perceptions within a music classroom to moderate success. However, Gumm's findings point to a majority of active and concrete learners in a choral classroom and are followed with concern that most learning contexts in those classrooms are targeted to those specific learning preferences while ignoring others. Gumm feared that "the learning needs and interests of students with reflective and abstract learning styles were not being met in these traditional choral music classrooms" (p. 20). Further study is needed in regard to non-choral music ensemble classrooms and their distribution of LSI profiles—it remains to be seen if specific instruments demonstrate a preference. Such data would be informative in developing instructional approaches designed to attract and challenge individuals of all learning preferences.

Basilicato (2010) sought to follow up on Gumm's 2004 research by investigating the relationship between student learning style preference and their perception of their music teaching style in instrumental music classrooms as opposed to choral classrooms. Basilicato also gathered data on LSI profile distribution among the middle school instrumental students (*N* = 192) who participated in the study. Those participants were divided between three teachers among two schools. Basilicato reported that Diverging (CE/RO) and Assimilating (RO/AC) represented the majority of all participants with 32% and 29% respectively. However, when data were broken down by school and by teacher, the distribution became less reliable. For example, 35.86% of Teacher-1's students preferred Diverging learning styles whereas only 17.50% of Teacher-2's students indicated that Divergent preference. Overall, Basilicato found that the students' learning style preferences did not impact the composite perceptions of music teaching style. Although significant relationships were found between LSI profiles and several teaching style dimensions of specific directors, Basilicato was unable to draw consistent conclusions across all participants.

Basilicato (2010) attempted to determine if there was a relationship between students' learning preferences with how they perceived their music teachers' instructional style. While that relationship was not identified, Basilicato suggested that students with a certain kind of learning style preference are more attracted to music and become a part of that instrumental music program. Alternatively, music teachers' style of teaching—that of performance-based instruction and similarly aligned activities—might be more aligned with specific learning preferences. Learners that align with these preferences might be more likely to stay in the programs whereas students with less flexible or non-aligned learning styles may leave the music programs. Moreover, there could be some sort of combination of effects that result in greater specific learning preferences within a music program. Basilicato's summary of potentially self-selecting music students was in line with Gumm's (2004) findings who found the majority of middle and high school choral students in that study demonstrated Accommodative (AE/CE) and Convergent (AC/AE) learning styles. Basilicato, in studying middle school band instrumentalists, found that the majority of participants preferred Diverging (CE/RO) and Assimilating (RO/AC) learning styles. These disparate findings indicated that specific choral and instrumental band activities are self-selecting for students, even at the middle school age. Basilicato suggested that further research is needed to investigate specific dimensions of teaching behavior as well as how orchestral students might respond to those instructional methods.

Basilicato (2010) and Gumm (2004) utilized LSI data as a means to investigate other dimensions—in this case, teaching style and students' perception. However, Basilicato found that across all learning preferences, there was little difference in how students perceived their teacher's style of instruction. Regardless of their learning preferences, students in this study were able to make similar inferences regarding instructional dimensions. Conversely, Basilicato noted that the way students perceived a teacher's instructional style did not always align with the way that director self-reported their own instructional style. There might exist a misalignment between how the teacher believes their instructional methods are perceived and how individual students interpret and apply those methods. Furthermore, "although students may perceive their teachers similarly, this does not necessarily mean they are learning or understanding equally" (p. 46). Combined with a potential student-teacher misalignment in pedagogical methods, disparity between how students learn and understand based on their learning preferences in a given context would yield an imbalanced classroom where only a handful of students are successful at a task. This study intends to investigate this fundamental concern by exploring a single dimension of pedagogy: modeling.

The LSI was a means for Basilicato (2010) and Gumm (2004) to contextualize their specific research goals. Further applying the inventory as a means to differentiate participants and contextualize their learning responses, Zahal (2016) utilized Kolb's LSI as part of a theoretical lens in which to investigate performance anxiety among instrumental and vocal preservice educators. Among all groups of participants—which included subgroups formed by primary instrument—LSI distribution was Assimilating (45.5%), Diverging (27.3%), Converging (17.2%), and Accommodating (10.1%). Although the LSI distribution of string preservice educators—which formed 55% of participants—was not reported by individual instrument, Zahal's overall distribution was representative of other groups such as classical guitar, piano, voice, and flute. After comparing participants' self-reported data from a performance anxiety inventory and Kolb's LSI profiles, Zahal found no overall significant relationship. However, the abstract conceptualization component of Kolb's ELT was found to be inversely significantly related to vulnerability and anxiety. Zahal found that higher AC values mean less anxiety before and after performance though there was less confidence that lower AC causes these issues.

Two noteworthy findings emerged from Zahal's (2016) study. The first is the distribution of LSI profiles among preservice educators grouped on their primary instrument. Similar to Basilicato's (2013b) findings, Assimilating and Diverging learning styles made up the majority of LSI profiles. A potential explanation for this distribution is due to the majority of Zahal's participants' primary instrument—either a wind or string instrument. Gumm's (2010) LSI distribution represents only vocal performers and found a majority of Converging and Accommodating learning preferences among participants. There is no conclusive research regarding correlation between specific instruments and an LSI profile.

A second noteworthy finding of Zahal was the relative importance of the AC dimension of Kolb's ELT cycle when addressing levels of anxiety and panic during performances. Gumm (2010) found that vocal performers in middle and high school demonstrated increased AE values as they became more experienced vocalists. These findings in the field of music education indicate that the individual dimensions of Kolb's ELT—and by extension Kolb's LSI profiles—might have some correlation with music performance. These relationships could be related to how musical performance might correlate with LSI profiles or specific dimensions of the ELT.

To date, only a single researcher has applied the ELT dimensions within a music educational context. Similar to Svinicki and Dixon (1987) and Baker et al. (2012), Danyew (2015) utilized a collaborative, inquiry-based study exploring practical keyboarding skills, collaboration between teacher and student, and creativity in a collegiate context. Six undergraduate music education students and the author applied Kolb's (1984) ELT as a framework to develop unique learning opportunities within an introductory piano course based on community, novel skills, collaborative learning, and risk-taking. Danyew applied the ELT as a framework to drive curricular goals via novel avenues in an attempt to create an increasingly collaborative, egalitarian learning space. Using qualitative data, Danyew identified emergent themes centered on community, applicable skills, experimentation, and efficacy. This practical application of the ELT as a curricular framework has been unique among both music and ELT researchers. Though Danyew applied the ELT as a conceptual framework within a music classroom, emergent themes and classroom activities were largely unrelated to the ELT cycle. Instead, learner goals and procedures were dictated in a way that guided the participants through the ELT cycle during typical piano coursework.

Several other researchers have integrated Kolb's (1984) LSI profiles into the field of music education utilizing descriptive methods (Hurst-Wajszczuk, 2010; Russell-Bowie, 2013; Woods, 2017) or teacher-training investigations (Zahal, 2016). Although these investigators did not directly explore learning styles in the secondary ensemble classrooms, their results and implications can guide future LSI research in the fields of music education.

Utilizing descriptive research methods, Russell-Bowie (2013) and Hurst-Wajszczuk (2010) applied Kolb's ELT to a music education context. Russell-Bowie explored how an ELT model might be applied by preservice general education instructors in Australia. Specifically, Russell-Bowie investigated how an exploratory application of activities following the ELT learning cycle might impact the confidence of preservice instructors. Using instructional methods that pair with ELT cycle stages such as journal entries (RO) and curricular design (AE), Russell-Bowie collected quantitative and qualitative data regarding how confident the general education participants felt teaching music-specific lessons. Prior to the course, only 21% of students reported feeling confident concerning music education. Post experiment self-reporting showed that 84% of students reported feeling confident concerning music education. When reading the qualitative data, Russell-Bowie found similar positive remarks concerning dispelling apprehension regarding music instruction. Furthermore, the activities employing the CE phase such as direct instruction, tutorials, and textbook participation were reported as the most valuable components of the learning cycle in developing confidence and competency.

Utilizing similar descriptive research methods when applying Kolb's ELT and LSI in vocal pedagogy, Hurst-Wajszczuk (2010) detailed how a teacher might direct their instruction towards specific LSI profiles in both a vocal ensemble classroom and a voice studio context at the post-secondary level. For example, Hurst-Wajszczuk posited that learners exhibiting the Convergent (AC/AE) learning preference in a large ensemble context might best be instructed through multiple questions or problems to solve while attempting to execute the subject material. Within the context of a collegiate voice studio, Hurst-Wajszczuk noted that learners' behaviors typically align with their learning preferences within the context of the vocal studio. Observable behaviors and the way that individuals respond to specific instructional methods often corresponded to their learning style. In addition to identifying these behaviors, Hurst-Wajszczuk detailed potential teaching approaches that might better align with learners' preferences, suggesting that "having a general idea of a student's learning style allows us to help students remediate their weaknesses and accentuate their strengths" (p. 426).

Although both Hurst-Wajszczuk (2010) and Russell-Bowie (2013) utilized Kolb's ELT and LSI in more practical manners, Woods (2017) built on that research to create a band-specific curricular guide around Kolb's ELT cycle and a praxial, flipped-classroom format. Applying methods similar to Russell-Bowie, Woods laid out a step-by-step guide to enable preservice and first year band ensemble instructors to enter the work force with an understanding of how to be successful. Specifically, Woods established pedagogical activities aligned with Kolb's ELT such as analysis and reflections (RO) and evaluative design (AE) for preservice instrumental students.

These three researchers (Hurst-Wajszczuk, 2010; Russell-Bowie, 2013; Woods, 2017) created descriptive studies applying components of Kolb's ELT or LSI in a music education context. Their results demonstrated practical, real-world applications wherein Kolb's theoretical framework is utilized in music education classrooms. As teachers better understand how the ELT cycle and LSI profiles might impact their music classroom, their instructional methods can benefit from the more discrete organization of pedagogical activities as well as unique viewpoints that their learners might be applying.

Summary

The studies reviewed above show a discrepancy in how researchers view the effectiveness of modeling in a music classroom. The research conducted by Kerns (1991), Carroll and Bandura (1982), Rosenthal (1984), Hewitt (2001), Henley (2001), Baker (1980), Linklater (1997), Dickey (1988), and Sang (1987) demonstrated overall significant differences in performance achievement between modeling and no-modeling conditions among participants. Their findings are tempered, however, by the research conducted by Matthews (2014), Quindag (1992), Cribari (2014), Haston (2010), and Morrison (2002), who found mixed results in modeling versus non-modeling conditions. Of note in the group of researchers demonstrating mixed results is Quindag (1992), who studied string students' performance achievement in relation to modeling conditions as well as comparisons to learning style. Taken as a whole, the findings of the above researchers concluded, at the very least, that modeling should be a component of instrumental instruction although the degree to which modeling was effective in relation to performance achievement remains disputed.

All the above researchers attempted to determine the effectiveness of modeling based on how participants/students react to a model as a composite whole. None of the surveyed studies were focused on how individuals might react to a specific modeling. Rather than a top-down approach to interpreting the effectiveness of a model, an investigation of how students differ or align in their interpretations of a model might shed new light on how researcher determine modeling's effect on performance achievement.

In order to investigate the manner in which individual students might differ or align in their modeling interpretations, Kolb's (1984) theory of experiential learning can be applied to both illuminate the distinct, often unseen cycle of learning and help organize the way in which students fundamentally prefer to engage with learning scenarios. Built on the theories of Dewey (1897, 1938), Lewin (1936), and Piaget (1950; 1952), Kolb's ELT is built upon two diametrically opposed dimensions of learning via transformation and prehension. These two dimensions of learning divide into a four-phase learning cycle—Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). Research conducted by Clarke et al. (1977) and Gypen (1981) laid the groundwork for the manner in which individuals prefer to engage with learning—LSI profiles—whereas researchers Svinicki and Dixon (1987) and Baker et al. (2012) supported those findings through practical applications of ELT cycles.

Within the field of music education, however, few researchers have applied Kolb's ELT or LSI theoretical framework. These researchers were either investigating specific components of variability among student perceptions of teachers' instructional styles (Basilicato, 2010; Gumm, 2004) or performance anxiety (Zahal, 2016). In all of these cases, the researchers were unable to draw significant relationships between specific LSI profiles and their research focus. However, specific dimensions of Kolb's ELT cycle were deemed significant within the research findings of Gumm and Zahal. These researchers demonstrated that though Kolb's ELT might not have much bearing on student perception of teachers' instructional style or performance anxiety, it has potential to be impactful in other areas of music education. The descriptive research of Russell-Bowie (2013), Hurst-Wajszczuk (2010), and Woods (2017) further supported the use of Kolb's ELT in the field of music education from at least a curricular and pedagogical planning perspective.

Extant literature regarding modeling's effectiveness on performance achievement shows a propensity for researchers to apply modeling conditions among participants with the assumption that each participant views, reflects upon, processes, and manifests the source material in the same fundamental manner. Additionally, research regarding modeling in a string context is limited. By utilizing Kolb's ELT as a lens to view and group student responses, this study intends to investigate the manner in which string students interpret and internalize a model.

CHAPTER THREE: METHOD

The following research questions were investigated via the below quantitative and qualitative research designs in Phases I and II, respectively:

1. What is the distribution of Learning Styles Inventory (LSI) profiles among high school violin students?
2. In what ways do students attempt to reflect upon and transform a modeled concrete experience?
3. To what extent do students' transformations and comprehensions align with teacher intent?
4. How do students' grasping and transformation of a teacher's model vary in cognitive complexity from one another?

In previous modeling studies, quantitative methods have been used to determine modeling's effect on performance achievement or student performance (e.g., Cribari, 2014; Dickey, 1992; Hewitt, 2001; Quindag, 1992). However, the scope of this study was focused on determining what students were learning from a model and how they might compare to each other. The mixed-method design within this study resembles the research methodology utilized by Matthews (2014), who combined survey responses with long-form questionnaires and interviews in order to explore students' perceptions in response to modeling experiences.

Researchers applying ELT have set a precedent for the use of the LSI as a quantitative survey instrument for gathering data (Alan, 2006; Boyatzis & Mainemelis, 2010; Mainemelis et al., 2002). Researchers have applied the LSI to analyze how individuals with different learning preferences respond to various situations and contexts in fields such as higher education (Boyatzis & Mainemelis, 2010; Claxton & Murrell, 1987; Travers, 1998), management (Dixon, 1999), computer and information science (Davis & Bostrom, 1993; Ozgen & Bindak, 2012), and medicine (Curry, 1999). Data from the LSI have allowed researchers to describe how individuals within large populations apply phases of the ELT learning cycle in response to different contexts (Kolb, 1984; Mertens, 1998).

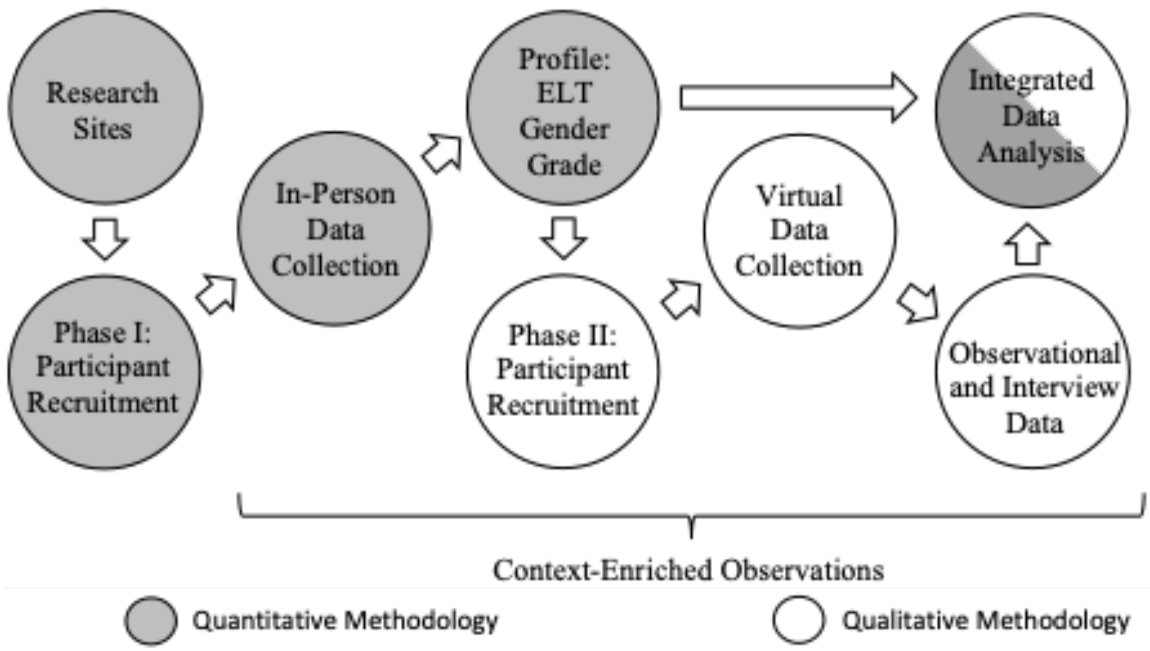
In this study, I investigated how the variables of LSI profile, gender, and grade level might intersect when comparing student responses to a modeling experience. Due to the need to investigate LSI, gender, and grade level data in order to compare students' responses to a modeling experience, both quantitative and qualitative methods were employed. A quantitative method—in this study, the LSI—was used to delimit students for Phase II and establish a framework to compare student responses to each other. Qualitative methods were used to gather data from student responses from recorded stimuli and interview questions. By interpreting interview and observational data within the contexts of the independent variables of LSI profile, gender, and grade level data, I aimed to explore the ways that learners differ or align in their response to a modeling experience.

The complex nature of comparing student responses necessitated a mixed-method approach. Specifically, I utilized a sequential explanatory research design. The gathered quantitative data provided valuable information regarding the distribution of learning preferences. However, my analysis of the qualitative data was enriched by the additional context provided by the quantitative data. This informed analysis allowed me to respectfully engage with participants' behaviors in order to better contribute to the larger practical and theoretical applications. Researchers (Greene et al., 2001; Greene, 2006; Greene, 2008; Howes, 2017) have encouraged the application of mixed-method research designs as a means to observe dynamic socially derived behaviors. Greene et al. (2001) posited that researchers who combine traditional quantitative methods with observational and conversational qualitative methods intend to increase validity and credibility, improve the depth of findings, create unique perceptions for complex phenomena, and opportunities for more diverse voices. My research design sought to combine formal quantitative data with descriptive qualitative data in a coordinated format in order to make unique conclusions regarding the outcomes of each specific phase. This intersectionality is a unique benefit to mixed-method research—I am able to draw conclusions from multiple angles regarding the behaviors and social phenomena of participants in response to a violin model.

In the field of education, and specifically music education, a mixed-method research approach allows me to analyze the potential of multiple viewpoints. Teddlie and Tashakkori (2006) posited that a mixed-method approach is most useful as a means to appreciate critical examination and practical application of social evaluative work. In addition to reflexively portraying student voices within this study, I sought to provide practical suggestions and research implications. See Figure 1 for a visual representation of this process.

Figure 1

Visual Representation of Mixed-Method Approach



Greene (2008) stated that mixed-method approaches most often offer "deep and potentially inspirational and catalytic opportunities to meaningfully engage with the differences that matter in today's troubled world, seeking not so much convergence and consensus as opportunities for respectful listening and understanding" (p. 20). My mixed-method research design—a sequential explanatory design—is a means to better understand student behavior and provide a voice for those learners to express their unique interpretations and interactions while performing.

Research Sites

Invitations to participate in the study were initially emailed to 38 high schools within a 50-mile radius of my geographical location that, after researching their websites, I was able to confirm included orchestra as a course offering. These invitations included schools in Delaware, Maryland, and Pennsylvania. Invitations were sent to the orchestra director, principal, and when applicable, superintendent asking for their permission to collect data at their respective schools (Appendix C). After sending the invitation template, 14 schools declined outright. Two weeks after sending the initial invitation, I followed up with a second invitation. In response to this follow up, six schools agreed to grant permission to collect data at their sites. A third—and final—invitation was sent two weeks after the second email to the remaining 18 schools. In response, four more schools declined permission whereas the remaining 14 schools did not respond to any of the correspondence.

I initially sought a large pool of participants from a large pool of schools in order to more fully investigate and explore all 12 learning styles in addition to gender and grade level variables. The relatively low participation rate in this study can be attributed to several variables. The first round of invitations was sent out in the middle of September—a time when many schools are beginning their pre-testing protocol tied to their school achievement. Additionally, many of the schools who declined to participate cited that their teachers were unable to assist in the study due to time constraints. Others noted that their schools were already hosting data collection at their site and did not want to overwhelm their respective teachers. Regardless, the number of schools who either declined or did not respond to the research invitations was high for this study—a fact that might warrant further investigation by researchers.

The schools that did grant permission for data collection immediately put me in touch with their orchestra director. I then coordinated with those individual directors regarding when and where I was able to collect the initial LSI data. High school orchestra students from six suburban high schools in Delaware took part in the study. One high school (Site A) was a private boarding school where I was granted access to a small participant pool (*n* = 3). Four of the high schools were public schools (Sites B, C, D, and E). The final high school was a charter school (Site F). For sites B, C, D, E, and F, I gathered data from all orchestra students regardless of their instrument in order to provide the individual directors with generalized data regarding the overall LSI distribution of their orchestra programs. I also provided the directors some background details regarding LSI profiles to further inform and guide their planning in response to the aggregated data.

For the purposes of this study, however, I only investigated the LSI data of high school violin students. In addition to the three participants at Site A, I collected LSI data from nine violin participants at Site B. At research site C, 22 violin participants in the data collection. I was able to collect data from 26 and 14 violin participants at research sites D and E, respectively. At research site F, I collected data from 27 violin participants. At the beginning of Phase I data collection, 101 participants were initially enrolled in this study. A single participant was removed from the study—100 participants completed Phase I.

Of those Phase I participants, females (*n* = 82) were more highly represented than males (*n* = 18). Grade levels were more evenly distributed. Grade 10 (*n* = 32) was the highest represented variable closely followed by grade 9 (*n* = 28). Grades 11 (*n* = 22) and 12 (*n* = 18) were the least represented among Phase I participants.

Participant Recruitment

Starting in October of 2019, I began to make visits to the six individual high schools that had agreed to participate in this study. With the exception of site A, I met with all orchestra students of the respective high schools and discussed my study (Appendix D). At site A, I met with the participants individually prior to an individually scheduled violin lesson offered at their school. At all sites, I gave participants a consent form (Appendix E) and asked them to discuss their participation with their parent or guardian. I indicated that after I compiled the LSI data, I would return their LSI profile results in addition to an explanation of what those results meant (Appendix F). Participants were able to opt out of the study as a whole without any negative impact in their orchestra course or simply opt out of receiving their LSI results. Students were permitted to provide verbal consent which I attained during the next visit when I handed participants their learning style inventory. Although all violin students at every site agreed to participate in the study, one participant indicated that they would not like to receive their LSI profile results.

Phase II was initially designed to gather responses from participants that reflect all 72 permutations of the three independent variables—nine LSI profiles, two genders, and four grade levels. I entered participant variables into a matrix to determine who would be contacted to participate in Phase II. The original design of the study was meant to gather comprehensive qualitative data from participants representing all permutations of the three variables (n = 72). Due to the COVID-19 outbreak, I was unable to reconnect with many participants from Phase I. Instead, I opened Phase II to include any and all willing participants of Phase I regardless of variable combinations. I then conducted the videotaped lesson and interview questions—see below—for all participants that volunteered to meet with me via Zoom (*n* = 15). For Phase II, there were far more female participants (*n* = 14) than male (*n* = 1). Grade level participation was also uneven—Grades 9 (*n*= 5) and 10 (*n* = 5) were most represented among Phase II. Grade 11 (*n* = 4) was similarly characterized in the Phase II data collection. Grade 12 (*n* = 1) had the lowest participation.

Procedures

The current study was divided into two distinct phases. Phase I was designed to gather quantitative LSI data and identify participants who represented combinations of the three independent variables—LSI profile, gender, and grade level. Phase II was designed to gather qualitative data based on student responses to a videotapes model. Student responses were then coded and compared to each other based on the three independent variables.

Phase I

All violin participants from all six sites agreed to complete Kolb's (1984, 2005) Learning Style Inventory (LSI) 3.1. Participants also completed a brief survey I created that asked them to indicate their gender and their grade level. The LSI was chosen for this study due to its connection with the ELT cycle and its ability to clarify the direction and intensity of individual's learning preference. In order to determine how learners prefer to engage in a continuous cycle in response to a modeled experience, the LSI results in a profile that allowed me to compare participants' responses based on their orientation on that inventory.

The LSI was administered during class time to high school students at each site with the exception of Site A where the LSI was administered individually prior to a violin lesson. Participants completed the LSI over the course of 15 minutes. Kolb's (1984, 2005) LSI 3.1 is a series of 12 sentence stems wherein participants rank four sentence endings depending on how accurately those endings describe their interactions with day-to-day situations (e.g., "When I learn: __ I am happy. __ I am fast. __ I am logical. __ I am careful). Participants' rankings—from one to four without repeating a number—of the sentence endings correlate to one of the four dimensions of the ELT cycle—concrete experiences (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE). I collected the completed LSI answer forms and scored them using the scoring matrix provided. Data obtained from the LSI functioned as one of the independent variables in this study. Other independent variable data points included students' indicated gender and grade level. Once the raw LSI, gender, and grade level data had been compiled and analyzed, I selected participants for Phase II that represented one of the 72 possible combinations of the three variables (e.g., Deciding-Female-10th Grade, Accommodating-Male-12th Grade, Balanced-Female-11th Grade, etc.). Due to the COVID-19 pandemic between Phases I and II, many participants became unreachable or otherwise disengaged from the study. After reaching out to the selected Phase II participants and their respective instructors with little success, I decided to accept any and all violin participants from Phase I regardless of their variable representation (n = 15). Specifically, one student from each of sites A, B, and F was represented in the study. Site

C had three Phase II participants. Sites D and E had five and four participants respectively.

Phase II

For the second phase of this study, I selected a sub-set of the participants (*n* =15) from Phase I to observe and perform along with a video recorded violin lesson. Immediately after the lesson, I conducted a brief interview with the participants.

Modeling Tape Preparation

The Phase II modeling tape consisted of a melody and teaching script. Once those components were completed, a local teacher and violin performer acted as the "actor" for the violin lesson. After the lesson had been taped, I then edited the recordings into a single master file.

For the modeling melody, several method books were consulted in order to create a novel melody—Suzuki's (2007) *Violin School*, Kreutzer's (1963) *Forty-Two Studies or Caprices*, Schradieck's (1899) *School of Violin Technics*, Anderson and Frost's (1990) *All for Strings*, Kayser's (1986) *36 Elementary and Progressive Studies*, and Applebaum's (1960) *String Builder*. Although previous researchers have used either a single method book (Linklater, 1997; Quindag, 1992) or a programmed piece of music (Morrison, 2002) as the source of a recorded model, I determined that an amalgam of sources should act as the model. Because I was not previously aware of the potentially myriad method books and pieces the participants might have performed over the course of their violin experience, I concluded that a novel melody consisting of small fragments of notable violin methodology should act as the melodic material for the taped violin lesson (see Figure 2). This novel, eight-measure melody was divided into four, two-measure "chunks" with varying difficulties and required all students to learn the melody from the taped lesson rather than rely on prior experience or performances.

Figure 2

Phase II Melodic Lesson

A teaching script was also created to present and subsequently teach the novel melodic material. After consulting teacher instructional texts (Duke, 2005; Hamann & Gillespie, 2018; Hopkins, 2018; MacLeod, 2018), I determined that an approach utilizing smaller "chunks" of instruction with frequent recontextualizations of those "chunks" into the larger melodic material would be pedagogically appropriate. Other researchers measuring modeling's impact of student achievement (e.g., Henley, 2001; Hewitt, 2001; Rosenthal, 1984; Sang, 1987) have collected data in more longitudinal formats rather than the current study's attempt to determine differences in student internalization and interpretation via a single, static modeling experience. These researchers did not identify specific modeling methodologies to be implemented over the course of data collection. However, in a similarly aligned modeling study, Guerriero (2011) utilized videotaped recordings of violinists performing extremely brief melodic "chunks." The brevity of the melodic content used by Guerriero was designed to limit the length of the data collection and analysis rather than pedagogical motivations.

The teaching script (See Appendix G) included an introduction by the teacher "actor," a summary of the activities for the lesson, an explanation of the instructional sequence, required "check-ups" designed to establish a baseline of student response, and reminders regarding how and why data is being collected in this fashion. Specifically, participants were instructed that there would be eight second pauses after each instance of teacher modeling. Furthermore, participants were informed that they were welcome to engage with the musical material in any way they chose—they could perform along with the teacher, after each modeling instance, or only during the required "check-ups." Finally, participants were reminded that the quality of their performance would not be assessed or adjudicated during the course of the data collection.

After the conclusion of the introduction, the teacher "actor" announced the start of the lesson. The teacher initially performed a complete play through of the eight-measure melody and subsequently identified the first two measure "figure." The first of the two-measure "chunks," the teacher modeled the performance of this figure three times before including the second figure with the first. The teacher then modeled the second two-measure "figure" three times before combining it with the initial two-measure "figure." The first "check-up" followed these instances of modeling wherein the teacher performed the entire piece from start to finish while the student performed along with the model. The teacher then isolated the third two-measure "chunk" and repeated the model three times followed by the second "check-up." The fourth and final two-measure "chunk" was introduced in the same manner as the previous "chunk." The teacher then combined the last two "chunks" three times before moving on to the third "check-up." Finally, the teacher modeled the initial two "chunks" and the last two chunks. The entire eight measure melody was then combined and modeled three times prior to the final "check-up." The teacher thanked the student for joining them.

I began the interview portion immediately after the conclusion of the modeling video. The interview questions (See Appendix H) were designed to draw participants' attention to specific components of Kolb's (1984) experiential learning cycle as well as how participants incorporated and reacted to the modeling experience. Questions one and two dealt with observations and experiences prior to the performance section of the lesson. These questions dealt with the CE phase and required participants to recall and identify immediate perceptual characteristics of the teacher and the lesson. Questions three and four narrowed the participants' focus on the performance component of the lesson. These questions compelled participants to identify specific facets of the lesson in order to clarify how they were engaging with the subject matter. Specifically, these questions attempted to elucidate how participants transformed myriad stimuli from the lesson via intention (RO) and extension (AE) by means of the abstract conceptualization. Questions five and six were similarly focused on a dialectic of Kolb's ELT—that of grasping. Participants were asked how they incorporated lesson components (AC) into their own playing (AE) and described how their performance (CE) became more refined throughout the modeling instruction. The interview concluded with two open ended questions designed to gather more generalized data regarding participants' past experiences with modeling. After the interview portion of Phase II concluded, I thanked the participants and directed any questions or concerns to my email address. The performance portion of the lesson was approximately eight minutes in length while the subsequent interviews ranged from five to nine minutes in length. All Phase II lessons and interviews were conducted via Zoom, recorded, and transcribed for further analysis and validation.

Reliability and Validity

Phase I: Learning Style Inventory

Two sets of researchers investigated the test-retest reliability of the LSI 3.1. Veres et al. (1991) found test-retest correlations above .9 when administering the LSI three times over the course of 16 weeks. Individual Kappa coefficients (Test 1 to Test 2 = .81; Test 1 to Test 3 = .71; Test 2 to Test 3 = .86) indicated that few participants demonstrated changes in their learning preference over the course of the study. However, Rubie and Stout (1991) conducted similar test-retest research looking at LSI reliability between two tests, five weeks apart. Average correlations were reported as .54 over six LSI scales—in this study, the researchers gathered data on the composite learning dimensions of transformation (AE-RO) and prehension (AC-CE). Furthermore, the researchers summarized that 47% of students changed their learning preference upon retest. Kolb and Kolb (2013b) attributed the incongruity of test-retest findings regarding the LSI 3.1 to the fundamental nature of both the ELT and LSI. The same student might react to a single sentence stem differently over time because “learning style is situational, varying in response to environmental demands” (p. 53). For the current study, I attempted to accommodate Kolb's explanation by gathering Phase II data in close proximity to Phase I data—all Phase II data was collected within the same school year as Phase I.

Internal reliability factor analysis was conducted on prior versions of the LSI by Marshall and Merritt (1986), Katz (1986), and Brew (2002). Kayes' (2005) investigation regarding the internal validity and reliability of Kolb's LSI 3.0 supported the use of the LSI as a research instrument. Specifically, Kayes utilized a modified correlation matrix to compare correlations between the scale items—in this case the dimensions of the ELT (CE, RO, AC, and AE) as well as the overall dimensional ratings (AE-RO and AC-CE)—and the correlations within the scale items. "Between scale item correlations ranged from -.18 to -.48 for the four-dimensional scores, (in contrast to within inter-scale correlations of .76–.82) suggesting empirically distinct constructs" (p. 254). Kayes also reported Cronbach alphas between .77 and .82 for each of the four dimensions of Kolb's ELT. Though Kayes investigated undergraduate and graduate collegiate students, the variables used in that study closely resemble those used in the current study with support of the LSI's internal construct validity.

Researchers investigating the external validity of the LSI have shown that four factors impact the results—age, gender, educational level, and educational specialization. Kolb (1976a, 1984, 2005) demonstrated that age impacts learners' preference of grasping via transformation—their indication of abstract conceptualization. "Results from the KLSI 3.1 normative sample show…significant relationships between [AC-CE and AE-RO] scores and six age ranges—<19, 19–24, 25–34, 35–44, 45–54, and >55…" (Kolb & Kolb, 2013b, p. 58). Specifically, average AE-RO scores rise until the 25–34 age range and then decrease as individuals age. A similar increase is seen in the average AC-CE scores until the 25–34 age range when average scores drop until they rise again at the >55 age range (See Appendix J for the complete age range normative values). Kolb (1976b, 1985) also reported that gender differences on the AC-CE dimensional scales showed that males preferred more abstract learning than did females. Significant differences were similarly reported between genders by Kolb and Kolb (2013b) on the AC-CE dimensions and “smaller but significant differences on AE-RO” (p. 58). Kolb and Kolb (2013b) cautioned that other factors—such as educational differences and career choices rooted in systemic biases of gendered occupations—complicate isolating gender as a variable.

Kolb and Kolb also noted that although the average differences between AC-CE and AE-RO are statistically different, the gender distributions overlap considerably. The level of an individual’s education—elementary, high school, undergraduate, and graduate degree—also impacts LSI data. Longitudinal research conducted by Kolb and Kolb (2013b) and Mentkowski et al. (2000) “shows increasing movement in learning style from reflective to an active orientation through the college years” (Kolb & Kolb, 2013b). Specifically, average AC-CE dimensional scores showed a linear increase as individuals acquire more degrees. Mean AE-RO scores showed less consistent patterns as individuals decrease, then increase, and finally return to just above their starting score throughout their elementary, high school, undergraduate, and graduate degrees respectively. Finally, educational specialization has been shown by Wilcoxson and Prosser (1996) in a review of research regarding the LSI and educational specialization “that learning styles may be influenced by environmental demands and thus results obtained for professionals and students in a specified discipline may be dissimilar" (p. 249).

Kolb and Kolb (2013b) provided a breakdown of composite LSI profiles based on occupation but again caution against using the LSI as a predictive instrument designed to determine future success in a given field. To control for the external variables of gender and age in the current study, they were treated as independent variables in addition to LSI results. The external variable of level of education was combined into the independent variable of participant age. Educational specialization was not considered because all participants were of a homogenous population of high school orchestra violinists—an already narrow range of specialization.

Phase II: Video Lesson and Interview Data

In order to establish consistency in reporting among qualitative lesson observations and interview data sets, I sought to manifest credible, authentic, critical, and reflective criteria throughout the data collection process (Whittemore, Chase, & Mandle, 2001). During several visits to each research site during Phase I, I established connections with both the larger ensembles and more focused violin sections within the courses. During Phase II, I was able to build on those connections prior, during, and after the data collection process. This allowed for an open and honest exchange of ideas, thoughts, and performance effort throughout Phase II data collection. Many of the coded observations are highly contextual and based on a triangulation of my own experience, oversight and feedback from individual participants, and learning profile data gathered from Phase I. However, the interpretations and conclusions drawn as a result from the quantitative data portray an accurate depiction of both the internal and external schemata of participants' responses to the videotaped model and interview questions.

To build on the observational data gathered in response to the videotaped lesson, I also paired interview data to provide additional context and meaning behind particular behaviors whenever possible. This interview data provided individual participants a chance to clarify their own thought processes after the lesson portion of Phase II was concluded. No more than two weeks after each participant's Phase II data collection, I individually emailed a transcript of my interpretations of their behaviors and their responses to the model. Included with that email was a transcript of their interview responses. As a means of member checking, I asked that they verify their responses and my interpretations for authenticity.

During the coding and data analysis process of Phase II, I routinely verified and revisited original videotaped data to consistently appraise my own response to participants' behaviors as well as contextualize individual responses within the larger framework of a participants' actions throughout Phase II. Through a reflective and recursive analysis process, I was able to gather meaningful and rich depictions of student interpretations and internalizations within the context of the ELT cycle. When coding, I initially reviewed student interactions with the videotaped model and recorded each action—or inaction—in as much detail as possible. Each pass through each participant's video took approximately 45 minutes to record the various responses. Once my initial pass was completed, I reviewed the descriptions for common themes such as how students made their performances, what they were doing when they performed, their apparent focus, how intense they were in their performance, when they were performing, and other specific features (see Appendix I for a more complete list of both specific codes and eventual consolidations). Once I had compiled this extensive list of themes and codes, I sought to apply them into larger groupings. I then attempted to determine how these larger groupings intersected with Kolb's (1984) ELT cycle and larger theoretical framework. I grouped specific participant strategies according to how they aligned with Kolb's ELT cycle. For other themes and codes, I sought to organize salient and descriptive groupings that best demonstrated how individual participants exhibited their unique cognitive processes and voices.

This process was only possible through a self-critical lens wherein my own observations must be viewed as incomplete and internally biased despite my best attempts otherwise. However, my positionality as a high school string teacher with over a decade and a half of experience provided unique insights into student interactions and potential cognitive processes. Specifically, I was able to quickly categorize and describe a multitude of details when observing and coding participant responses and performances. Similarly, when required to analyze how participants were internally processing the lesson, I was able to use context and my own past experience and training to best approximate their reflective intentions or the focus of their conceptualization.

I continually sought to manifest valid and reliable quantitative observations through a combination of vigorous coding and rich descriptions. Each depiction of participants' behaviors is contextualized by previous behaviors when possible, quantitative data (Gender/Grade Level/LSI Profile), and precise setting within the modeled lesson. I attempted to describe both large-scale behavioral responses to the model and the smaller-scale mannerisms that accompanied those responses. According to Whittemore, Chase, and Mandle (2001) these intense and in-depth observational representations are reflective of both primary and secondary validation criteria.

Data Analysis

Using SPSS software, I determined Cronbach Alpha values to compare the internal consistency of the current study's participants with previous normative and sub-group data (Kolb & Kolb, 2013b). I then performed two- and four-factor analyses to determine variability among the distinct ELT orientations (CE, RO, AC, and AE). I also conducted a frequency distribution and relative frequency analysis in addition to employing a mixed MANOVA to analyze variances within distinct ELT orientations (CE, RO, AC, and AE) and among grade levels and gender.

Data from the qualitative interviews were transcribed, coded, and analyzed to determine themes among the participants' three variables of gender, grade level, and LSI profile. A short list of "lean codes" (Creswell, 2013, p. 184) were extracted from Kolb's ELT (1984) as a basis for analyzing the interview transcripts. These lean codes related directly to phases of the ELT cycle—e.g., AE/CE for instances when a participant performed concurrently with the model. The a priori codes acted as a starting point for the interview and observation transcripts used for analysis. All codes were consolidated into six large themes with subcategories. Furthermore, data extracted from recursive analysis of the observations were used to support and triangulate interview data, thereby increasing trustworthiness as a result of the coding and analysis process (Creswell, 2013; Mertens, 1998).

I sought to address the research questions investigating the different manners with which students attended to modeled experiences, alignment or misalignment with a teacher's intent in response to a model, and how students compared in their response to that model using the codes and consolidated themes. Using an internal cross-case analysis of participants across similar instances within the videotaped lesson, I pursued a deeper understanding of how learners with various learning preferences, flexibilities, genders, or grade levels aligned or differed in their transformation and comprehension of a teacher's model (Alan, 2006; Miles & Huberman, 1994). Specifically, I created matrices based on these variables to compare themes of individual learners' KLSI 3.1, observation, and interview data across all participants' responses to individual portions of the videotaped lesson. For example, each teacher performance and simultaneous student response was an instance. The immediate eight-second following each modeled performance was another instance. The matrices provided insight across each participant as well as throughout the lesson as a whole. Miles and Huberman's (1994) conceptually ordered displays allowed for flexible analysis of data sources across all participants while maintaining a focus on individual decision-making processes.

Previous ELT researchers (Alan, 2006; Pedrosa de Jesus et al., 2006) explored the detailed descriptions provided by participants, as opposed to the rationale behind those descriptions. For example, Pedrosa et al. (2006) used a single artifact-style research design to portray how learners of specific learning styles and integrative phases ask questions. By applying an internal cross-case analysis of participants, I was able to retain the contextual justification behind individuals' interpretation of the modeling video while exploring how individuals differed in their response based on their own set of variables without having to explore the reasoning behind individuals' responses.

I conducted cross-case analysis utilizing KLSI 3.1 profile data, gender, and grade level using the codes as a basis for comparison among participants' responses to the model. Using the matrices as a means to align participant responses in a temporal manner, I was able to look for how students contrasted or aligned in their grasping and transformation of the teacher model. I examined matrix data between the following variables: contrasting genders (M vs. F); matching KLSI profiles (e.g., Analyzing vs. Analyzing vs. Analyzing); directly contrasting KLSI profiles (e.g., Experiencing vs. Thinking; Initiating vs. Analyzing); overlapping KLSI profiles (e.g., Reflecting vs. Experiencing vs. Thinking); developmental level via KLSI profiles (e.g., Balanced vs. Thinking vs. Experiencing vs. Reflecting); matching grade level (e.g., Grade 9 vs. Grade 9 vs. Grade 9); and contrasting grade level (e.g., Grade 9 vs. Grade 10). I also compared raw KLSI 3.1 data to previous results presented by ELT researchers who had investigated average norms as well as norms specific to subsets of populations based on educational specialization, age, gender, and level of education.

CHAPTER FOUR: FINDINGS

In this chapter, data from the Cronbach's alphas, factor analysis, frequency distribution, relative frequency, and an analysis of variance among means are presented. Next, I present the results beginning with the specific behaviors participants employed in response to the model. Subsequently, I demonstrate how these behaviors align or fail to align with the model's expectations within the context of the lesson sequence. Finally, I present qualitative data comparing how participants vary in their responses.

Phase I: KLSI 3.1 Data

The following quantitative data are presented in order to address the first research question: What is the distribution of Learning Styles Inventory (LSI) profiles among high school violin students?

Internal Consistency

Kolb's KLSI 3.1 uses a randomized scoring format to ensure internal consistency. The average scale reliability of the current study using Cronbach's alpha was $\alpha = .76$. Average internal consistency alpha scores for specific ELT Dimensional questions were CE = .79, RO = .76, AC = .78, AE = .71. According to Nunally and Bernstein (1994), a Cronbach alpha close to .80 is the recommended criteria for applied research. Although internal consistency values of $\alpha = .70$ can be used for most varieties of research, the inter-test reliability should be viewed with caution. All four of the primary ELT Dimensions displayed acceptable rates of inter-test reliability—though the AE dimensional scores should be viewed with caution as they were only marginally above the Nunally and Bernstein's suggestion for applied research.

Confirmatory Factor Analysis for KLSI Dimensions

Kolb and Kolb (2013b) utilized factor analysis as a means to present the internal validity of the KLSI tool. All editions of the KLSI utilize an ipsative, forced choice methodology due to participants ranking their preference of the ELT-related sentence stems. Kolb and Kolb admitted that forcing participants to rank their chosen responses one through four indicated that a participants' score on a given question for a specific variable—CE, RO, AC, or AE—was unintentionally dependent on the other three variables. This produced negative correlations among internal variables as a result of the methodology and directly impacted the independence of error variance when conducting factor analysis. As such, researchers performing factor analysis of KLSI data have utilized various methodologies to compare the internal comparisons of the ELT variables. I performed a factor analysis in order to compare the internal ELT data from the KLSI 3.1 administered to Phase I participants. I initially performed a two-factor, varimax rotation analysis along the AC-CE and AE-RO dialectic variables. The Kaiser-Myer-Olkin measure of sampling adequacy was determined to be low at .29—well below the recommended value of .60 (Harmon, 1976). However, Bartlett's test of sphericity was significant at χ^2 (6) = 75.86, $p < .05$. As seen in the below correlation matrix in Table 1 all diagonals were below .30 indicating weak relationships between variables along dimensional values.

Table 1

Correlation Analysis of Dialectics AC-CE and AE-RO

		CE	RO	AC	AE
Sig. (unilateral)	CE		.000	.000	.084
	RO	.000		.033	.201
	AC	.000	.033		.420
	AE	.084	.201	.420	

Additionally, although communalities were above .60 in all four-dimensional values with the exception of AE (.16), the relationships between factored variables did not indicate appropriate correlations either positive or negative as seen in Table 2.

Table 2

Two-Factor Component Matrix (Rotated)

	Component	
	1	2
CE	-.772	-.547
RO	.900	-.335
AC	.094	.885
AE	-.082	.392

Note. Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization.

According to Kolb (1984), specific dimensions of the ELT cycle should correlate to one of the two dialectic factors. As seen in Table 2, few clear correlations exist between ELT dimensions and the factors—e.g., although the RO dimension has a strong correlation with component 1 and a moderate negative correlation with component 2, the AE dimension has an extremely weak negative correlation with dimension 1 and a moderate correlation with component 2.

Due to the lack of clear interactions between the AC-CE and AE-RO variables, I also performed a four-factor, varimax rotation analysis along individual ELT variables—CE, RO, AC, and AE—based on their associated sentence stem from the KLSI 3.1 (Table 3).

Table 3

Four-Factor Component Matrix (Rotated)

	Component			
	1	2	3	4
CEQ1	.002	**.719**	-.038	.024
CEQ2	-.091	**.644**	-.246	-.033
CEQ3	-.129	**.646**	-.068	-.003
CEQ4	-.125	**.596**	-.057	-.059
CEQ5	.120	**.310**	-.259	-.184
CEQ6	-.158	**.484**	.098	-.037
CEQ7	.030	**.607**	-.189	.005
CEQ8	.005	**.499**	.140	.182
CEQ9	-.069	**.503**	-.304	-.048
CEQ10	-.179	**.334**	-.317	-.141
CEQ11	-.279	**.345**	-.221	.180
CEQ12	-.026	**.500**	-.108	.004
ROQ1	**.710**	-.193	-.082	.111
ROQ2	**.626**	-.081	-.222	-.169
ROQ3	**.318**	-.381	-.213	-.389
ROQ4	**.631**	-.290	-.153	.099
ROQ5	.193	**.265**	.189	-.224
ROQ6	**.729**	-.192	-.227	-.039
ROQ7	**.624**	-.320	-.160	.069
ROQ8	.125	-.219	-.105	.192
ROQ9	**.389**	-.329	.091	-.178
ROQ10	**.323**	-.120	-.169	-.186
ROQ11	**.701**	-.358	-.176	.077
ROQ12	.067	-.130	-.462	.021
ACQ1	-.021	-.083	**.481**	-.129
ACQ2	-.151	-.331	**.497**	-.374
ACQ3	-.283	-.211	**.422**	-.240
ACQ4	.080	-.074	**.640**	-.046
ACQ5	.140	-.462	**.404**	.100
ACQ6	.051	-.393	**.664**	-.001
ACQ7	-.118	-.002	**.755**	-.016
ACQ8	-.252	-.047	.109	-.515
ACQ9	.116	.232	**.442**	.145
ACQ10	-.077	-.057	**.635**	-.207
ACQ11	.173	-.076	**.638**	-.104
ACQ12	-.043	-.235	**.255**	-.030
AEQ1	-.631	-.313	-.287	-.015

AEQ2	-.352	-.136	-.113	**.601**
AEQ3	.037	-.045	-.083	**.714**
AEQ4	-.604	-.154	-.415	-.024
AEQ5	-.462	-.072	-.352	**.302**
AEQ6	-.552	.147	-.458	.062
AEQ7	-.590	-.264	-.343	-.064
AEQ8	.142	-.280	-.157	**.179**
AEQ9	-.468	-.298	-.245	.100
AEQ10	-.106	-.047	-.063	**.826**
AEQ11	-.602	.110	-.237	-.140
AEQ12	.040	-.169	**.298**	-.028

Note. Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization.

This more detailed analysis of participants' KLSI 3.1 responses yielded more specific correlative data. The CE-related sentence stems demonstrated an overall correlative proclivity towards the second component. Less confidently, the RO-related sentence stems generally correlated with the first component with the exception of questions 3, 5, and 8 which had stronger relationships—either positive or negative—with components two and four. RO-related question 12 had a stronger correlation between component two and three. The AC-related sentence stems were mostly correlated with component 3 with the exception of questions 5 and 8. AE-sentence stems demonstrated the weakest correlations with any of the four components. Although questions 2, 3, and 10 indicated strong correlations with component four, AE-related sentence stems from questions 1, 4, 7, and 11 exhibited negative correlations.

Overall, as seen in Table 3, there were more clear relationships between specific participant responses along the AC and CE variables as well as the AE and RO variables. Kolb (1984) posited that not only should these sentence stems relate to specific dimensions of the ELT cycle, they should also be inversely related to the opposite dialectic pole—e.g., the CE dimension (component 2) should be overall negatively correlated to the AC dimension (component 3). These relationships are relatively clear along all ELT variables with the exception of the AE dimension—particularly among specific item questions 1, 4, 6, 7, 10, 11, and 12. Overall, however, the factor analysis results are inconclusive and only marginally support “two bipolar factors, one with AC and CE as poles and the other with AE and RO as poles, representing the grasping and transforming dimensions of the learning cycle” (Kolb & Kolb, 2013b, p. 57).

Individual Relative Frequency and Frequency Distributions Among KLSI and ELT Orientations

Learning styles among all participants were broken down by specific KLSI orientation (e.g., Thinking, Experiencing, Reflecting, etc.) and the ELT orientation (e.g., Apprehension /North, Intention/East, etc.) based on the intersection of the Grasping (AC – CE = y-axis) and Transforming (AE – RO = x-axis) dialectics. The x- and y-axis values correlate to a single plot point on a unique chart (see Figure 3). These Grasping and Transforming values also determined participants’ learning styles as indicated by Kolb and Kolb’s (2013b) specific cut scores. For example, according to Kolb and Kolb’s cut scores, a participant with a Grasping score greater than 14 and a Transforming score greater than 11 would prefer the Deciding (AC/AE) learning style.

The Reflecting (CE/RO/AC) learning orientation represented the largest group of participants (20%) though the adjacent and overlapping Analyzing (RO/AC) group was the second largest (15%) within the study. The Deciding (AC/AE) and Acting

(AC/AE/CE) learning orientations were the least represented (5% each) by participants in the study. Table 4 is a complete breakdown of the overall relative frequency of the nine Kolb learning orientations based on KLSI from the violin participants in the current study. Figure 3 is a scatterplot of KLSI scores for all participants in the study.

Kolb (1971) originally based the x- and y-axes and origin on normative results from previous researchers (Kolb, Rubin, & McIntyre, 1971) investigating learning styles. These normative values have been updated throughout the various versions of the LSI (see Kolb & Kolb, 2013b, for a brief history of the LSI). In Figure 3—as in the KLSI 3.1—the origin is centered "on the 50^{th} percentile of the normative comparison group" (Kolb & Kolb, 2013b, p. 47).

Table 4

Relative Frequency of KLSI 3.1 Profiles Among Participants

Concrete Experience

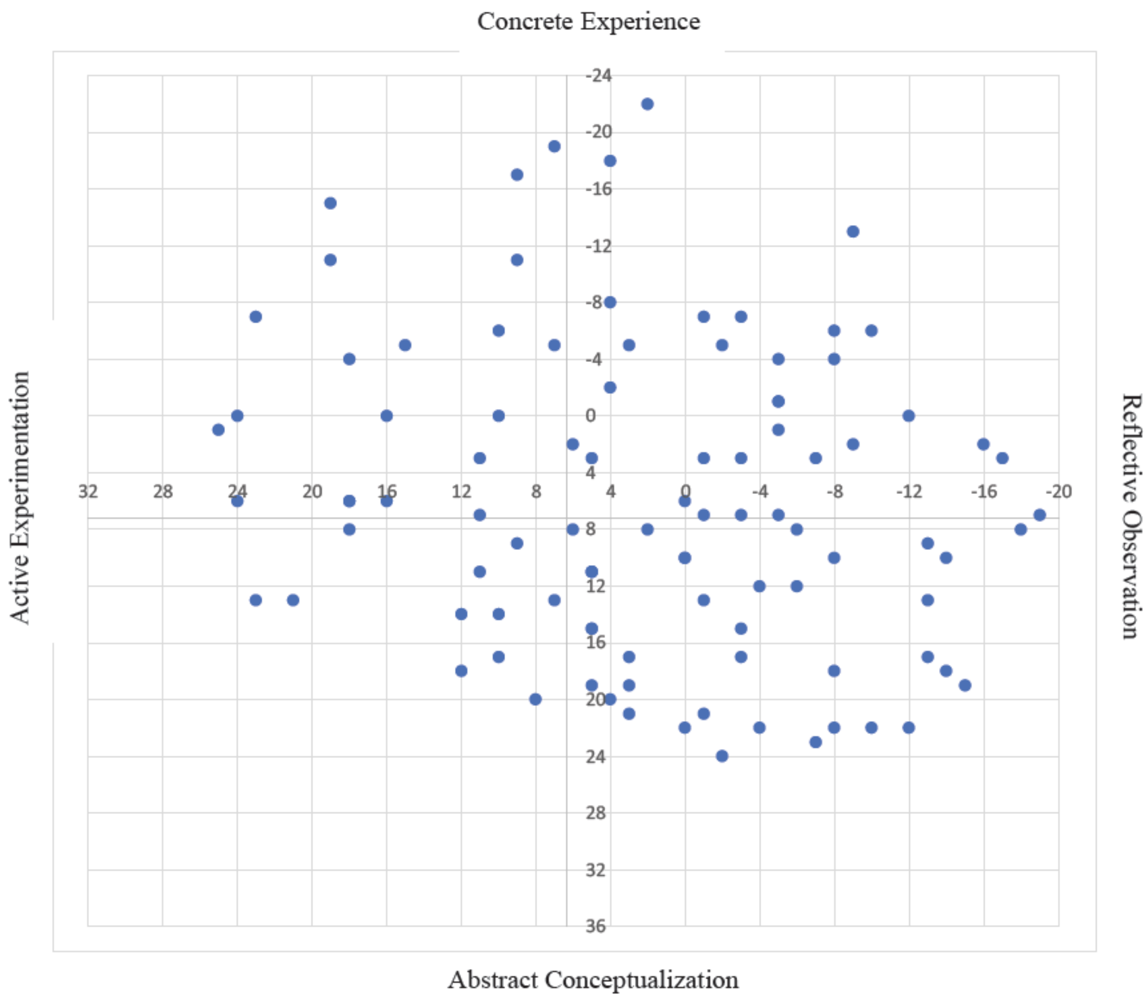
Active Experimentation | Reflective Observation

Initiating AE/CE 9%	Experiencing AE/CE/RO 10%	Imagining CE/RO 13%
Acting ACE/AE/CE 5%	Balanced *All* 12%	Reflecting CE/RO/AC 20%
Deciding AC/AE 5%	Thinking RO/AC/AE 11%	Analyzing RO/AC 15%

Abstract Conceptualization

Figure 3

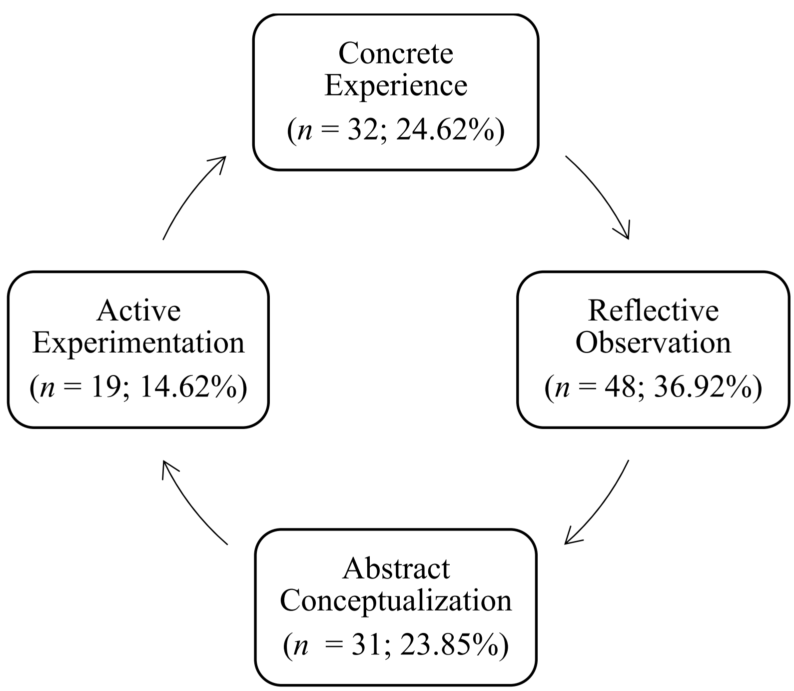
Distribution of KLSI 3.1 Scores Among Participants



Other researchers (Boyatzis & Mainemelis, 2010; Kolb et al., 2000) have utilized KLSI data to represent participants' learning orientations via their dominant dialectic dimension—Apprehension/North, Intention/East, Comprehension/South, Extension/West. These relate to Kolb's (1984) ELT cycle—e.g., Concrete Experience is equivalent to Apprehension/North profiles, etc. Within the current study, Reflective Observation represented the strongest orientation (36.92%) although Active Experimentation (14.62%) was the least represented as seen in Figure 4. The relative frequency is indicative of the overlap that occurs in the fundamental learning profiles—e.g., the Initiating (AE/CE) learning profile is indicative of both the North and Western dimensions and was counted twice.

Figure 4

Frequency Distribution and Relative Frequency of Dominant Dialectic Orientation Among Participants



Frequency Distribution among Participants' Learning Orientations by Gender and Grade

In addition to the KLSI data, two other independent variables were identified within the current study as external factors that might impact KLSI results—gender and age (Kolb & Kolb, 2013b). Frequency distributions and relative frequency for the grade level and gender variables are presented in Table 5, which shows a larger number of female students across grade levels.

Table 5

Frequency Distribution and Relative Frequency for Grade Level and Gender

	9	10	11	12	Total
M	3 (16.67%)	6 (33.33%)	4 (22.22%)	5 (27.78%)	18 (100.00%)
F	25 (30.49%)	26 (31.71%)	18 (21.95%)	13 (15.85%)	82 (100.00%)
Total	28 (28%)	32 (32%)	22 (22%)	18 (18%)	100 (100%)

Table 6 represents the frequency distribution and relative frequency for the variables of gender and learning preference orientation. After running a Chi-Square Test of Independence, there was a significant relationship between gender and ELT Dimensions (χ^2 (8, 100) = 18.03, p = .02). This significant relationship suggested that among the study participants, males showed a more frequent KLSI Deciding orientation than females. However, in all other orientations, females surpassed their male counterparts in their frequency distribution, which could be explained by the overall larger number of female participants in the study.

Table 6

Frequency Distribution and Relative Frequency for Gender and KLSI 3.1 Profile

	Initiating (AE/CE)	Experiencing	Imagining (CE/RO)
M	1 (1%)	3 (3%)	1 (1%)
F	8 (8%)	7 (7%)	12 (12%)
	Acting (ACE/AE/CE)	Balanced (*All*)	Reflecting (CE/RO/AC)
M	1 (1%)	0 (0%)	3 (3%)
F	4 (4%)	12 (12%)	17 (17%)
	Deciding (AC/AE)	Thinking (RO/AC/AE)	Analyzing (RO/AC)
M	4 (4%)	2 (2%)	3 (3%)
F	1 (1%)	9 (9%)	12 (12%)

Table 7

Frequency Distribution and Relative Frequency for Grade Level and KLSI 3.1 Profile

	Initiating (AE/CE)	Experiencing	Imagining (CE/RO)
9	2 (7.14%)	2 (7.14%)	4 (14.29%)
10	1 (3.12%)	1 (3.12%)	3 (9.38%)
11	1 (4.55%)	4 (18.18%)	3 (13.64%)
12	5 (27.78%)	3 (16.67%)	3 (16.67%)
	Acting (ACE/AE/CE)	Balanced (*All*)	Reflecting (CE/RO/AC)
9	2 (7.14%)	3 (10.71%)	8 (28.57%)
10	3 (9.38%)	4 (12.50%)	4 (12.50%)
11	0 (0%)	3 (13.63%)	7 (31.82%)
12	0 (0%)	2 (11.11%)	1 (5.56%)
	Deciding (AC/AE)	Thinking (RO/AC/AE)	Analyzing (RO/AC)
9	0 (0%)	7 (25.00%)	0 (0%)
10	3 (9.38%)	4 (12.50%)	9 (28.13%)
11	0 (0%)	0 (0%)	4 (18.18%)
12	2 (11.11%)	0 (0%)	2 (11.11%)

Mean Differences in Kolb's ELT Dimensions

Individual participants' results were divided between their indications of how they prefer to interact with the four dimensions of Kolb's ELT—Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). Furthermore, the KLSI 3.1 collected data regarding which dimension of the grasping and transformation dialectics participants prefer. As dictated by the LSI manual (Kolb & Kolb, 2013a), the grasping dialectic was calculated by subtracting the Concrete Experience results from the Abstract Conceptualization results (AC – CE = Grasping). Similarly, the transforming dialectic was the result of Reflective Observation scores subtracted from the Active Experimentation scores (AE – RO = Transforming). The grasping and transforming dialectics represent the two spectrums along which learners interact with experiences. For example, learners generally exhibit a preference to interact with either externalized Concrete Experiences or internalized Abstract Conceptualizations. A negative score among the AC-CE dialectic indicates a CE preference. A negative score among the AE-RO dialectic indicates a RO preference.

In order to examine the mean differences in participants' ELT dimensions, as well as the possible differences attributed to gender and grade, I performed a three-way mixed MANOVA to examine the main between-subjects effects for gender (M/F) and grade level (9–12), and the Learning Style as the within-subjects effect based on KLSI 3.1 ELT dimensional scores (CE, RO, AC, and AE), as well as their interactions. Kolb and Kolb (2013b) posited that the ipsative nature of the KLSI tool impacts insight into any analysis of variance performed due to the unmeasured interactions between variables' means. Although researchers performing multiple ANOVAs might do so in order to isolate such interactions, Type I error is compounded when running multiple analyses of variance on a single dataset. Therefore, the use of a mixed MANOVA allowed me to control for Type I error. Table 8 presents the multivariate tests for the mean differences of ELT Dimensions, as well as the main effects of grade and gender, and the three-way interaction.

Table 8

*Three-Way Mixed MANOVA: ELT Dimensions * Grade * Gender*

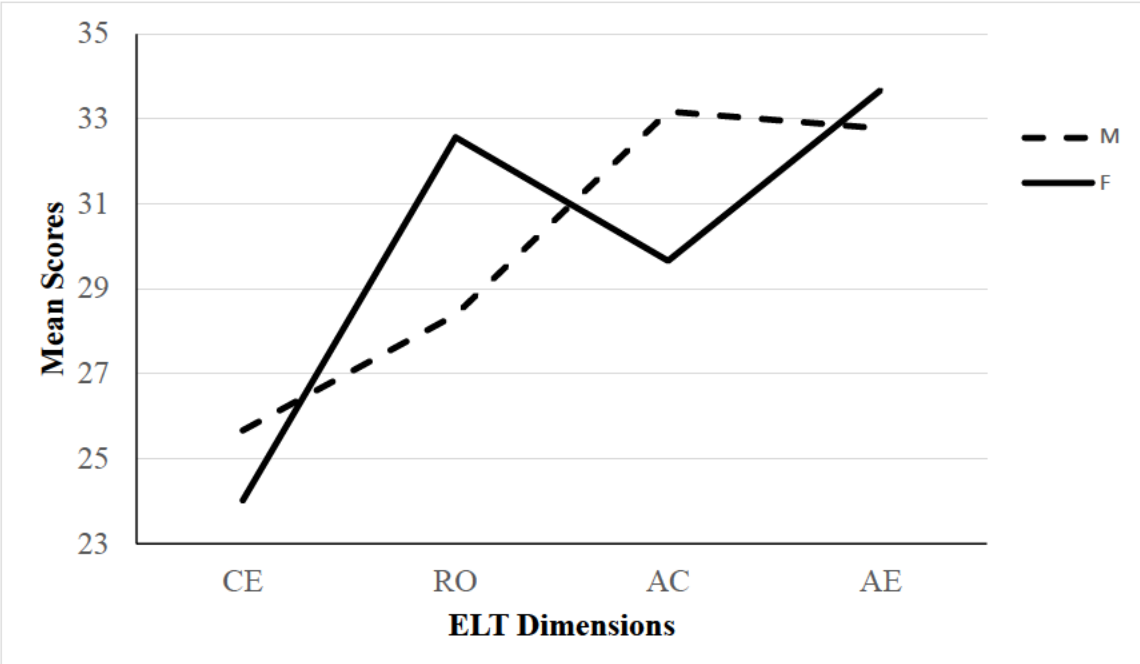
Effect		Value	F	Hypothesis df	Error df	Sig.	Partial η^2
ELT (Dimensions)	Pillai's Trace	.32	14.05	3.00	90.00	.000	.319
	Wilks' Lambda	.68	14.05	3.00	90.00	.000	.319
	Hotelling's Trace	.47	14.05	3.00	90.00	.000	.319
	Roy's Largest Root	.47	14.05	3.00	90.00	.000	.319
ELT * Grade	Pillai's Trace	.15	1.62	9.00	276.00	.108	.050
	Wilks' Lambda	.85	1.63	9.00	219.19	.108	.051
	Traza de Hotelling	.16	1.63	9.00	266.00	.108	.052
	Roy's Largest Root	.11	3.49	9.00	92.00	.019	.102
ELT * Gender	Pillai's Trace	.09	3.31	3.00	90.00	.024	.099
	Wilks' Lambda	.90	3.31	3.00	90.00	.024	.099
	Hotelling's Trace	.11	3.31	3.00	90.00	.024	.099
	Roy's Largest Root	.11	3.31	3.00	90.00	.024	.099
ELT * Grade * Gender	Pillai's Trace	.14	1.55	9.00	276.00	.131	.048
	Wilks' Lambda	.86	1.55	9.00	219.19	.133	.049
	Hotelling's Trace	.16	1.53	9.00	266.00	.136	.049
	Roy's Largest Root	.09	2.95	3.00	92.00	.036	.089

The results of the mixed-MANOVA, using the multivariate criterion of Pillai's Trace, yielded no significant differences between the three-way interaction (ELT Dimensions * Grade * Gender) nor between grade levels and ELT orientations ($p > .05$). The ELT Dimensions * Gender was tested. Based on these results, the variables of grade level and ELT dimension are not significantly related. Similarly, the univariate tests associated with the Gender [$F(1, 92) = .25$, $p = .61$] and Grade [$F(3, 92) = .34$, $p = .79$] main effects also failed to meet statistical significance.

Though much of the mixed-MANOVA analysis yielded non-significant results, there was one exception. The ELT Dimensions * Gender interaction [Pillai's Trace = 32, $F(3, 90) = 3.31$, $p = .02$, $\eta^2 = .10$] was significant in addition to the ELT Dimensions as the within effect [Pillai's Trace = 32, $F(3, 90) = 14.05$, $p < .01$, $\eta^2 = .32$]. The interaction indicated that Gender was related to the ELT Dimensional means at the threshold for statistical significance. Four paired-samples *t* tests were conducted to follow up the significant interaction. I controlled for familywise error rate across these tests by using Holm's sequential Bonferroni approach (adjusted $\alpha = .05/4 = .0125$). Mean comparisons suggested that female students reported significantly higher use of reflective observation than male students, $t(28) = -2.67$, $p = .012$. The effect size for the difference between the groups was calculated using Cohen's d resulting in a value of .63 which is considered a medium to large effect (Thompson, 2007). Despite the visual interaction across ELT dimensions, as it can be seen in Figure 5, gender differences for concrete experience, abstract conceptualization, and active experimentation did not meet statistical significance ($p > .0125$).

Figure 5

Two-Way Multivariate Analysis of Gender and ELT Dimension



Note: CE = Concrete Experience; RO = Reflective Observation; AC = Abstract Conceptualization; AE = Active Experimentation.

For the main within-subjects effect of the ELT dimensions, the multiple pairwise comparisons (Table 9) suggest significant differences between the CE and the other ELT Dimensions. As such, Concrete Experience (M = 25.41, SD = .84) was significantly lower than Reflective Observation (overall M = 30.52, SD = .88; p =.004), Abstract Conceptualization (M = 30.79, SD = .85; p =.002), and Active Experimentation (M = 33.24, SD = .79; $p < .001$). No other comparison among ELT dimensions met statistical significance ($p > .05$).

Table 9

Pairwise Comparisons Among ELT Dimensions

					95% Confidence Interval for Difference	
ELT Dimension	ELT Dimension	Mean Difference	Std. Error	Sig.	Lower Bound	Upper Bound
CE	RO	-5.11*	1.45	.004	-9.023	-1.198
	AC	-5.39*	1.45	.002	-9.293	-1.479
	AE	-7.83*	1.2	<.001	-11.079	-4.589
RO	CE	5.11*	1.45	.004	1.198	9.023
	AC	-.28	1.33	1.000	-3.852	3.300
	AE	-2.72	1.43	.358	-6.576	1.128
AC	CE	5.39*	1.45	.002	1.479	9.293
	RO	.28	1.33	1.000	-3.300	3.852
	AE	-2.45	1.37	.459	-6.133	1.237
AE	CE	7.83*	1.2	.000	4.589	11.079
	RO	2.72	1.43	.358	-1.128	6.576
	AC	2.45	1.37	.459	-1.237	6.133

Note. * = significant at an alpha level of .05. Adjustment for multiple comparisons: Bonferroni.

Mean Differences in Kolb's ELT Dialectics

A similar three-way mixed MANOVA was conducted in order to examine any mean differences between ELT dialectics (AC-CE and AE-RO), as the within-subjects effects, and the possible interaction with the two main effects of Grade and Gender. However, none of the interactions and main effects met statistical significance ($p > .05$).

The implications and discussion of the KLSI-specific alpha values, correlations, and mean differences in comparison to extant data regarding previous KLSI research—including normative values and ANOVAs from Kolb and Kolb (2013b)—will be conducted in Chapter 5.

Students' Reflections and Transformations

To address research questions two through four, Phase II was conducted with a sub-group of participants (*n* = 15) who were shown a videotaped violin lesson (see Appendix G for a script) and asked eight interview questions regarding their personal strategies, observations, and thoughts immediately following the lesson (see Appendix H). The KLSI data, after collected, was used in conjunction with participant grade level and gender as variables to observe and compare participants' responses to a videotaped violin lesson. The three variables served to classify responses to both the lesson and the interview, shed light on individual motivations seen through the lens of Kolb's (1984) ELT as compared to the instructions from the lesson, and differentiate participant response data. The remainder of Chapter 4 will focus on qualitative data gleaned from participants' videotaped responses and interviews.

After conducting the interviews with the sub-group of participants, I coded, tabulated, consolidated, and organized participant responses to the lesson and interview. Over the course of Phase II data collection, I accumulated 3,327 total codes totaling 118 unique codes—each session yielded an average of 221.8 codes per participant. To develop a coherent list of codes, I applied Miles and Huberman's (1994) structure of cyclical coding as the basis of my analysis. I further consolidated and organized the codes into six emergent patterns or themes—Strategy, Focus, Intensity, Response to Model, Approach and Application, and ELT complexity. Those emergent themes of Strategy and Focus, their subcategories, and specific codes are detailed in Figure 6 and Table 10, respectively. Table 11 represents the frequency distribution of the six emergent themes and subcategories (where applicable).

Figure 6

Strategy Subcategories and Composite Codes

CE/AE Pitch Identification First Pitch Melodic Contour Interval Identification	**AE/CE/RO** Error Detection (Self) Verbalization Visual Observations	**CE/RO** Listening
AC/AE/CE Non-Sequential Performance* Delayed Sync. with model Tempo Modification Rhythmic Contour Reference/Anchor Pitch Drone Gesture Isolation	**Balanced (CE/RO/AC/AE)** Blended Strategies Overlapping Instances	**CE/RO/AC** Retention Task Identification Theory Testing
AC/AE Movement Guessing Trial/Error Sustained Tone Matching	**RO/AC/AE** Damage Mitigation Counting/Pulse Singing/Humming Audiation Alternative Fig.	**RO/AC** Null/No Observed Action

Note. *Non-Sequential Performance refers to participant who reacted to the modeled performance out of the model's performed order—thereby suggesting that they were using a blend of the model's external performance and their own internal concept of the performance.

Table 10

Focus Subcategories and Composite Codes

Subcategory	Code
Musical	Slurs
	Emotion & Musicality
	Intonation
	Rhythm
	Style
	Tempo
	Articulation
	Dynamics
	Tone
Left Hand	Vibrato
	Fundamental Skills & Technique (LH)
	Posture
	Positioning
	Visual (LH)
Lesson Execution	Instructions
	Pacing
	Model
	Repetition
Right Hand/Bow	Bowing Technique
	Bow Hold
	Bow Location
	Bow Speed
	Bow Length
	Bow Distribution
	Bow Direction
	Bowing (General)
General	Holistic Observations

Table 11

Frequency Distribution: Emergent Themes and Subcategories

Strategy	AE/CE	247
	CE/RO/AC	84
	CE/RO	212
	RO/AC/AE	64
	RO/AC	93
	AC/AE/CE	47
	AC/AE	31
	AE/CE/RO	150
	Balanced	52
Focus	Musical	129
	Left Hand	42
	Lesson Execution	18
	Right Hand/Bow	36
	General	3
Response to Model	External	65
	Internal	13
Intensity	Intensity	285
Approach/Application	CE Concurrency	236
	AE Generation	618
	Instrument Location	72
ELT	Individual	13
	Dual	811
	Complex	6
Total		3327

Strategies and Transformations

The theme of strategy directly relates to the ways in which students attempt to transform a modeled concrete experience—in this case, a videotaped violin lesson. These include the means with which participants interacted—or did not interact—with the modeled lesson. With regard to students' applied learning strategies, Kolb (1984) posited that the complex nature of learning indicated the possibility of distinctive and combinative ways that individuals interpret and respond to an experience and context.

Specifically, their idiosyncratic use and dependence of behaviors along the ELT cycle potentially yielded particular “possibility-processing structures of styles of learning” (p. 64). A learner’s choices—and the consequences of those choices—potentially establish a pattern of apprehension of comprehension. They also tend to create a habit of transforming experiences by extension or intension. The particular degree to which learners might apply a specific dialectic is context-driven yet relatively consistent. As such, when a learner encounters a context that requires a strategy, they tend to apply a strategy that correlates with their own learning style. An Analyzing learner (RO/AC), for example, might apply a process of comprehension via intentional transformation of the subject matter. Kolb explained this process as “a kind of inductive model-building process relying on abstract conceptualization and reflective observation” (p. 65). For the purposes of this study, I have coded such a strategy as a RO/AC behavior. Kolb explains that there are four such elemental or fundamental combinations of ELT sub-groups in response to a learning context: AE/CE, CE/RO, RO/AC, and AC/AE. All sub-groups use adjacent phases of the ELT cycle.

The strategies applied by participants within Phase II of the current study were predominantly related to Active Experimentation/Concrete Experiences (24.46%) or Concrete Experiences/Reflective Observation (20.99%) though a more advanced, higher-order combination of Active Experimentation/Concrete Experience/Reflective Observation was utilized relatively frequently (14.85%). All other strategic orientations and combinative complexities were utilized less than 10% of the time by participants in response to the various challenges put forth in the videotaped lesson. See Table 12 for the relative frequency of the strategies applied by participants in response to the modeled videotape lesson. Appendix I has a complete list of the strategies that comprise the sub-categories.

Table 12

Relative Frequency of Applied Strategies

Applied Strategies	Frequency	%
AE/CE	247	24.46
CE/RO/AC	84	8.32
CE/RO	212	20.99
RO/AC/AE	94	9.31
RO/AC	93	9.21
AC/AE/CE	47	4.65
AC/AE	31	3.06
AE/CE/RO	150	14.85
Balanced	52	5.15
Total	1010	100.00

Fundamental Strategies. The majority of strategies (57.72%) applied by participants (*n* = 15) in Phase II utilized only an elementary, or fundamental, combination of adjacent ELT phases—e.g., only the CE/RO phases or only the AC/CE phases. Strategies that included the Active Experimentation/Concrete Experience phases directly related to the stimuli from the videotaped lesson. Participants that applied AE/CE-related strategies, therefore, attempted to identify pitches within the melody, isolate the primary pitch of a fig., or even break down the melody into rough outlines of descending or ascending patterns without identifying individual pitches. These strategies deal with "'hands-on' experience and real life situations" (Kolb & Kolb, 2013b, p. 195) that focus on decisive action, risk taking, and immediate feedback. The nature of the context and task required of the participants within the lesson is most likely a direct cause for the majority of strategies employed by students to fall within the concrete experience category. Indeed, the simple act of Pitch Identification comprised 21.09% of strategies employed by participants (*n* = 15)—again, this is most likely due to the nature of the task within the lesson.

Concrete Experiences/Reflective Observation strategies comprised the second most frequently applied act of transforming the material within the violin lesson by participants. Although there were several more advanced strategic combinations of Reflective Observation and adjacent ELT cycles of Concrete Experience and Abstract Conceptualization—e.g., Error Detection, Verbalizations, Task Identification, etc.—the only strategy that I categorized as CE/RO was the act of active listening during the teacher's performance. Kolb and Kolb (2013b) classify CE/RO tasks focused on "stepping back from experiences to observe and reflect…on feelings about what is going on" (p. 201).

All told, AE/CE and CE/RO strategies represented 45.45% of participant responses to the videotaped lesson. One participant, Maya, pivoted between the two strategies for the majority of the time spent on fig. 1.[1] Maya was a 9th Grade female who represented the Imagining (CE/RO) learning preference. Below is a depiction of Maya's response to the videotaped model. It—and all subsequent participants' depictions and interviews—will be presented in italics.

[1] In order to avoid confusion, I will use the abbreviation fig. to denote the specific section of the modeled piece from the lesson. I will continue to use the term Figure to refer to specific visual representations of data.

It is early in the videotaped lesson. Maya has indicated she was ready to begin and has listened both the instructions and the entire piece from the teacher. She sits ready to begin but seems nervous.

"I will now play the first fig.," the teacher states. During the subsequent performance of the first two measures, Maya gets into playing position, sets her bow on the string, but only listens to the model's performance. Once the model has stopped performing, Maya hesitates a beat and then carefully starts to explore how to match the model's performance. Her first note is tentative—she seems unsure of how to actually apply what she has gleaned from her previous reflections of the model. She holds her first note too long and then quickly plays through the rest of fig. 1 with only a key signature mistake. She is, however, interrupted by the model continuing with the lesson—she is unable to process or refine this initial attempt.

"The first fig. again," intones the teacher. Maya, once again, sits ready in playing position with the bow on the string and listens to the modeled performance. Maya seems to have learned from her previous mistake and starts right away—no time for hesitancy, it seems. She repeats her previous attempt including the key signature mistake. Maya completes this single attempt, pauses to reflect upon this performance, and waits for the teacher to continue.

The teacher continues, "One more time." Maya adheres to her strategy of listening during the modeled performances before resuming and refining her previous approach. She waits even less time before making her single attempt—it would seem that her simple strategy combined with moderate success has yielded increased confidence.

Although Maya has not corrected her key signature error, she has correctly identified the other pitches as well as the rhythms of the opening fig.

"I will now play the second fig.," says the teacher before performing fig. 2. Maya continues to apply her previous listening strategy in conjunction with preparing to make her attempt as soon as the model finishes performing. Her confidence has grown a great deal—she makes three rapid attempts at determining the first pitch of fig. 2 while imitating the model's articulation. Maya settles on the correct pitch before trying to determine the next pitch. She decides to consolidate the effort by returning to the first pitch of fig. 2 and attempt at the general outline of the descending and ascending gestures. Maya's confidence has resulted in a more advanced, refined pattern of strategies just in time for the novel challenges of fig. 2.

The manner with which Maya applied the pitch identification and listening strategies in the above vignette represent a great deal of participants' strategic transformations throughout Phase II. When participants did not actively respond during a modeled performance instance, I coded their strategy as listening. However, as Maya pointed out during her interview, she might also have been using visual stimuli as a basis for her own performances:

John: When the teacher did start playing, what was the first thing you focused on so you could learn the song?

Maya: Um, I tried to figure out the notes I was familiar with. And if I didn't have notes that I was familiar with, I would try to look what notes where [the model's] fingers on the fingerboard—just to see.

John: So, you were relying just on visual input? Like you were just watching?

Maya: Yeah. I was kind of doing listening more than visual. I knew most of the notes were on the E string so I just tried to figure out if there was not an exact note that I knew, I would try to look at [the model].

Here, Maya's initial strategy becomes clearer. Her first response to the model was to try to aurally determine the model's pitches and rhythms. She would then either use visual input to confirm or otherwise substitute information in order to refine or correct subsequent attempts. Maya's strategic cycle of listening and observing followed by pitch identification served as the basis of her approach towards transformation of the model's performance and is emblematic of a great deal of other participants' applied strategies. It also serves as a clear example of AE/CE and CE/RO strategies.

Furthermore, Maya's KLSI profile—Imagining (CE/RO)—suggests that the above pattern of strategies falls well within her comfort level. By alternating back and forth between AE/CE and CE/RO strategies, Maya played to her strengths when she worked to transform the modeled content into her own learning schema. While this cycle of strategies is seen in other participants at other times in the lesson sequence, Maya's early application of the strategies is evidence of how specific KLSI profiles might apply certain strategies in lieu of others—even if other strategies might be more appropriate.

A similar pattern of alternating AE/CE and CE/RO strategies arises when the teacher introduces fig. 3. All but one participant applied a variation of a CE/RO listening strategy during the teacher's performance. Fig. 3 is the only segment of the piece containing sixteenth notes and was most likely identified by participants as the most challenging part of the melody. At this point in the lesson, most participants had found a pattern or rhythm to their strategic approach to the modeled lesson—specifically, many participants utilized the AE/CE and CE/RO strategies as a fundamental combinative approach to the challenge inherent to fig. 3 while also applying their own preference of strategies. Xavier, the sole male and sole Experiencing (AE/CE/RO) learning style in Phase II, exhibited a similarly direct AE/CE and CE/RO strategic approach to the increasingly challenging fig. 3 as Maya.

Eleventh grader Xavier has done well engaging with the lesson material thus far. Although he has expressed both his frustration and elation throughout the lesson, he has maintained his focus and successfully developed effective strategies in response to the challenges of the first two figs.

"Now let's take a look at the third fig.," the teacher states moving on from the immediately previous check-up. The teacher performs fig. 3 while Xavier starts to play along but quickly stops. He makes a frustrated face and listens without watching the model's performance. Listening is a strategy that Xavier has used sparingly this lesson—he has yet to establish a set routine of strategies but seems to be nearing an effective pattern. During his eight-second personal practice time, Xavier very quietly and quickly determines the opening pitches and rhythm of fig. 3—the pickups to measure five as well as the repeated As in measure five. He is even able to repeat this sequence two more times before the teacher cuts in again.

"I'll play the third fig. again," interjects the teacher. Xavier seems even more intent on listening this time—perhaps he realizes he acted hastily last modeling instance

by trying to perform subsequently without getting a clear image of the musical task. Xavier turns his head and listens without watching the teacher. As soon as the teacher stops, Xavier puts his bow to the string and starts to tackle the 16th note gestures. He makes two very quiet attempts but is incorrect both times. He crinkles his nose in response to his attempts and decides to wait until he has more information. This insecure, quiet performance is not uncommon among other participants—particularly when faced with the challenge of the 16th note gestures.

The teacher continues, "And again." Xavier directs his attention to the model—this time he watches the recording in addition to listening. Xavier's next three quick attempts at the 16th notes gestures show progress. He is slowly figuring out the pitches of the gestures but is somehow unable to connect his internal concept of the task with his external performance. He crinkles his nose again. Although he has made considerable progress, he remains dissatisfied with the outcome and his inability to determine the exact sequence of 16th notes gestures.

Xavier's application of listening (CE/RO) followed by rapid strategies focused on pitch identification (AE/CE) was—on a fundamental level—similar to Maya's approach. Throughout the lesson, he was able to squeeze rapid performance attempts into his personal practice time between modeling instances with great success. In the above example, however, Xavier struggled for the first time during the lesson. His reaction—an increased focus on the CE/RO strategy—was a noteworthy component of his learning style. Xavier did not increase his repetitions during the personal performance. Neither did he apply a more advanced combinative strategy utilizing multiple ELT cycles. Instead, Xavier relied on his listening and, eventually, his visual acuity.

John: When the teacher did start playing, what was the first thing you focused on so you could learn the song?

Xavier: [Answering immediately] Um, I think the first thing I focused on really was the notes. Like, I said this earlier, like what note it started on. And then I guess I focused on [pauses]…I think I focused less on rhythm and more on the notes at the beginning. [More pause] Um, and I think it was helpful that I focused on some major identifying points…

Xavier pointed out that he used the model to transform his understanding of pitch and rhythm through an understanding of certain “landmarks” within the performance. Using both the aural and visual data, Xavier was able to piece together an internal image and then check the validity of that internal model in various ways. In the above example, Xavier used rapid repetitions as a means of determining the validity of his internal model as compared to his external performance. Frustration arose when he was unable to align his internal concept with his external performance. Kolb and Kolb (2013b) posited that the rapid pace of the lesson might be an underlying reason for Xavier’s frustration. His lack of “deep involvement in [his] life experiences and contexts” (p. 197) might lead to a learning context outside of his comfort zone. Xavier needed more time to dig into the challenge inherent to fig. 3 and develop unique solutions.

Theresa applied a similar sequence of strategies at the same point in the lesson with significantly less success. Theresa is a 9th grade female who indicated a Thinking (RO/AC/AE) KLSI orientation—a more developed and flexible combination of RO and AE with an emphasis on the AC comprehension dialectic dimension. Kolb and Kolb

(2013b) posited that individuals who embody the Thinking learning style are "distinguished by the capacity of disciplined involvement in abstract reasoning, mathematics, and logic" (p. 205).

Theresa has been struggling with this lesson. So far, she has shifted her pattern of applied strategies several times in the first half of the lesson. She remains diligent, however—she simply refuses to give up despite limited success. The model has just wrapped up the first check-up that asks the participant to perform the entire piece concurrently with the model. Theresa valiantly struggled along with the modeled performance without much success.

"Now let's take a look at the third fig.," states the teacher before performing the pick-ups to measure 5 until the third beat of measure 6. It's the most difficult passage in the lesson and it comes at a time when Theresa's confidence is at a low point. Theresa sits and listens to the model's performance of the third fig. When the model has finished, Theresa tries to mimic the rhythm but simply can't find the initial pitch of fig. 3. She makes several attempts but only proves that she has assembled the rhythmic content without any success matching pitches—it's a start.

"I'll play the third fig. again," the teacher continues. During this next modeled performance of fig. 3, Theresa only listens. Now that Theresa has a better understanding of where she needs to focus, she immediately gets to work after the model has concluded. Theresa spends the entire time between modeled these instances trying to identify the initial group of pitches—she is struggling to find the upward pick-up gesture.

The teacher moves on, "And again." During this third modeled performance of fig. 3, Theresa leans in while ready in playing position. It would seem that she is trying to rely on her visual perception as well as just listening. However, this effort does not yield new information that immediately helps. Theresa does not make an attempt to perform after the model—instead she freezes and makes no sound. The teacher moves on to the second check-up while Theresa is left with very little to show from this fig. 3 sequence.

The above vignette shows how Theresa followed a similar strategic pattern as Maya—albeit in a different portion of the lesson. Though the musical content is more difficult in fig. 3 as compare to fig. 1, Theresa was unable to even make moderate progress with the same set of strategies that Maya applied. Here, AE/CE and CE/RO strategies did not work for Theresa. Instead, at the end of the vignette, Theresa applied a passive strategy she had only used once before at the very beginning of the lesson. During her own personal practice time—the eight seconds between the teacher's performances—Theresa did nothing.

Other Frequently Applied Fundamental Strategies. When participants remained passive during a modeled performance, I coded their listening strategy as that of Concrete Experience/Reflective Observation—Theresa was obviously leaning in to combine visual and aural observations in order to yield some sort of positive outcome. However, when participants remained passive during their own personal practice time, I coded their strategy as that of Reflective Observation/Abstract Conceptualization (RO/AC)—or a Null RO/AC response. This difference between a passive response during the teacher's model and the passive response between the teacher's model is an important distinction. During the model, participants who did not externally engage with the lesson were coded as Listening-CE/RO. Participants who did not externally engage with the lesson between modeling instances were coded as Null-RO/AC. The difference, according to Kolb (1984), is the context in which a learner interacted with the learning material. Participants utilizing a Listening strategy were responding directly to a Concrete Experience in real time—regardless of the effectiveness of that Listening activity. Participants engaged with a Null strategy might have been utilizing internal conceptualizations of the previously performed melody. They might also have been engaged with other processes—e.g., planning, reflecting, memorizing, audiation, or some other non-musical activity. It is impossible to identify exactly what was occurring on a cerebral level when participants, such as Theresa, were not taking any action during their provided time. Kolb's ELT suggests that this inaction is not, however, passive—it is merely the act of internalization by the learner in response to an external experience. Theresa, as a participant exemplifying the Thinking learning style, preferred "to work along and need[s] time to think things through" (Kolb & Kolb, 2013b, p. 206). The eight seconds provided, combined with the relatively increased difficulty of fig. 3, was outside of Theresa's comfort zone regardless of the strategies applied. In fact, at the end of the vignette when Theresa remained passive during her practice time, she was most likely working towards her personal strengths—giving herself time to process one component at a time and think.

John: Now I'd like to ask you about some of the things you learned from the video. Describe how your performance became more refined throughout the video.

Theresa: Uh, it didn't go very well [Laughs]. I think I was trying to listen to the different parts and focus on just one part. It was kind of difficult to focus on all the parts at the same time.

John: So, it was just a lot of music—so you struggled with it?

Theresa: Yeah.

John: Do you think you were more focused on just the notes, the rhythms? What do you think you struggled the most with?

Theresa: I think I struggled the most with the notes and because I was so focused on the notes, it sort of messed up my rhythm, too.

Maya's strategic default of AE/CE and CE/RO strategies was aligned with her learning style. Xavier's application of the AE/CE and CE/RO strategies was also within his learning style. However, the nature of the videotaped violin lesson—with structured yet unforgiving time allotted for participant practice—forced Theresa to apply strategies outside her own comfort zone. Her application of the passive, Null-RO/AC strategy aligned with many other participants' strategic applications. In fact, 9.21% of participants' (*n* = 15) responses during the lesson were coded as Null-RO/AC. Although this is a lower frequency than the AE/CE or CE/RO strategies, it was the fifth most frequently applied strategy by participants in Phase II. In short, a commonly applied strategy by a great deal of participants when given time to practice was to simply to perform no observable behaviors.

Theresa's application of the Null-RO/AC strategy was most likely her attempt to apply her own personal strengths after struggling with the content of fig. 3. Other participants' applications of the Null-RO/AC strategy was less clear. Kolb (1984) referenced learning styles as a starting point for learners to apply "possibility-processing structures" (p. 64). These structures relate to specific combinative strategic applications of ELT cycles. For example, some learners might employ a "model-building process" (p. 65) as a means of overcoming a specific challenge. Regardless of their KLSI profile, the Null-RO/AC strategy was applied by several participants throughout the lesson.

Theta is a 10th grade female displaying a Thinking learning style. Unlike Theresa, Theta has been applying Null-AC strategies throughout the lesson. The first occurred early in the lesson and was a clear result of confusion—she looked up, raised her eyebrows, and remarked, "Huh?" Now, just before the first check-up, Theta has found success in a shadowbowing technique that allows her to perform concurrently with the model while still listening to the modeled performance. The teacher has performed fig. 1 and 2 three times for Theta and is ready to move on.

"Now put the first two figs. together," instructs the teacher. Theta applies her shadowbowing strategy concurrently with the model during fig. 1 but sets her bow into the string and produces sound along with the model during fig. 2—a complex blend of strategies that is a result of Theta's growing confidence. Despite the confidence, Theta is not as successful compared to when she performed the figs. on their own. Once the teacher has finished, Theta waits, but looks up and down several times. It seems that Theta is either deciding or evaluating something.

In the above vignette, Theta's strategy was not directed at processing the model's performance. Instead, Theta seemed to be critical of her own strategy—it was a novel application of shadowbowing and concurrent performance that she had not previously applied. The Null-RO/AC strategy was not, in this instance, passive. Rather, Theta was using the time provided to reflect upon her strategy—an approach that Kolb and Kolb (2013b) might have supported stating that Thinkers tend to "concentrate on the quality of [their] plan rather than achieving the actual goals" (p. 205). At a fundamental level, Theta and Theresa's application of the Null-RO/AC strategy was similar—they were processing their own internal response to the external model.

Anissa, an 11th grade female with an Analyzing learning style, applied the Null-RO/AC early in the lesson. The Analyzing profile shares the RO and AC components of the ELT cycle with the Thinking learning style. Below, Anissa used her Null-RO/AC strategy to make a plan in response to the modeled performance.

Anissa has just finished listening to the teacher explain the task. The teacher puts the violin to their jaw and performs the entirety of the melody. Anissa sits in rest position but leans forward and tilts her left ear towards the screen. Anissa raises her eyebrows when the teacher gets to fig. 3, intimidated by the 16th note gestures. Once the teacher has finished, Anissa remains in rest position and pauses for a moment. She slowly leans back and puts her violin into playing position. Anissa is processing the task—she must determine how best to tackle the skill and is unsure of where to begin.

"I will now play the first fig.," says the teacher. Anissa listens—a CE/RO strategy. After the model has concluded the performance, Anissa remains still. She seems unsure of how to begin. Still in playing position, Anissa sets the bow on the string. Then she removes it. Then she sets it back again only to repeat this pattern twice more.

Anissa remained inactive during the first three instances of the lesson when she had the opportunity to perform. However, this inactivity was likely not passive. Perhaps Anissa was trying to memorize the melody or attending to specific musical components and constructing an internal model of the modeled performance. Her learning style suggests, however, that Anissa most likely was constructing a schematic plan or structure to address the learning task presented to her. In this context, Theresa, Theta, and Anissa were all utilizing their time to process the task at hand.

Other participants' application of the Null-RO/AC strategy implies less strategic processing and more indecisiveness. In the following two examples, the participants in question were unsure of what to do next. In these contexts, the participants were not formulating novel strategic approaches or internally analyzing the modeled activity—they were simply stuck.

Indira, a 9th grade female Initiating (AE/CE) participant, is nearing the end of the lesson. She has already been introduced to all four figs. of the piece and now the teacher is combining figs. 3 and 4. Indira has been consistently applying a trial-and-error strategy throughout the lesson with moderate success. She is beginning to refine that strategy to include other, more complex strategies in addition to increasing her repetitions. In short, she has found an effective rhythm despite the increasing difficulty.

"I'll now play the third and fourth figs. together," states the teacher. During the model's performance, Indira attempts to play along with the model. It seems that she is able to retain and perform the rhythm but misses most of the pitches despite her success earlier in the lesson. Once the teacher has finished modeling the two figs., Indira picks

her bow up off the string and waits. This is not unusual for Indira—she has pivoted back and forth between utilizing her provided time between practicing a specific skill and developing her own internal model throughout the lesson.

"And again," the teacher continues. Indira sits and listens. Again, this is by itself not unusual behavior. However, when combined with her previous Null-RO/AC strategy, it seems that Indira might be trying a new approach. Perhaps she is further refining her internal model and is using this external model as a way to determine the validity of her own internal construct of the performance. Once the model is done, Indira pauses. She makes several unclear gestures—some of those gestures include hesitant motions at getting her bow on to the string but she stops herself each time. It now seems that Indira is temporarily overwhelmed by what is missing from her own performance. She is unsure of how to solve the problem.

"One more time," says the teacher and launches into the final performance of the third and fourth figs.. Indira only listens. During the subsequent personal practice time, Indira now moves into rest position and waits. It isn't until the teacher prompts her to perform along during the third check-up that Indira plays again.

It seems that in the above example, Indira knew that she was unable to execute a specific component of the two figs. but was unable to devise an effective strategy to overcome her own shortcoming. Kolb and Kolb (2013b) might have suggested that Indira, as a student with an Initiating learning style, "is distinguished by [her] ability to initiate action in order to deal with experiences and situations" (p. 195). Initiating learners would rather act than measure or deliberate. Up until that point in the lesson, Indira had been utilizing a trial-and-error strategy very much aligned with her Initiating learning style. Indira's response to the above challenge might have been a result of her lacking the tools to address the need to change strategies or refine her approach beyond that of a typical Initiating learner. She most likely needed to transform her own strategy but did not have the skill or experience to do so.

Mia, a 10th grade Imagining (CE/RO) learning style female, has been pivoting wildly between strategies. She has tried listening, pitch identification, returning to the previous fig., focusing on retention, error detection, utilizing a reference pitch, and performing a drone along with the performance with limited success. The teacher has introduced figs. 1 and 2 and has just asked Mia to combine them.

"It's time for our first check-up. I will start the piece from the beginning. Please play along with me," instructs the teacher. Mia performs the opening note and several others randomly throughout the model's performance. It seems that her array of strategies has not yielded much success at this task so far. Once the model is finished with check-up, Mia makes several gestures to refine her previous performance but does not actually start moving the bow. It seems she is unclear how to start this task.

In the above example, Mia also seemed aware of what she was unable to perform but lacked some key skill to move forward. She was able to diagnose the problem, but could not prescribe a solution. Below, Anissa—11th grade, female, Analyzing—responded similarly to the same challenges as Indira and Mia with an important distinction.

Anissa is now at a later point in the lesson. She has been using Null-RO/AC strategies intermittently throughout the videotaped lesson in response to the teacher's modeled performances. She clearly would prefer to listen and process—Anissa performs only when she is sure she knows what the outcome will be. Anissa struggled with the 16th note gestures in fig. 3 but was able to perform fig. 4 by herself immediately prior to this section of the lesson.

The teacher says, "I'll now play the third and fourth figs. together." As she has done several times previously during this lesson, Anissa leans forward while in playing position to better see and hear the model. She tries to perform the opening pitches of fig. 3—something she was successful with earlier in the lesson—but has either forgotten them or makes a mistake. She immediately stops and waits for the teacher to finish the model. During the following practice time, Anissa does not pause to reflect or otherwise refine her internal model. Instead, she does something she has not yet done previously in the lesson—Anissa falters. She puts her bow to the string but immediately removes it. She resets her bow closer to the middle of the bow but removes it again. She makes a final bow placement somewhere between her first two decisions but seems to decide that she's run out of time—she must wait until her next chance.

"And again," interrupts the teacher. Anissa only listens to the teacher play through fig. 3 but effortlessly joins in at the start of fig. 4. It is now obvious that fig. 3 remains the problem for Anissa. She can successfully perform fig. 4 when needed, but has work left to do on fig. 3.

Anissa's application of the above Null-RO/AC did not seem voluntary. Anissa seemed to know that she struggled with fig. 3 and therefore would have liked to spend time refining her performance. Instead, she was paralyzed by indecision—much like Indira and Mia were. The obvious difference, however, is that Anissa's Null-RO/AC functioned as a byproduct of her successfully pivoting strategies. After Anissa failed to perform during her Null-RO/AC strategy, she applied a complex blend of strategies designed to mitigate her inability to perform fig. 3 while also confirming her performance of fig. 4. She utilized a complex combination of listening and concurrent performance that both played to her strengths and reinforced her previous comprehension of the modeled task.

It should be noted that Anissa, Indira, and Mia differed not only in learning style but also by grade level. Based on her learning style (See Appendix F or Kolb & Kolb 2013b for a thorough description), Anissa was likely more comfortable processing her indecision and devising a new strategy to apply. Indira and Mia, on the other hand, were less comfortable manifesting a new strategy after their Null-RO/AC. Additionally, Anissa was two grade levels older than Indira and one older than Mia—Anissa simply had more experience and possibly had more tools at her disposal to overcome the adversity they encountered. However, the fact remains that when confronted by a similar challenge, Anissa, Indira, and Mia all hesitated due to indecision. Only Anissa was able to transform her own strategic response to the modeled task.

Finally, the Null-RO/AC strategy was occasionally used as a simple transition between preferred strategies. Participants that utilized this application of Null-RO/AC strategies might not have necessarily been using the time to refine their internal concept of the model but rather were waiting for the next opportunity to perform with the model as seen in the below example.

It's near the end of the lesson. The teacher has introduced all the individual figs. and is now repeating combinations of various figs. to increase student retention and provide additional growth opportunities. Thea—9th grade/female/Thinking (RO/AC/AE)—has all but mastered the content in the lesson. Her ability to create, refine, and manifest her internal model has been truly impressive.

"I'll now play the third and fourth figs. together," states the teacher. Thea plays along with the model but very quietly. She's mastered the individual figs. but seems to be checking her own performance against the model's in real time. After the teacher completes the model, Thea stops and waits. She makes no movement during her eight-second personal practice time. It is unclear what she is doing.

"And again," says the teacher. Thea performs along with the model with a much more confident sound—she increases her bow speed and volume. After both have finished their fig. 3 and 4 performances, Thea sits back in playing position and waits again.

"One more time," continues the teacher. Thea again joins the model with a repeat of her previous confidence. After, she waits.

Thea repeated this pattern of concurrent performance followed by a Null-RO/AC strategy until the end of the lesson. Though there might be some reflection and refinement of her own performance, she most likely was not changing her understanding of the model's performance. Instead, she was using the Null-RO/AC strategy as a means to move from one modeled performance to another rather than any overt, concerted effort to transform her own playing or concept of the model. At the end of the lesson, other participants executed similar applications of Null-RO/AC strategies. In these contexts, the Null-RO/AC is less centered on transforming the comprehension of a model intentionally, and used more as a transitional period between other, more useful strategies that directly interact with the model according to individual participants' needs.

Less Frequently Applied Elementary Strategies. Although AE/CE, CE/RO and RO/AC related strategies comprised the majority of strategies participants used to transform the modeled videotaped violin lesson, the AC/AE-based strategies were less applied among participants (3.06%; n = 15). These strategies included movement (e.g., swaying, rocking, or bobbing their head, etc.) and trial and error. Most AC/AE strategies were targeted responses to specific challenges rather than repeated patterns of behavior. Andi—a 10th grade Analyzing (RO/AC) female—used both movement and trial and error strategies below.

It is still early in the lesson and Andi has not been able to find an effective combination of strategies. She's tried several fundamental and advanced strategic approaches within just the first few instances including listening, tempo modification, pitch identification, and even a single instance where she attempted to just collect her thoughts and develop a plan. Despite this wide strategic approach, she has been relatively successful in performing fig. 1.

"One more time," says the teacher wrapping up their work on fig. 1. Andi stands in playing position with her third finger on the E string, ready to play. Instead, she just

listens. During her provided practice time, Andi rocks back and forth but makes no attempt to perform. She seems to be moving in time to her own internal model—perhaps she is even practicing her internal model while manifesting an external tempo. Then again, she was relatively successful in her previous approaches. Perhaps her movements indicate confidence as she compares the model's performance to her own previous performances. In any case, the rocking movements suggest a novel approach as compared to other strategies.

The teacher moves on, "I will now play the second fig." Andi waits and then tries three quiet notes in quick succession to identify the starting note of fig. 2—an AE/CE strategy similar to bigger-picture pitch identification approaches. She continues this strategy as the teacher completes the model. She finds the correct pitch on the third attempt and then plays that note two more times to confirm her own accuracy.

Andi's application of two novel AC/AE-based strategies was not in keeping with her Analyzing learning style—usually focused on methodical reflection and consideration. Strategies related to Active Experimentation would be antithetical to her learning style. Kolb (1984) explained this process of strategic application in opposition to a specific learning style by suggesting that learning preferences exist due to comfort with a specific framework of learning or interaction with an experience within an individual. In certain contexts, individuals might incorporate learning phases outside their preferred style as a means of experimenting or building more complex, higher strategies. Kolb's posited that the LSI does not function as a predictive mechanism for individual behavior but rather as a framework for understanding the deeper process of learning. Specifically, the LSI was never designed as a means to anticipate behaviors or forecast success with a specific task or occupation. Instead, the LSI—in combination with the ELT—was constructed as a way to describe and contextualize the individualities inherent in complex responses to human behaviors. Andi's application of AC/AE-based strategies despite her learning preference for RO and AC behaviors is indicative of the potential for any learner to utilize strategies that represent a wide array of ELT phases and developmental complexities.

Overall, basic trial and error and movement-based approaches were relatively rare. For the task of transforming a modeled performance by a learner, the AC/AE phase of the ELT cycle seems to have limited use by itself. The act of comprehension transformed via extension might not seem as valuable or applicable a strategy when a teacher's model is readily available to supersede internally developed models. Alternatively, external factors, such as perceived stress or unfamiliar contexts might have impacted participants' use of AC/AE strategies. As a more complex strategic component, however, Active Experimentation holds far more potential.

Advanced Combinative Strategies. The previous examples and descriptions depicted strategies that embodied only a fundamental combination of phases of Kolb's ELT cycle. "Although one can analytically identify certain learning achievements in each of the four elementary learning modes…, more powerful and adaptive forms of learning emerge when these strategies are used in combination" (Kolb, 1984, p. 65). These strategies combine multiple adjacent dimensions of the ELT cycle—e.g., Error Detection as a combination of Concrete Experience, Reflective Observation, and Abstract

Conceptualization (CE/RO/AC) or Tempo Modification as a combination of Active Experimentation, Concrete Experience, and Reflective Observation (AE/CE/RO). These advanced, higher-order combinative strategies comprised 37.13% of participant responses to the videotaped violin lesson.

The most frequently applied advanced combinations of the ELT cycle among participants (*n* = 15) were the AE, CE, and RO phases—which totaled 14.85% of overall strategic responses and 39.89% of the advanced combinative strategies (not including the strategies employing all four quadrants of the ELT cycle). The AE/CE/RO strategies were also the third most applied sub-category of overall strategies among participants. This sub-category included Non-Sequential strategies, Delayed Synchronization with the model, Tempo Modification, Reference Pitches, Drones, and Gesture Isolation. The most frequently applied AE/CE/RO strategy was Gesture Isolation—a particularly common response to the difficult 16^{th} note gestures in fig. 3.

Theta (10/F/Thinking) is in the middle of the teacher's demonstrations of fig. 3. She is fully aware of the challenge inherent to this section of the lesson and is attempting to elevate her own strategic responses accordingly. In response to the initial modeled performance of fig. 3, Theta made an overt effort to memorize the pattern by closing her eyes and leaning in order to really concentrate.

"I'll play the third fig. again," the teacher continues. Theta listens and remains holding her violin in guitar position and plucking a note or two near the end. She has not yet made an attempt to perform fig. 3 but is instead intently focusing on cultivating her own internal model. After the modeled performance, Theta gets into playing position and

quickly gets to work identifying the first seven notes of fig. 3. She seems to be intent on compartmentalizing the task in order to tackle the overall increased difficulty. She spends her entire eight second personal practice time identifying the opening portion of fig. 3 correctly.

The teacher interrupts, "And again." Theta checks her own previous hypothesis with the model's. Her first seven notes are correct—her effort at gesture isolation is successful thus far. She is even able to correct her bow direction partway through the first seven notes. When the model reaches the 16th notes gestures, Theta stops to listen. Once the model has completed, she focuses her attention on the 16th note gestures by layering on another common AE/CE strategy—tempo modification. Theta slows down her attempts at the 16th note gestures to discern the specific pitches. She pays particular attention to the starting and ending pitches of the gestures. She settles on a theory that the pitches move stepwise but runs out of time. The teacher moves on to the second check-up and away from Theta's work on fig. 3.

Theta found temporary success with gesture isolation and even supplemented her approach with another AE/CE/RO strategy—tempo modification. Even these brief applications of AE/CE/RO strategies were enough to make large breakthroughs.

John (PI): Is there anything else you feel stood out to you in this lesson that helped you?

Theta: Um, I think actually the notes that were being played. Because they were actually pretty close together—like they were all in the same ballpark. It was kind of easier for me to get the notes. Especially because…I believe they were 8th notes [Note: Theta is referring to the 16th note gestures in fig. 3]—I realized they were just going in an *ascending and descending order and that helped me learn that part quicker.*

Theta was able to make this realization because of her combination of gesture isolation and tempo modification despite these strategies laying outside her learning preference. However, her utilization of foreign strategies was uncommon outside of fig. 3. This fig. forced several participants outside their comfort zone, as well.

Anaya (11/F/Analyzing) has been doing well throughout this lesson. She quickly found a combination of strategies at the start of the lesson that has allowed her to transform the modeled performance into her own understanding of the task. She, like most of the other participants, struggled a bit with the challenge of fig. 3 but has recovered and was able to grasp the material in fig. 4 without issue.

"And again," continues the teacher before wrapping up their work on fig. 4. Anaya just listens to the model—it's a component of the strategy that has worked well for her. Once the teacher finishes the final tremolo, Anaya easily and causally performs fig. 4 in response. That task completed, Anaya returns to her work on fig. 3. She was clearly not satisfied with where she was forced to stop. She pauses a moment before the 16th note gestures before launching into her attempt. Anaya had previously stopped between the descending and ascending 16th note gestures—she no longer needs that slight hesitation.

"Now I'll play the third and fourth figs. together," the teacher says. Anaya, seemingly not surprised by this new challenge, simple listens. Near the end of the modeled performance, Anaya gets into playing position, ready to go. As soon as the teacher finishes, Anaya seizes her opportunity. She focuses her efforts on the 16th notes gestures by making three rapid attempts to smooth out her approach to the gestures. She

had previously been focused on reflection—a strategy more aligned with her learning preference. Now, she seems intent on manifesting her internal construct of the task. Her work is interrupted by the teacher.

"And again," the teacher intones. Anaya listens to the teacher combine figs. 3 and 4 again before launching into her attempt at mirroring back the teacher's performance. She performs figs. 3 and 4 subsequently almost without error—she suffers a brief false start at the onset of the 16th note gestures. She takes this opportunity to restart measure six and make another attempt at the 16th notes.

"One more time," says the teacher. Anaya shadowbows along with the model. She seems to be comparing her own internal model with the external performance and is most likely focused on the 16th note gestures. After the teacher completes the model, Anaya resumes her work at the start of fig. 3. She reaches the repeated As in measure five and starts audibly counting. She continues this strategy into her 16th note performance—she seems to be trying to determine if there is a rhythmic inaccuracy in her performance of the 16th notes gestures.

Anaya's slow refinement of her own strategies using gesture isolation as a common thread in response to the 16th note challenge of fig. 3 was a more complex example of the AE/CE/RO strategy. She responded to the greater challenge with an increase in the combinative complexity of her own learning flexibility. Kolb (1984) clarified stating that when learners utilize greater combinative complexity, they enhance the central phase of their learning cycle. For Anaya, she was able to better attend to her own fragmented performances (CE) due to a blend of repetitions (AE) and attention to detail (RO). This more complex and determined strategy most likely blended short, frequent performances with a focus on a single or small group of performance observations. In Amaya's example above, she was most likely refining some rhythm or pitch accuracy issue. Due to a rapid alternation between—or even simultaneous application of—the AE and RO phases, Amaya was able to generate additional experiences that might have yielded greater results than elementary strategic approaches.

Anaya's response, therefore, is an example of how a learner might utilize the Concrete Experience—or apprehension—dialectic as the fundamental approach towards a challenging task. In the above example, Anaya explored several strategies related to apprehension as a means of reflecting and experimenting. In short, Anaya pivoted back and forth between creating experimental approaches related to the task and reflecting on the effectiveness of her applied strategies.

John: Describe how your performance became more refined throughout this video.

Anaya: Looking specifically at that one part [fig. 3], where it was [Anaya sings the 16th note gestures]. I had to stop for a moment because I realized there was something I wasn't doing right. So, I kind of just listened to it and I thought, "If I played this, what would it sound like on my instrument and how would it differ from what [the model] played?" In the beginning, so I listened to it and I tried my first version out. It didn't sound the same. I listened again. I tried a different method that I thought would work. It did seem like it matched what [the model] was playing.

John: So, it almost sounds like it was a trial and error. Would you say it almost started up here [gestures to head] and then you just did it? Or was it kind of like at the same *time? Did you hear it as you thought it might sound and tried that method? Or did you try it out and then compare it?*

Anaya: I knew it sounded wrong so I was like, "Ok, let me see what else I can do with the instrument." And then I played a different type and that worked.

Anaya pivoted back and forth between experimentation and reflection oftentimes layering several strategies within a single instance. She combined a fundamental trial and error, an advanced gesture isolation strategy and a fundamental reflective listening strategy all the while centered on the teacher's model as a means of comparison.

Less Frequently Applied Advanced Combinative Strategies. Two other AE/CE/RO strategies were frequently applied by participants in addition to gesture isolation—delayed synchronization and tempo modification. Each comprised 16% of the total AE/CE/RO strategies among participants (*n* = 15). Delayed synchronization occurred amongst participants for two reasons: as a result of lack of preparation, and as an advanced means of reflecting and experimenting on the teacher's model.

Rebecca is a 10th grade female who indicated a Reflecting learning style (CE/RO/AC). She has had intermittent success throughout the lesson sequences but struggled with fig. 3. She still seems unsure of herself in relation to fig. 3 but has reached the point where she can struggle through the 16th note gestures without stopping. Now, the teacher has moved on to fig. 4.

"I'll play it again," intones the teacher. Rebecca had just listened to the teacher during the first play through of fig. 4 and seemed caught off guard during her personal performance time. Now, she quickly resets and plays slightly behind the teacher's

performance. Specifically, Rebecca utilizes the rests of fig. 4 to imitate the teacher's performance—much like a call and response. It is an unusual strategy not applied by any other participant and seems to be focused solely on determining the correct pitches of fig. 4. During her personal practice time, Rebecca repeats fig. 4 but accidentally omits a note in the middle of measure seven. Inexplicably, Rebecca then returns to fig. 1 and starts the entire piece from the start.

The teacher interrupts, "And again." Rebecca is caught off guard and is still playing the opening two figs. when the model begins fig. 4 again. She tries to repeat her previous call and response strategy but fails to match anything except the final note.

Rebecca's initial application of delayed synchronization in the above vignette seemed to be experimental in nature. Perhaps she noticed that fig. 4 had the rests that allowed her to try out a novel approach. The second application of the delayed synchronization above is a clearer example of a lack of readiness on the part of the participant. Rebecca—who later indicated that she was concerned that she would forget the earlier figs.—was focused on a component of her own learning and was forced into an ineffective strategy. Later in the lesson, however, Rebecca found a great deal of success with the same delayed synchronization strategy.

The teacher has introduced each of the individual figs. and is now working on various combinations of them with Rebecca. They are nearing the third check-up and are practicing figs. 3 and 4 together.

"One more time," continues the teacher. Rebecca hesitates for a moment when the teacher starts performing figs. 3 and 4. Her hesitation is not a result of lack of

preparation, however—she has a new plan in mind. She plays a split second after the model. It would resemble bad karaoke if it was less effective. Instead, Rebecca makes dramatic improvements on matching the teacher's bow length and direction as well as small adjustments to rhythm and intonation. This momentum is short lived, however. The teacher moves on to the third check-up and Rebecca does not return to the delayed synchronization strategy.

It is unclear if Rebecca's initial delayed synchronization strategy within the context of fig. 4 was directly related to the application in the example above. Rebecca used the first strategy as a basis for a more fundamental pitch identification approach. Her relative success might have encouraged her to continue with that strategy but was superseded by a different intrinsic need. Later in the lesson, Rebecca was able to apply the same strategy with dramatically increased complexity—she focused on much more nuanced components of the lesson with improved effectiveness. The developmental complexity of the delayed synchronization applied by Rebecca is particularly noteworthy due to her learning preference of reflective transformation via intention of a given task. She was able to rapidly develop a strategy focused on apprehension—a dialectic dimension adjacent to her preferred approaches.

Strategies involving tempo modification were more straightforward. Participants' application of tempo modification strategies centered on their need to listen and reflect upon their own performance at a slower tempo. Maya—9th grade, Female, Imagining—engaged in the most common application of a tempo modification strategy at a late stage of the lesson below.

Maya and the teacher have just finished their third check-up of the lesson. Maya continues to struggle with various components of the piece. Like most other participants, Maya seems to be stuck on the 16th note challenge of fig. 3. In fact, after completing the third check-up, Maya immediately returns to start fig. 3 again but does not make it far.

"I'll now perform the first two figs. again," interrupts the teacher. Maya just listens—she isn't as interested in the first half of the piece because she feels that the third fig. is a more important task. During her provided personal practice time, Maya attempts the 16th note gestures of fig. 3 slower. She then repeats the gestures several more times, speeding up each time. It seems that she has found a solution that matches the model to her satisfaction and is repeating the gestures for retention. When the teacher moves on to the combine figs. 3 and 4, Maya listens and but does not repeat her tempo modification strategy again.

Maya's use of tempo modification—particularly in response to the 16th note challenge of fig. 3—was emblematic of other participants' applications. Without exception, tempo modification was used in a single instance of personal practice time and combined with other, similar strategies—particularly gesture isolation. Participants seemed to use the tempo modification strategy to solve a very specific problem and then move on.

Strategies utilizing the opposite dialectic dimension—RO/AC/AE—emphasized grasping via intention. Participants (*n* = 15) applied these strategies second most frequently amongst the more complex combinative strategies—9.31% of the time, overall—and incorporated retention and task identification approaches. These grasping via intention strategies were more focused on intrinsic or internal schema.

Rebecca (10/F/Reflecting) has been taking a very quiet approach to the start of the lesson. Here in the early stages of the lesson, she is not using her bow—it seems she prefers to focus on the task of pitch identification without the complexity of bow directions and accompanying technical components. It seems to be paying off because by the second instance, Rebecca has accurately plucked the first fig.

"One more time," continues the teacher as Rebecca gets ready to perform concurrently with the model. She is able to perfectly play fig. 1 using pizzicato along with the teacher. During the subsequent personal practice time, Rebecca makes a subtle shift in her strategy, though. Whereas in previous personal practice instances, Rebecca only made two attempts at the fig. as time allowed, now she makes five continuous, looping performances of fig. 1. Each performance is identical—it doesn't seem like Rebecca is making any adjustments to her performance. Instead, she seems intent on committing this initial fig. to memory by performing it over and over.

Rebecca's goal in the above example was to repeat the short passage to prevent attrition. Indeed, most participants' repetition strategies were incongruous amounts of repetitions during their personal performance time as compared to their performances during the modeled instances. For Rebecca, though, this focus on retention enabled her to further refine her approach to the lesson.

John: Describe how your performance became more refined through this video.

Rebecca: Um—I think it became more refined the more I played it. Like, once I played the beginning part—once I got it down—it became really easy for me because I *remembered it. It was really easy for me to play it out. Like, I eventually picked up my bow and stopped plucking—it was easier to match the sound. There were some parts that I never got to refine. I know there was one chunk I never quite figured out [fig. 3]. I know the more I played it, the better the section got. Although, I did start to forget some parts but once we came back to it, I got it again.*

For Rebecca, retention was a major concern throughout the lesson and was a large component of her applied strategies. Rebecca's strategic approach throughout the lesson was a complex sequence of listening, pitch identification, and retention followed by specific strategies dependent on the current portion of the lesson. Though other participants might have bypassed retention-based strategies in lieu of more focused, technical challenges, Rebecca's learning preference was designed around her internal construct of both the lesson and the task at hand—a more generalized, bigger-picture focus.

Task identification—the other popular alternative RO/AC/AE strategy—generally saw participants focused on similar macro-level mindsets. Strategies that involved a task identification component typically involved low or zero performance attempts during the participant's performance time between the modeling instances. In short, when participants used their time to collect their thoughts or overtly experiment with fragments of novel approaches, I labeled their approach that of task identification. Indigo—12th grade, Female, Initiating—applied a common instance of task identification at an early stage of the lesson.

Indigo seems enthusiastic about this lesson so far. She seems to be in great spirits and is eager to get started. As the teacher provides the instructions and performs the initial piece in its entirety, Indigo sits patiently in rest position and listens. During her provided practice time, she initially does not move but stays perfectly still. Indigo seems reluctant to move as if any motion might break the concentration she needs to process the task at hand. She then looks down at her instrument—then looks back at the modeling video. She seems to be determining something. Indigo plucks a string and smiles. It seems like she has decided on a course of action and has started to take the first steps towards that strategy. She plucks another string and then returns to the original plucked string.

The teacher continues, "I will now play the first fig.." Indigo gets into playing position and shadowbows. It isn't until the model has completed the first fig. that Indigo begins to execute the plan she's devised—the plucked strings were reference points for the initial melodic patterns. She very quietly bows the opening note and compares it to her first plucked reference pitch. She returns to the first note again and holds it out. Indigo is now able to perform the entirety of fig. one with only a single pitch error. She immediately hears her mistake but seems to realize that she is running out of time. Instead, she gives herself the opening reference pitch again.

Indigo spent an entire instance devising a strategic response to the lesson's task. Though she certainly did not strictly adhere to this strategy throughout the rest of the lesson, her initial approach served as a strong foundation.

Moreover, the reference pitch tactic—AE/CE/RO—that resulted from Indigo's task identification strategy was well aligned with her AE/CE and was relatively complex for such an early approach to the lesson tasks. Kolb (1984) posited that learners with the same preferences as Indigo—Initiating (AE/CE)—tend to organize their understanding through the lens of specific problems requiring singular solutions. "The greatest strength of this approach lies in problem solving, decision making, and the practical application of ideas" (p. 77). Here, Indigo was able to utilize a task identification strategy as a stepping stone towards her own individual strength as a learner. Task identification strategies were most often applied by participants in response to novel challenges—such as fig. 3 or when multiple figs. were combined—and were not applied in consecutive instances. Most participants used task identification strategies in the same manner as Indigo—a moment to collect their thoughts, process the task, and manifest a new avenue towards success.

The least frequently utilized advanced combinative strategies included the transformation via extension dimension. Participants infrequently (*n* = 47; 4.65%) applied strategies involving the AC/AE/CE phases of the ELT cycle. However, this sub-category of codes included a wide array of strategies focused on participants' manifestation of their internal model into a new concrete experience. The most frequently applied AC/AE/CE strategy was when participants returned to a fig. that was the focus of a previous instance of the lesson (*n* = 15; 1.49% of all responses). Other strategies included damage mitigation, counting/pulse-related activities, singing, and humming.

Xavier (11th Grade/Male/Experiencing) has moved on from his previous frustration with fig. 3 and has resumed his previous success. The teacher has finished introducing the individual figs. and is now reviewing various combinations of subsequent figs.

"I'll now perform the first two figs. again," the teacher says. Xavier performs along with the model and is able to test out several novel approaches. He increases his vibrato speed during fig. 1 to better match the model and moves slightly lower in the bow for the duration of figs. 1 and 2. His confidence is clearly increasing. He feels comfortable with his work on figs. 1 and 2 so he decides to return to a previous point in the lesson where he struggled—fig. 3. Xavier makes a single attempt at fig. 3 in attempt to untangle the 16th note gestures that troubled him previously.

In the above example, Xavier decided to deviate from the immediate task to attend to a more intrinsically driven need. He might have decided that his work with figs. 1 and 2 was satisfactory and therefore returned to a previous challenge. Alternatively, Xavier might have made the decision that he needed to work on fig. 3 more than he needed to work on figs. 1 and 2. In either case, Xavier's application of a strategy utilizing a previous fig. highlights his need to prioritize a task over the immediate focus on the lesson or teacher. Kolb (1984) suggested that the extension dimension, as a fundamental component of knowledge, "occurs through the active extension and grounding of ideas [and] experiences in the external world" (p. 52). By returning to a previous task, Xavier was extending his understanding of fig. 3 by manifesting his internal concept of as a concrete experience.

Not all previous fig. strategies are as intentional and deliberate as Xavier's. Thelma demonstrated an application of the strategy that seems to originate from boredom or absentmindedness.

Thelma (9th Grade/Female/Thinking) has been a particularly vocal student throughout the lesson. In addition to the typical bowing and plucking techniques, she has also been singing, humming, and even talking aloud to herself in response to the lesson. Her approaches have been effective, however. Now near the end of the model's performance of fig. 4, Thelma continues to apply a variety of strategies with very little repetition.

The teacher is about to perform fig. 4 for the second time, "I'll play it again." Thelma shadowbows along with the model in attempt to confirm her internal concept of the rhythm while also refining her construct of the overall pitch direction. Immediately after the model is completed, Thelma performs fig. 4 again—the fifth and sixth pitches are incorrect. Thelma immediately hears the problem and restarts. Her second attempt corrects the mistake—it would seem that Thelma's effort refining her internal model of fig. 4 is paying off. Thelma turns her head to the side as if she isn't quite sure—it would seem more work is needed.

"Interesting. My facial expressions are so bleck!" It would seem that Thelma has been watching herself on the Zoom camera.

"And again," continues the teacher. Thelma leans forward and listens. Before her focus shifted to her own appearance, she had indicated her need to confirm her internal model of fig. 4. Near the end of the teacher's model, Thelma sets her bow on the string and gets ready. Once the teacher is finished, Thelma confirms her internal concept of the performance by immediately performing back fig. 4 correctly. She is, however, using a copious amount of bow.

"Oh no! Bow control has left the chat!" laughs Thelma. She is done with fig. 4 now—she was able to confirm her own internal model of the task and seems to lose focus. During this personal practice time, Thelma returns her focus to fig. 1—she hums the opening fig. quite loudly.

Thelma had—perhaps—made a similar decision as Xavier. Namely, her performance was satisfactory or less important than an alternative task. Thelma's focus on a previous fig. was less purposeful than Xavier's. It is, however, equally important. Thelma—possibly without meaning to—extended her understanding of a previous fig. according to her own immediate need. Xavier's act of extension arose out of necessity. Thelma's arose out of boredom or a loss of focus.

Damage mitigation was a less utilized—yet noteworthy—AC/AE/CE strategy where participants compromised portions of the teacher's lesson in order to better transform other performance components. Often used near the end of the lesson when a participant might have been feeling overwhelmed by the subject matter or felt that they were running out of time, damage mitigation strategies allowed participants to rely on their own intrinsic understanding of the task in order to attend to immediate, attainable goals.

Near the end of the lesson now, Anissa (11th Grade/Female/Analyzing) has settled into a routine that seems focused on making the best of a bad situation. Her inability to find a solution to the 16th notes has prevented Anissa from making progress beyond the second fig. This hasn't stopped her from applying a wide array of strategies—though she continues to remain tacit during her provided performance time. Her strategic pattern, at *a fundamental level, is a sequence of concurrent playing with the teacher and quiet reflection between the modeled instances.*

"Now the entire piece," says the teacher. Anissa, already in playing position, leans forward and mostly watches the teacher perform the entire piece—a slight deviation from her early strategies. She compensates for this, however, by making small shadowbow movements in conjunction with the model. Though it is unclear exactly what Anissa is focusing on during this modeled performance, it is evident that she is refining or comparing the modeled experience with her internal concept of the performance. The subtle bow movements seem to confirm that Anissa is double checking her understanding of the task. When the teacher concludes the model, Anissa remains still and makes no further effort on her own.

The teacher continues, "And again." Anissa manifests her own performance concurrently with the model now. When they both reach fig. 3, Anissa tries a simplified version of the 16th note gestures she had previously struggled with. She remains unsuccessful. The variation Anissa attempted seemed deliberate, however. It retained the melodic contour of the 16th note gestures but did not seem to be a step towards better understanding or transforming the gestures. Instead, it resembled a messy approximation of the gestures absent of any attempt to improve. Anissa does not seem to be bothered by it, however—she simply waits during her provided time between models.

"One more time," the teacher says before launching into the final performance before the fourth check-up. Anissa repeats her previous strategy—she performs along with the model. When they reach fig. 3 this time, Anissa drops out. Immediately after the

16th note gestures, Anissa rejoins the teacher and completes fig. 4. Her strategy is now more evident. Her goal was to make it to the end of fig. 4 and the 16th note gestures served as a significant—possibly insurmountable—obstacle. In order to solve this problem, Anissa resolved to fake her way through the end of fig. 3 but was unable to do so during the second complete performance with the model.

"It's time for our fourth and final check-up," the teacher declares, "I will start from the beginning. Please play along with me." Anissa does so. She mostly matches the model during figs. 1 and 2. During fig. 3, however, Anissa only shadowbows. She rejoins the model during fig. 4 with moderate success.

Anissa's interaction with the model near the end of the lesson in the above vignette is an example of two clearly different damage mitigation strategies. In the first example, Anissa performed a messy, generalized approximation of the pitches, rhythm, articulation, and tone of the 16th note gestures in concurrence with the model. When that was not effective, Anissa scaled back her active experimentation of that specific section in order to better perform the last fig. of the piece. In short, she realized that she was not going to be able to perform the 16th notes and that her inability was interfering with the overall performance of the task. Whether Anissa made a deliberate decision to sacrifice the 16th note component of the lesson for the greater good of fig. 4 is unclear.

Kolb and Kolb (2013b) posited that Analyzing learners—such as Anissa—might specialize in this deliberate, analytical evaluation process. Analyzing learners "like to carefully analyze each step and weigh its relative consequences before taking action. Because [they] like to plan ahead, [they] are able to minimize mistakes and anticipate potential problems and pitfalls" (p. 203). Anissa's learning style relied on calculation and reflection. The sequence of the modeled lesson did not provide much opportunity for Anissa to objectively reflect on an effective approach. Because of this, she was only able to settle on an effective strategic approach near the end of the lesson. She simply was not afforded the time to reflect on fig. 3 and develop an effective strategy—Anissa was eventually forced to bypass the challenge in lieu of other task components. Although damage mitigation was not a frequently applied strategy—representing only 1.19% of applied strategies by participants—it was utilized as a response late in the lesson by participants that struggled with components of the lesson.

Balanced Strategies. Kolb (1984) pointed out the importance of understanding the "diversity and complexity of cognitive processes and their manifestation in behavior" (p. 66). The above strategies and their relative applications of the ELT cycle are a representation of the range of strategies that individuals of different learning preferences might utilize in response to a single modeled experience. The multitude of above strategies vary in their application of transformation and grasping as well as their complexity in alignment with—or in opposition to—individual learning preferences. In the above examples, only two or three components of the ELT cycle were utilized by participants. All four elementary learning phases—or a balanced style—represents the highest, most well-rounded form of learning. A learning utilizing a balanced strategy might draw from the benefits of all four learning phases as a truly reflexive and robust interaction with an experience. Kolb posited that such a balanced, highest level of learning is rare and not often sustained over long periods of time. Balanced strategies might be applied by any learner in any context yet most are most frequently utilized when an individual is able to supplement their own learning preference with another advanced combinative strategy in response to an experience.

Such balanced, holistic, and complete learning strategies made up only 5.15% of participant responses. Just as Kolb (1984) described, they most often occurred as a result of a participant applying several learning strategies at a time—often outside their own learning preference. The series of examples below illustrate how strategies might layer and evolve over time to become unified, holistic approaches.

Thea (9th Grade/Female/Thinking) had very little trouble with the overall lesson. At this point in the lesson, the teacher has introduced figs. one through three. Thea has seemingly mastered the rhythm and pitches of these figs. and has recently been focused on refining intonation and tone clarity.

The teacher continues, "It's time for our second check-up. I will start the piece from the beginning. Please play along with me." Thea performs along concurrently with very little difficulty. When the model performs fig. 4, however, Thea stops. She leans forward and seems to be establishing—or refining—her internal model of this final fig. She is trying to get a head start on this section after the perceived challenge of fig. 3.

Thea had not applied this sequence of strategies—retention (RO/AC/AE) and listening (CE/RO)—at any previous point in the lesson. Indeed, Thea applied a listening strategy only five times previous and always by itself. Her overt gesture—leaning forward—as she stopped playing at the end of fig. 3 indicated that it was a deliberate strategy designed to transform lesson material ahead of schedule. In the previous check-up, Thea had applied a similar but less confident strategy—she continued playing over the novel material of figs. 3 and 4 but reduced her volume to better hear the model's performance. Her evolution of learning—and more clear application of a reflection strategy—is evident of a procedural, combinative, and high order approach even at this early point in the lesson. As the lesson progresses, Thea further extended her understanding of the lesson material. However, the above example seems to the culmination of the highest-level learning strategy. Thea's subsequent strategies did not incorporate all four ELT phases.

Mayu (10th Grade/Female/Imagining) demonstrated similar holistic approaches in response to the challenge of fig. 3. More notably, she made a dramatic shift by incorporating learning strategies outside her comfort zone.

Mayu has been doing well so far. Her main approaches have stayed close to her learning preference (CE/RO)—she often listens and reflects and then uses her provided time to make pizzicato trial and error attempts. Mayu has also applied pitch identification and other CE- and RO-based strategies, though far less frequently.

"Now let's take a look at the third fig.," says the teacher. Mayu tries to out several pitches in order to ascertain the opening pitch of fig. 3 but quickly stops once the model gets to the 16th note gestures. Perhaps caught off guard a bit, Mayu adjusts her sitting position and plucks several other pitches. Though it's unclear what facet of fig. 3 Mayu is focusing on, she is most likely attempting to reconcile a fragment of her internal model with an external solution. More specifically, Mayu probably knows how fig. 3 is meant to sound and is working towards that goal in an abstract, non-linear fashion.

"I'll play the third fig. again," the teacher explains. Rather than play concurrently, Mayu elects to deviate from her previous trial and error strategy and adhere closely to her own learning style by leaning forward and intently listening. After the model's conclusion, Mayu uses this newly gathered information and plucks several longer components of fig. 3. However, she stares off into the middle distance—she is distracted. Her focus seems to be on her internal model rather than the result of her own active experimentation as seen in previous instances. This novel focus on her own intrinsic operations is a stark deviation from any previous operation Mayu has applied in this lesson. This is further compounded by her incessant active experimentation via pizzicato.

The teacher interrupts, "And again." Mayu returns to the comfort of her own learning style and just listens and reflects. At this point, her strategies begin to stabilize again and refocus on the combination of reflection and her own concrete experimentations. Her attempts are ultimately unfruitful, however. The second check-up arrives before Mayu is able to manifest a coherent attempt at fig. 3.

Mayu's shift in learning strategies to include an AC/AE-based approach is antithetical to her own learning preference. This might explain why she struggled to find traction using these relatively advanced, highest-level combinations of strategies. However, her use of a blend of ELT phases is emblematic of how higher difficulty tasks might necessitate higher combinations and complexities of learning strategies.

The previous two instances of balanced strategies might suggest that when learners operate outside their learning preference, they do so with middling results regardless of strategic complexity. However, Kolb (1984) suggested learning strategies that incorporate all four ELT cycles function at a higher level and eventually lead to more beneficial learning outcomes. When a learner applies a balanced strategy, they are "creating an increasingly sophisticated adaptive process that is progressively attuned to the requirement of the [task]" (p. 66). A balanced application of the ELT phases, therefore, creates a more efficient developmental learning sequence.

Indigo (12th Grade/Female/Initiating) is near the end of the lesson. She, like most participants, struggled with fig. 3 but has settled on a solution that works for her and continues to make progress. The teacher has introduced all four figs. and is now chunking subsequent figs. Indigo has settled on a strategic routine of concurrent performance with the model followed by frequent performances based on her own internal concept of the individual figs.

"I'll now play the third and fourth figs. together," the teacher says. This catches Indigo off guard a bit—she takes a moment to recall fig. 3. She begins by performing slightly behind the modeled performance but quickly catches up by measure five. During the subsequent individual performance time, Indigo focuses on refining her performance of the latter half of fig. 3 but gets stuck at the descending 16th note gestures. She makes two attempts to overcome her problem but seems stuck—so she waits. Here, Indigo's applied strategy was gesture isolation (AE/CE/RO)—a complex, but not quite highest-level, adaptive strategy centered on her immediate need to clean up or retain the end of fig. 3.

The teacher continues, "And again." Indigo continues her routine of concurrent performance along with the model—a strategy that has worked well for her and falls within her learning preference. Her accuracy in the second half of fig. 3 remains unclear. This is made more evident by Indigo's sustained focus on the 16^{th} note gestures of fig. 3. On her own now, she begins fig. 3 but when she reaches the 16^{th} note gestures, she adjusts the tempo to determine her technical problem. It is here that Indigo begins to apply a balanced blend of strategies—tempo modification (AE/CE/RO), error detection (CE/RO/AC), and melodic contour (AE/CE). She is able to perform both figs. 3 and 4 with the temporal adjustment twice before forced to move on. Indigo's first performance was focused on the task of tempo modification in a more general sense—she was unable to make much progress on the specific pitches in the 16^{th} note gesture and only performed the rough outline. However, the second attempt was far more accurate. Indigo was able to perform the correct number of pitches in 16^{th} note gestures, yet at a significantly slower tempo—she remains unsatisfied by her inability to find the exact pitches, however.

"One more time," interrupts the teacher. Indigo performs along with the model but it is unclear if she was able to transfer her work on the 16^{th} notes gestures to the model's task. Her practice time, however, features still more balanced strategic approaches. She repeats her earlier strategies when performing figs. 3 and 4 but includes gesture isolation (AE/CE/RO). Specifically, it seems that Indigo is trying to identify the bottom pitch of the 16^{th} note gestures. In this, Indigo's gesture isolation and tempo modification strategies are successful when combined with her previously applied error detection. In fact, it seems that Indigo's internal concept of figs. 3 and 4—combined with

her ability to slow down and isolate problems—are the deciding factors in her immediate success.

Throughout the remainder of the lesson, Indigo reached an equilibrium of applied strategies. She returned to her previous alternation of concurrent performance with the model and focused work on specific components relevant to her own observations. Like Mayu and Thea, Indigo's application of several balanced strategies was brief. Also similar to Mayu and Thea, Indigo's application of balanced strategies indicated a turning point or culmination of strategic complexity in the lesson. Although Indigo's blend of balanced strategies was more successful in the short term, all three learners created more efficient learning sequences as a result of their balanced application of strategies. Kolb (1984) noted a similar shift—albeit referring to stages of ELT development—that is seen when learners resolve a dialectic conflict. Namely, when learners are able to expand their strategies and operate outside their own learning preference, they gain the ability to shape their response according to the task's demands. On a very micro-level, "the person experiences a shift in the frame of reference used to experience life, evaluate activities, and make choices" (p. 145). The above learners underwent a shift—sometimes subtle—in their approaches that led to more consistent results based on efficient and appropriate strategies.

Participant Approaches and Responses to the Model

Kolb's (1984) ELT cycle provides a framework to better understand how individuals might interact with a single learning experience. More specifically, the ELT—and its four distinct phases of learning—allows for more accurate descriptions of the nature of learning activities. In addition to pairing specific strategies to ELT phases—described in the previous section—the ELT provides researchers a means to better analyze learner alignment with teacher goals, learner focus, and how individual leaners approach various tasks set forth by the teacher or model. Individual learner transformations and comprehensions with relation to the teacher become more evident.

A potential problem described by several researchers investigating the effectiveness of modeling is the capacity for misalignment—particularly when the teacher's goals do not match the learner's needs or focus. Matthews (2014) suggested that "a teacher may model to demonstrate a musical phrase using dynamics and articulation, but the student uses the model to learn or improve the rhythm while missing teacher's intended goal" (p. 74). This example points to an interesting concept concerning modeling and student reception of that model. If the student is misaligning models with their intended usage, the learning cycle might be interrupted or otherwise derailed. Two potential outcomes might arise from such a misalignment: (a) A student bypasses one or more phases—for example, reflective observation—of the learning cycle in lieu of the model's and allows the external source to directly manipulate their own internal concept of the performance thereby creating a weak, tenuous grasp on the material because the concept is now based on non-intrinsic sources; or (b) A student's learning phase—for example, abstract conceptualization—does not align with the teacher's intended outcome and therefore creates an unintended, incorrect, or incomplete concept wherein the student misses the teacher's instructional goal and substitutes their own. Either scenario is how modeling might, from an ELT perspective, become antithetical to learning. Matthews continued by suggesting that "teachers' intentions when modeling often function quite different for students" (p. 84). Basilicato (2010) further posited that "although students may perceive their teachers similarly, this does not necessarily mean they are learning or understanding equally" (p. 46) referring to the multiple perspectives individual learners apply to a single experience.

Frequent Participant Responses. Interview data regarding how individual learners responded to the model were grouped into two areas of focus: external and internal. Participants mentioned their focus on the teacher more often (67.50%) than their own internal schemata or approaches (32.50%). See Table 13 for a complete list and relative frequency of topics mentioned by participants with regard to the manner in which they were responding to the model.

Table 13

Interview Data: Learners' Response to the Model

	Response	Frequency	%
External	Chunking	17	42.50
(*N* = 27)	Background/Environment	5	12.50
	Respect/Decorum	2	5.00
	Unconventional Solution	2	5.00
	Task Difficulty	1	2.50
Internal	Confidence/Efficacy	5	12.50
(*N* = 13)	Stress	4	10.00
	Struggle	2	5.00
	Strategy	1	2.50
	Flexibility	1	2.50
Total: 40		40	100.00%

Unsurprisingly, the most frequently mentioned topic was the manner with which the model chunked (42.50%) the performance and how learners perceived that approach.

Participants, without exception, conveyed their appreciation for how the piece was divided and administered by the teacher. Theta (10/F/Thinking), for example, noted that the chunking nature of the lesson was one of the first things she noticed within the lesson.

John: What details did you notice before the teacher even started?

Theta: I think, just what [the teacher] was saying about the piece, like how there were four [figs.] so we would learn them in parts.

For Mayu (10th Grade/Female/Imagining), chunking played a much larger role in her transformations of the modeled performance. After the conclusion of the lesson, she immediately referenced the individual figs. of the piece and then mentioned chunking throughout the interview.

John: Alright! So how was that for you?

Mayu: It was OK.

John: Yeah? What was OK about it?

Mayu: Um, the first two parts were easier to understand than the third. The third—I was just not quite sure. Because it was so fast it was…[pauses]…I took music theory so I know to focus on certain things at a time.

Later in the interview, Mayu made similarly salient observations.

John: Do you remember anything about the model or how the model was giving instructions?

Mayu: Um, so [the model] gave off the process that [the model] was going to break down for me. So, [the model] told me that [the model] was going to play it and it was going to be cut up into four pieces so that you could expect four pieces.

Similar to Theta, Mayu identified the importance of the teacher's chunking process and used that information to guide her learning process even at the very start of the lesson. In fact, chunking became so prevalent in her concept of the task that descriptions of the chunking process manifest themselves in her interview responses.

John: So how did you incorporate your strategies into your playing? So, once you figured out what the first "thing" was, what was the next step?

Mayu: So, once I [pauses], I kind of kept the pitch in my head. So, once I matched the pitch to what I remembered hearing and I went over the notes in the first chunk. I was just focused on the first chunk for a little bit. The rhythm wasn't very difficult but I remembered that the first note was a little bit longer than the notes that came after it. And they were all on the E string. And then once the second chunk came in, I just restarted the whole process.

For Mayu, the chunked nature of the lesson allowed her to organize her learning and strategic approaches into coherent and meaningful structures. It is unclear if every learner was able to glean that information as effectively as Mayu and Theta. Anaya (11^{th} Grade/Female/ Analyzing), for example, was caught off guard by the chunking approach used by the teacher despite the explanation at the start of the lesson. However, she innately trusted the teacher to made the subject material clearer for her.

John: I'd like to ask you about the beginning of the modeling video. What was the first thing you noticed on the modeling videos?

Anaya: Um, well, [the model] played the entire thing and I was really confused. I hoped he would break it down later.

John: So, you kind of trusted the teacher to make it more accessible for you?

Anaya: Yeah, pretty much.

Anaya, Mayu, and Theta's interview data points to a fundamental difference in how some learners might interpret a task before it has even begun. Theta and Mayu were prepared to process the subject material in smaller sections whereas Anaya was confused at the onset of the lesson. This initial and fundamental misalignment of how the basic structure of the lesson is organized points to how learners might deviate from a teacher's intended goals before any music is made.

Less Frequent Participant Responses. Although participants such as Anaya, Mayu, and Theta mentioned their perception of the lesson structure, other participants referenced and focused on non-pedagogical components. Other externally focused participant responses to the model were centered on the background or environment of the lesson (12.50%). Participants most often mentioned environmental aspects of the lesson as one of the first things they noticed when the lesson started.

John: I'd like to ask you about the beginning of the modeling video. What was the first thing you noticed on the modeling video?

Thea (9th Grade/Female/Thinking): Probably like the background—it was plain so it was easier to focus on the instructor.

John: Cool—but what was the first thing you locked in on?

Thea: About what I was learning?

John: Sure—or before the teacher even started playing. Were there any other details you can think of?

Thea: Um, well [the model's] instructions were really clear. Like when [the model] was explaining stuff, that was easy for me to understand.

For Thea, the connection between a neutral environment free of distractions and her ability to focus on the teacher's instructions were directly related. Rather than attend to specifics within the instructions, Thea's initial perception of the lesson was centered on what she saw and how that impacted her ability to discern the teacher's instructions. This focus on environmental stimuli and their impact on reflective and conceptual perception is closely aligned to Thea's Thinking learning preference. Kolb and Kolb (2013b) suggested that learners with a Thinking orientation "learn best in well-structured spaces with clear directions and learning agendas" (p. 205).

Thelma focused less on the environment of the lesson but still mentioned it in their response:

John: What was the first thing you noticed on the modeling video?

Thelma (9th Grade/Female/Thinking): Um—I wasn't really paying attention. The only thing I noticed was that [the teacher] had a navy-blue shirt. [Laughs]

John: So did you notice any other details before [the model] starting playing?

Thelma: [Thinks for a moment] No, I wasn't really paying attention to that. I was kind of paying attention to the task at hand—I guess.

Thelma's self-reported focus on the task at hand was not disrupted by the environment despite her attention to a specific detail such as the color of the instructor's clothes. Thelma—who shares Thea's learning orientation—might have attended less consciously to her lesson environment but instead made sure that the teacher's instruction was the primary focus.

Participants that mentioned environmental details did not fixate on them. Though Thelma and Thea might have casually referenced the room or the teacher's clothing, Anaya (11th Grade/Female/Analyzing) seemed to only cite environmental details in an effort to be thorough. After initially discussing task identification, chunking, and specific pitch identification and error detection strategies that she had noticed first, Anaya reluctantly described what she recalled from the lesson.

John: Alright, how about this? What details did you see before the teacher even started playing?

Anaya: I didn't notice much—I'm going to be honest.

John: So, you were just waiting to get the music.

Anaya: Yeah, I believe there was…[Anaya looks up and to the right—a cue that manifested itself throughout the lesson whenever she accessed her internal concept of the model]…just a white board behind the teacher. [The model] was wearing a black shirt. That's about it.

Anaya was so focused on her own strategies and her concept of the lesson that she only revealed her own recollections of the lesson environment and teacher when pressed. Indeed, her focus on her environment was of such little importance to her that she did not correctly recall the model's clothes—the model's shirt was blue. Kolb and Kolb (2013b) supported this approach and posited that Analyzing learners—such as Anaya—"are less focused on people and more interested in abstract ideas and concepts" (p. 203).

Balah (11th Grade/Female/Balanced) specifically mentioned the neutral, blank environment as a positive factor in her ability to focus on the various tasks of the lesson. Indeed, she contributed her relative success in the lesson to the lack of stimuli in her learning environment.

John: Last question—is there anything else you feel stood out to you in this lesson that helped you?

Balah: Um, I think the plain background. But I think that was just because everything else was just white—there wasn't anything else to look at. I'm the kind of person who gets distracted if there's stuff behind someone.

Respect (5.00%), unconventional solutions (5.00%), and task difficulty (2.50%) were also mentioned as externally focused responses to the model. These responses combined to represent only a small subset of codes (n = 5) from participants. Alternatively, chunking and environmental perceptions were far more frequently reported by participants. Some participants, however, mentioned more intrinsic responses to the model during the interview. Internally focused responses from participants mostly referred to confidence and efficacy (12.50%) and stress caused by the lesson (10.00%).

Mayu (10th Grade/Female/Imagining) referenced her own confidence as a deciding factor when determining an initial strategy to the model's tasks. For the first half of the lesson, Mayu remained in a modified guitar position and only plucked as a response to the teacher's prompts. She maintained this strategy despite more complex slurred passages—almost impossible using a pizzicato application—and only shifted into a more conventional playing position when learning the third fig.

John: Right, so I noticed that at some point during that third fig., you picked up your instrument. Why do you think you were hesitant at the beginning to pick up your instrument? Because, you were plucking and looking at it—I mean, you were certainly learning the melody. It was effective. Why do you think you didn't just start up on your shoulder?

Mayu: Honestly, it's a little bit of a nervousness thing. Um, it's always weird for me to play around anyone and I'm the only sound that's—you know—coming out.

John: So, it was just a confidence sort of decision then?

Mayu: Yup.

Mayu self-reported that her own confidence directly impacted her ability to learn the task presented by the model. Kolb and Kolb (2013b) suggested Imaging learners, such as Mayu, tend to be more sensitive to their own and other's feelings and opinions. They more frequently "learn by stepping back from experiences to observe and reflect on [their] feelings about what is going on" (p. 199). Mayu's confidence and focus on self-reflection led her to deviate from the teacher's instructions and potentially interfered with her own ability to transform the components of the lesson. Instead, Mayu would have preferred the safety of other performers or potential freedom from oversight.

Similar to confidence and efficacy, stress was reported by several participants as an internal factor in response to the teacher's modeled tasks. Participants most frequently reported their stressed level at the onset of the interview. Maya (9^{th} Grade/Female/Imagining) self-reported a typical stressed response when transitioning from the lesson to the interview portion of the data collection.

The teacher has concluded the lesson after the fourth—and final—check-up.

John: Not so bad, right?

Maya: Ummmmmm, I was kind of stressed out during it.

Several factors might have contributed to—or resulted from—Maya's stress level throughout the lesson. Maya was interrupted by the model far more frequently than other participants. On average, participants were interrupted 2.53 times over the course of the lesson—Maya was interrupted 11 times in total. The provided eight second personal practice time was frequently insufficient for her. Kolb and Kolb (2013b) suggested that learners who share Maya's learning preference are more inclined to reflect on personal feelings regarding the learning process. Maya's inability to devote time to introspection and reflection during the learning process might have contributed to her feelings of stress. Furthermore, at several points in the lesson, Maya seemed unable to recall many of the outcomes and decisions of her previous performance attempts. Throughout the lesson, Maya frequently determined the correct pitches and rhythms of various figs. but was often unable to reproduce that success in subsequent performance opportunities. It is unclear the causality of stress and Maya's lack of retention throughout the lesson, however.

Anissa (11/F/Analyzing) made a similar statement at the start of the interview.

Anissa and the teacher finish their fourth and final check-up.

John: Alright—that wasn't so painful, was it?

Anissa: [Looks pained] That was terrifying! [Laughs nervously]

Anissa—similar to Maya—struggled a great deal with the various tasks within the lesson. The effect of Anissa's self-reported stress was less observable during the lesson as compared to Maya. Indeed, the only indicator that stress might have impacted Anissa's performance or learning during the lesson was her inability to adapt her strategies to the variety of lessons' challenges. Although causality is impossible to prove in this instance, Anissa's inflexibility despite consistent struggle might have yielded a lower success rate throughout the lesson. Whereas participants in the study applied an average of 12.27 strategies throughout the lesson, Anissa only utilized seven. No other participant applied fewer strategies. Alternatively, Thea—who showed little difficulty with the lesson's challenges—also applied only seven strategies throughout the duration of the lesson perhaps demonstrating that strategic variance is not a direct factor in overcoming academic hurdles.

Internal and external responses to the teacher's instruction in this lesson indicated that students constructed individual interpretations of the tasks regardless of the teacher's intent. Though stress was self-reported at a low rate, those that did indicate their elevated level of stress had struggled with the subject material. Additionally, components of the environment as well as non-pedagogical factors related to the teacher were reported by participants. In this context, those external factors were not detrimental to the lesson.

Intensity of Participant Response. Participants, in their responses to the teacher's modeling, also varied in their intensity during the personal practice time. The provided time between modeled instances was only eight seconds. Of the 380 instances of personal practice time, participants most frequently played through the fig. most recently modeled by the teacher only once (33.68%). Table 14 is the list of relative frequencies of participant performance intensity.

Table 14

Relative Frequency of Participant Intensity Between Modeled Instances

Repetitions	Frequency	%
Null	93	24.50
0 Reps	3	0.79
1 Rep	128	33.68
2 Reps	36	9.48
3 reps	10	2.63
Medium reps	72	18.95
4 reps	10	2.63
High reps	28	7.37
Total	380	100.00

Repetitions were recorded as complete—or nearly complete—performances of a single or consecutive fig. between the teacher's modeled instances. Medium and high repetitions were recorded when learners performed fragmented or isolated gestures of a fig. The incomplete nature of such learners' intensities made it difficult to quantify the number of performances and were therefore categorized as either medium or high. I labeled an instance as medium repetition when the learner employed slight pauses between fragmented performances. Alternatively, I labeled a performance intensity as high when there was no pause between fragmented performance attempts.

Learners in this study preferred to make a single attempt in response to the model, reflect quietly without making a performance attempt (24.47%), or make fragmented responses at a medium rate (18.95%). Perhaps due to the relative brevity of the provided practice time, participants infrequently performed three (2.63%) or four (2.63%)

repetitions of a complete fig.

Frequent Areas of Participant Focus. Participant response and intensity throughout the modeled lesson suggest a varied approach to a single teacher's lesson directives. Similarly varied, participants' responses to the teacher's modeling yielded evidence of several different areas of focus. Codes were assigned when specific aspects of a participant's response to the model could be discerned and labeled. Pitch identification was identified as both a strategic approach to the modeled lesson as well as an area of focus by participants. Five subgroups emerged from the quantitative data that encompassed what component of the model that participants attended to during the lesson—musical, left hand, lesson execution, right hand/bowing, and general. See Table 15 for a complete list of the modeled components that students focused upon during the lesson and their relative frequency.

Table 15

Participant Focus in Response to Teacher's Model

	Modeled component	Frequency	%
Musical	Pitch ID	213	48.30
	Slurs	1	0.23
	Emotion	2	0.45
	Intonation	15	3.40
	Rhythm	78	17.69
	Style	6	1.36
	Tempo	2	0.45
	Articulation	14	3.17
	Musicality	2	0.45
	Dynamics	7	1.59
	Tone	2	0.45
	Sub-Total	342	77.55
Left Hand	Vibrato	15	3.40
	Fundamental Skills	1	0.23

	Posture	3	0.68
	Positioning	4	0.91
	Technique	8	1.81
	Visual (LH)	11	2.49
	Sub-Total	42	9.52
Lesson Execution	Instructions	2	0.45
	Pacing	1	0.23
	Model	7	1.59
	Repetition	8	1.81
	Sub-Total	18	4.08
Right Hand/Bowing	Bowing Tech	2	0.45
	Bow Hold	1	0.23
	Bow Location	1	0.23
	Bow Speed	4	0.91
	Bow Length	5	1.13
	Bow Distribution	3	0.68
	Bow Direction	10	2.27
	Bow Placement	3	0.68
	Bowing	5	1.13
	Bow	2	0.45
	Sub-Total	36	8.16
General	Overall (Holistic)	2	0.45
	No Details	1	0.23
	Sub-Total	3	0.68
	Total	882	100.00

Focus: Musical. Participants most frequently focused on musical components (77.55%) throughout the modeled lesson. String playing components—such as left hand (9.52%) and right hand (8.16%) technique—comprised only 17.68% of recorded points of focus by participants. Unsurprisingly, the specific components of pitch (48.30%) and rhythm (17.69%) were the main focal point of participants. A clear example of pitch and rhythmic focal points can be seen in Theresa's initial response to the model.

Theresa (9th Grade/Female/Thinking) is eager to start the lesson. She expressed optimism during our discussion prior to the data collection and seems only mildly *intimidated by the model's initial performance of the entire piece. In fact, after that initial performance, she was able to match the first two notes of fig. 1—she seems willing to put forth her best effort.*

The teacher continues, "I will now play the first fig." Theresa expands her success to by bowing the first four notes of the modeled piece out of tempo and then starts to work on the rhythm while the model finishes performing the rest of fig. 1. Her clear focus on pitch first—followed closely by rhythm—is evident even at this early stage in the lesson. She spends the rest of her personal practice time, however, quietly reflecting and makes no further effort to perform.

"The first fig. again," the teacher says. Theresa combines her initial focal points of pitch and rhythm by performing concurrently with the model—yet stops after the first two notes. It seems that she was unable to confidently identify the third and fourth pitches and successfully pair them with the appropriate rhythm.

In the above example, Theresa clearly divided her focus between pitch-related performance components and rhythmic-related components. She struggled when she tried to combine the two fundamental components. Few participants, however, divided their focus in such a way. In the example below, Thelma (9^{th} Grade/Female/Thinking) exhibited a more conventional combinative focus of rhythmic and pitch components.

Thelma seems as eager as Theresa to begin the data collection. She sits in rest position while the model performs the entire piece and occasionally plucks her open strings. She stops plucking when the model reaches the fig. 2 and raises her eyebrows at the 16^{th} *note passages in fig. 3.*

"Ok, well I know it's in D [Major]. That's like going way too fast," Thelma says to herself. She used the model's initial performance to gather information regarding the tonal center but seems concerned about the 16^{th} note gestures. She remains in rest position as the model moves on.

"I will now play the first fig.," intones the teacher. As the model begins, Thelma plucks the first note to test her tonal center-matching strategy as well as her ability to match the first pitch. She does not make an effort to perform, however.

"Yeah—wait. Am I supposed to play it back?" asks Thelma, once again to herself after the teacher concludes performing the first fig. She quickly picks up the bow and quickly plays the correct pitches with a general outline of the model's rhythm. She was able to quickly ascertain the correct pitches when recalling the majority of the rhythm at a very early stage of the lesson.

"The first fig. again," says the teacher. Thelma only listens to this performance as well. It would seem that she either refining her internal concept of the model or double checking her recent performance against the external experience of the teacher's performance. In either case, her reflection upon the performance yields dividends—she now performs the second measure with correct pitches and rhythms.

"I'm so confused!" exclaims Thelma—though it is unclear what she is confused about.

"One more time," remarks the teacher before performing fig. 1 a final time. Thelma is not prepared for this modeled performance, however. She is caught off guard and is forced to simply set her bow on the string and wait. Though her momentary panic

might have precluded a concurrent performance along with the model, it did provide Thelma with another opportunity to listen and refine her internal concept of the model. Her straightforward focus on rhythmic and pitch fundamentals turns out to be successful. As soon as the teacher finished playing, Thelma immediately begins performing fig. 1 with correct pitches and rhythm.

Throughout the model's performance of fig. 1, Thelma approached pitch and rhythm as interconnected musical components—a simple and effective area of focus applied with great effect throughout the rest of the lesson. Other participants focused on pitch components apart from rhythmic components—and vice versa—using more directed strategies with varying levels of success. Most frequently, participants attempted to individually focus on rhythm using shadowbow techniques—as seen by Mia in her response to fig. 3.

Mia (10th Grade/Female/Imagining) has successfully identified the initial pitch of the piece—a common stumbling block for participants as they begin to manifest strategies and attend to various musical and technical components. However, she made little progress once the model isolated fig. 1. During her provided practice time, Mia made random guesses at pitch identification with little success.

"The first fig. again," interrupts the model. Mia isn't rattled, though. She sets her bow above the string and shifts her focus to rhythm by shadowbowing along with the model for the first portion of fig. 1. During her personal practice time, she reverts her focus to the pitches of fig. 1. She bows the opening pitch of fig. 1 but is out of tune. She quickly realizes this and restarts with much improved intonation. Mia begins to bow

notes above and below the opening pitch—seemingly at random—in order to ascertain the general outline of the initial melody.

"One more time," continues the teacher. This time, Mia performs concurrently with the model with mixed results—she is able to successfully perform the correct rhythms with the model but fails to produce any of the correct pitches. Instead, she is only able to match the general melodic direction of the model's fig. 1 performance. She continues this process into her personal practice time.

Mia's brief focus on rhythm was—undoubtedly—successful despite her inability to pair correct pitches during subsequent performances. Her sole focus on rhythm did not yield a successful performance absent her ability to discern and retain information regarding pitches. Instead, her internal concept of the modeled performance was fragmented by her disparate reflection on rhythm and pitch. For Mia, her focus on a single component of the modeled performance prevented her from creating an applicable abstract concept of the task.

Participants also focused on more developed musical components in response to the modeled lesson such as intonation (3.40%) and articulation (3.17%). Whereas concepts such as intonation and articulation are significant aspects of music making, they cannot exist if the learner has not grasped the foundational components of rhythm and pitch. Unsurprisingly then, learners tended to focus on articulations, intonation, dynamics, and tone far less than the necessary concepts needed to simply perform concurrently with the model.

Regardless of how successful a learner was in acquiring the various modeled tasks, the secondary level components of intonation, articulation, dynamics, and tone were often focal points at late stages in the lesson. Maya (9^{th} Grade/Female/Imagining), despite struggling with the majority of the subject material, made a conscious effort to include intonation in an order to refine a single phrase of the piece.

Throughout the lesson, Maya has been largely unable to either efficiently grasp various performance components or unable to connect her own internal model to her own external performance. Nonetheless, she continues to frequently pivot between several strategies. Even at the late stage of the lesson, Maya is still attempting to match pitches with the model. Now that the teacher is modeling the entire piece, Maya seems to sense that the end of the lesson is quickly approaching.

"And again," continues the teacher before performing all four figs. through for the second consecutive time. Maya just listens to the first fig. and then begins to shadowbow along with the model starting at fig. 2. This most likely reflects her own individual learning needs—she wanted to reflect and refine her internal concept of the model yet test her own theory of fig. 2 against the model's. Her focus shifts yet again after the model completes the performance—Maya make three brief attempts at the 16^{th} note gestures of fig. 3. Her lack of persistent focus is detrimental. She makes little headway in solving the 16^{th} note gestures.

"One more time," interrupts the teacher. This time, Maya just listens to the teacher perform the entire piece. Immediately after, Maya confirms the final pitch against the model's recent performance. She then returns to fig. 1—a portion of the lesson where she had felt most confident—and makes a quick performance to confirm her own

accuracy. She then shifts her focus to intonation and makes three more performance attempts making minor adjustments on the quarter note G and F#s in the second measure. Each time, she is able to improve the accuracy of her intonation.

Maya chose to disregard rhythm components of portions of the piece in order to focus on the intonation of a section that she felt she could successfully refine. This decision resulted in an uneven overall performance during the subsequent fourth and final check-up. For Maya though, it was more important to refine areas of her performance to the detriment of other portions. In the later interview, Maya indicated that she was able to improve her intonation by simply performing consecutive repetitions.

John: I heard your intonation got better and better as you went along. Was that something you thought about or was it something that just happened?

Maya: Um, I guess…well for me, if I play something for a long time, it [intonation] kind of does that. I don't really think about it that much. And if I get used to it [intonation], then I can focus on stuff that I do need help on—like the third and fourth portion of the piece here.

Maya made several salient observations regarding her own learning focus and skill progression in the above statement. She felt that she did not need to overtly focus on intonation. Instead, she relied on sheer repetitions in order to make improvements. Maya's learning preference would suggest that she would rather "[step] back from experiences to observe and reflect" (Kolb & Kolb, 2013b, p. 199). Both her behavior and her above statement suggested that she was more comfortable manifesting multiple externalizations and allowing those to shape her progression of learning. For Maya, those performances functioned as the primary vehicle for her to shape her intonation so that she can then progress to other, more challenging areas of the task.

Indigo (12th Grade/Female/Initiating) focused on intonation in a more conventional and expected manner. Late in the lesson, once rhythms, pitches, and even articulations were addressed, Indigo began to focus on intonation by comparing her own performance against the model's in a holistic fashion.

The lesson is now nearly over and Indigo has finally demonstrated that she is able to perform the rhythms and pitches of the entire piece individually. She feels confident but is also aware that there is still work to be done.

The teacher moves to the final complete performances of the modeled lesson saying, "Now the entire piece." Indigo joins in and successfully performs concurrently through the entire piece. She seems slightly relieved but does not revel in her success. Instead, Indigo returns to the beginning of the lesson and performs figs. 1 and 2 stopping several times. Each time she pauses, she starts one or two notes prior to her stopping point and adjust her intonation. She does not completely solve her intonation issues but continues to make strides towards a stronger pitch center.

"And again," says the teacher before playing through the entire piece again. Indigo joins and is once again successful recalling all rhythms and pitches. She then repeats her previous halting approach in order to further refine her intonation. Each time she pauses and continues, her intonation is slightly improved—though not perfect. The strategy remains effective, however.

Unlike Maya, Indigo prioritized her focus on rhythms and pitches until she gained a level of fluency she felt was sufficient to move on to other performance components. Indeed, her relative mastery of rhythms and pitches within the piece allowed her to create a strategy wherein she focused on intonation within the context of her own performance—as opposed to stopping and reflecting each time she needed to make an intonation adjustment. Indeed, Indigo's more fluid and holistic focus on intonation was closely aligned to her learning style that would prefer to "…act quickly and decisively in a changing environment without being caught in excessive deliberations" (Kolb & Kolb, 2013b, p. 195).

Indigo only focused on intonation as a late-stage focal point. Prior to that, she made overt efforts to incorporate the model's articulations into her own playing. Other participants also overtly focused on articulation components throughout the lesson as a means of making more in depth observations and reflections on the performance tasks. Theresa (9^{th} Grade/Female/Thinking) was able to incorporate her focus on articulations alongside rhythm and pitch components when responding to the model's performance of fig. 4.

Throughout the lesson, Theresa has largely struggled with finding helpful reference pitches—such as the start of each fig. Her struggles have not impacted her eagerness to tackle the myriad challenges of the lesson, however.

"The last fig. is up next," states the teacher. When the teacher models fig. 4, Theresa adheres to the strategy that she has applied to almost every previously modeled performance in the lesson—listening. As soon as the teacher completes their performance of fig. 4, Theresa makes an attempt to match the rhythms and pitches while also

mimicking the articulation of the model. She succeeds in immediately mirroring the rhythms and even accurately performs the articulations yet only succeeds in matching the final pitch of the fig. She only makes this singular attempt—she then waits for the next modeled performance.

"I'll play it again," the teacher continues as Theresa settles in to watch the performance. Once the model is finished, Theresa makes a more successful attempt at fig. 4. The rhythms and articulations remain accurate—now the pitches are more accurate as well. The last modeled performance and Theresa's subsequent performance proceed in much the same manner. Theresa is able to demonstrate a slight increase in correct pitches. Her acquisition of the rhythms tied to the articulations lead to a significantly more confident performance despite the pitch inaccuracies. Theresa brazenly performs fig. 4—albeit with multiple wrong pitches—and executes the terminal tremolo with a flourish.

Throughout the lesson, Theresa struggled with pitch matching. In the above example, she was able to connect her focus on rhythm with a focus on articulations at an early stage of the learning process. Theresa found that her focus on pitch impacted her other components of the lesson.

John: So, you think you were more focused on just the notes? The rhythms? What do you think you struggled the most with?

Theresa: I think I struggled the most with the notes—and because I was so focused on the notes, it sort of messed up my rhythm, too.

Theresa's struggle with fundamental pitch components interfered with her ability to focus on higher level concepts. She was unable to apply her internalized abstraction of the reflected learning due to her inability to externalize the correct pitches. Theresa's roadblock in her learning cycle inhibited any focus beyond foundational pitch components and even interfered with foci that she was more comfortable with.

In direct contrast, participants such as Thea were able make salient connections between her focus on musical component and their impact on her learning sequence. Compared to other participants, Thea was able to easily grasp even the most challenging portions of the lesson. Her observations regarding her own learning process and learning cycle indicate a level of metacognition and awareness beyond that of other learners in the study.

John: Now I'd like to ask you about some of the things you learned from the video. Describe how your performance became more refined throughout this video.

Thea: Well, the more I watched [the model], the more details I was able to include in my performance. Like, using vibrato and using dynamics a little bit according to what [the model] was doing.

John: Sure—can you talk more about how that unfolded for you? Like after you got the notes and rhythms, what was the next thing? Can you remember what order you started attending to those things?

Thea: The first thing was probably vibrato because that comes naturally to me. After that, I tried to look at [the model's] articulations and then dynamics.

Thea mentioned that she most likely focused on vibrato because of her comfort level with that specific musical component. Her focus on specific aspects of the musical performance that might be easier or more accessible was mirrored—albeit at a lower level of conceptual difficulty—in Theresa's attempt to bypass pitch components in lieu of more accessible articulation focal points. Most participants, rather than focus on musical components that are lacking or need immediate attention, preferred to address areas that either yielded immediate success often at the expense of longer-term performance or learning goals.

Musical components such as dynamics were often overlooked by participants seeking to mitigate their struggle on fundamental musical aspects by focusing on short-term gains. Interview data, however, indicated that many participants recognized the importance of these components despite rarely making overt attempts to extend their concept of the model's application of dynamics, articulations, or other non-foundational musical aspects.

John: What did you move on to focus on after identifying specific notes that the model was performing?

Mia (10th Grade/Female/Imagining): The dynamics! I realized [the model] used—what it's called—when you use…I can't think of the name at the moment. [Pauses to think] But I focused on the dynamics.

If Mia reflected upon—and subsequently applied her focus on—the model's dynamics, it was not evident when observing her lesson responses. Although Mia might have made dynamics (and perhaps other musical components such as vibrato) a point of focus during the lesson, she did not extend those conceptual abstractions to her own externalized experimentations.

Indigo singled out dynamics as a technical component that she often looks for when observing modeled performances. Specifically, she felt that dynamics and other technical mechanisms were easier to grasp when observing a modeled performance.

John: I'd like to ask you to think about a situation when your teacher modeled something for you during class. What kinds of things do you feel you learn from those models?

Indigo: I learn the techniques—like the amount of bow that [my teacher] was using when they were playing. And also, how [my teacher] holds the bow. Like if [my teacher] is pushing the bow to make it louder or if [my teacher] is a little lighter on the bow to make it sound a bit softer.

Indigo indicated that her teacher's model was a source of more advanced musical focal points beyond the foundational rhythmic and pitch components. Indeed, Indigo was able to efficiently and fluidly respond to the myriad challenges of the lesson—she rarely had difficulty with pitches and rhythms. Her ability to focus on more complex musical components, such as dynamics, might be a luxury afforded to her by a series of adaptive, responsive strategies designed to constantly compare her own performance to both the external model and her internal concept of the task. Though these strategies might be aligned with her learning profile, other variables—such as age, years of playing experience, listening habits, and myriad of factors—might impact the extent to which Indigo is successful with this performance activity. That success rate, though observed and noted throughout learners' performance instances, was not directly measured in this study. Indeed, I only casually observed learners' successes or failures as an outcome and possible motivator for future behaviors within the context of each videoed lesson.

Focus: Technique. Although most participants focused on musical aspects of the modeled lesson, still others focused on more tangible components related to either the left hand (9.52%) or the right hand (8.16%). Together, these technical focal points comprised a small but notable (17.68%) subset of areas that learners in the study attended to in order to grasp and transform the modeled task. The largest focal points related to the left hand were that of vibrato (3.40%) and general hand shape (2.49%). Prominent right hand focal points included bow direction (2.27%)—though aspects such as bow location or placement, speed, length, distribution, and general comments related to bowing were also either referenced or an overt area of improvement by participants with extremely low frequency.

"The second fig. again," says the teacher. Amaya (11th Grade/Female/Analyzing) has been responding well to the lesson so far. Now that the teacher is modeling the second fig. again, Amaya listens and reflects—an effective strategy for her thus far. Once the model is complete, Amaya waits a moment. This pause seems to calibrate Amaya's strategy. Her subsequent attempt is clearly designed to detect errors in her own performance. It is less clear what exactly Amaya is comparing her own performance against—either the teacher's model or her own internal concept of the task. Her learning preference would suggest that she is utilizing her own conceptualization of the piece as the exemplar against which she compares her own singular performance attempt. Regardless of the source of her comparison, Amaya seems satisfied.

"And one more time," the teacher continues. Once again, Amaya applies her previously effective listening and reflecting strategy. This time, however, she sets her

instrument down into rest position—seemingly assured with her own performance response. The model's performance seems to align with Amaya's internal model as well as her interpretations of her own performance attempts. She gets back into playing position and performs fig. 2 again with correct rhythms and pitches. This time, Amaya adds a vibrato flourish to the end of the figure in a show of confidence. As the teacher moves on to the next step in the sequence, Amaya smiles to herself.

For Amaya, vibrato was a secondary focal point similar to the above musical components of articulation, intonation, and dynamics. Furthermore, Amaya only included vibrato as a means of demonstrating her own relative mastery of the immediate task. When provided the opportunity, she was able to incorporate higher-level, secondary focal points into her own extension of the task. Later, during the interview, Amaya noted that she used vibrato as a means of coordinating areas of the modeled task that required her attention—specifically rhythm.

John: I think you might have already talked about this next question or figuring out those pitches and incorporating them into your playing. Can you talk a bit about that? Like how did you incorporate focusing on the pitches and the duration of those pitches and how you incorporated that into your playing?

Amaya: Well, I really focused on where [the model] would use their vibrato because that was where I was like, "Ok, I need to hold this down for a certain amount of time." So, I kept track of that part. And just mainly based off the way [the model]...just the vibrato was kind of mainly what I used to keep track of the notes.

Amaya's clearly identified the model's use of vibrato and furthermore used it as a means of delineating rhythmic components. Rather than immediately apply that vibrato, Amaya made the decision to focus on rhythmic components that had vibrato in order to make a clearer, more applicable conceptualization of the modeled task. It was only after that Amaya felt confident with her own manifestation of the rhythmic task and she decided to incorporate vibrato into her own performance attempt—seemingly as a light-hearted ornament to her own learning process.

Right hand focal points were less overt during the modeled lesson. Most frequently, bow direction was a clear focus when participants shadowbowed along with the model after it was evident they had mastered the rhythm. Nonetheless, participants reported lower focus on right hand related components. It was often less clear when participants focused on components related to the right hand. Alternatively, participants might have found right hand components less useful—or less interesting—for the tasks required by the modeled lesson. Regardless, the application of shadowbowed strategies isolated rhythmic musical components as well as right hand related schemata such as bow direction (2.27%), bow length (1.13%), bow speed (0.91%), and bow distribution (0.68%). Bowing—in general—was referenced several times (1.13%) but I was unable to pair a specific bowing component to the participants' comment.

Anissa (11th Grade/Female/Analyzing) and model have just moved on from the third check-up. Immediately prior to that, Anissa struggled to keep up with the model's performance of fig. 3 and the 16th gestures within that section of the piece. She persevered, however, and now seems ready to tackle fig. 4.

"The last fig. is up next," says the teacher before modeling the final fig. of the piece. Throughout the lesson, Anissa has relied on either a reflective listening strategy or a shadowbowing strategy when the teacher is performing. Here, she adheres to her routine of reflecting listening during the initial model of fig. 4. Once the teacher is finished, she pauses for a moment. This is a deviation from her previous strategic sequences—she typically moves right into shadowbowing according to her internal concept of the performance. After several beats—about half of her provided practice time—she begins to shadowbow fig. 4. Her rhythm is clearly accurate but she pays little attention to the direction of her bow—often performing several down bows in a row in an attempt to isolate rhythmic aspects of the performance.

The teacher interrupts, "I'll play it again." Anissa's additional reflection seems to have paid off. When shadowbowing concurrently with the model, Anissa is able to confirm her internal concept of the rhythm as well as attend to—and improve—her bow directions. Immediately after the model concludes, Anissa is ready. She sets her bow to the string and performs fig. 4. Her performance is accurate with regard to rhythm, pitch, and even bowing. In fact, her only mistake is the tremolo at the end of the piece—she is unable to recall the technique that the model applied. Nonetheless, Anissa is pleased with herself and smiles.

"And again," continues the teacher. Anissa, imbued with a new confidence, deviates from her previous strategies and decides to test her recent performance attempt directly against the model. She is now perfectly aligned with the model except for the final note. Instead, Anissa delays her final note a split second to hear and see what the

model is doing and immediately applies the correct tremolo technique. After this success, she does nothing during the subsequent personal practice time.

In the above example, Anissa attended to two different right-hand focal points. Using visual stimuli, she was able to gather information to immediately apply to her own performance and make improvements. Specifically, Anissa focused on bow direction and bow technique as a way to make short-term gains with her transformation of the lesson material. However, similar to left hand focal points, Anissa was only free to focus on bow direction after she had grasped foundational components such as rhythm and pitch.

Rebecca (10th Grade/Female/Reflecting) reported the usefulness of teacher models with regard to focal points beyond that of rhythm and pitch. It is unclear if she—or any other participant—was able to identify the foundational qualities of pitch and rhythm. Instead, Rebecca stated that her interpretation of her own teacher's model often allowed her to focus on more advanced topics.

John: I'd like to ask you to think about a situation when your teacher modeled something for you during class. What kind of things do you feel you learn from those models?

Rebecca: Um, I think those models are really helpful because I learn more of how it's [the piece being modeled] supposed to sound—and kind of the style. In class, we talk a lot about style—you know—the Baroque style versus the Classical style. And hearing it played—it's kind of helpful. And also, kind of showing bow directions and bow usage. I remember we were playing [a piece from Rebecca's orchestra class] and how my teacher modeled something. Afterwards, the bow directions made more sense to me. How [my teacher] played it, it just clicked.

Although Rebecca did not claim to focus on crucial rhythmic and pitch components, she made an interesting remark regarding how she applied modeling to her own playing. Components such as style are often complex and not easily verbally explained. Even bow direction—which is relatively straightforward and more easily verbally conveyed—can be more efficient when modeled. Hickcox (1991) concurred stating that "observation can be a very efficient learning process. Through modeling, one can learn not only how to perform a behavior, but also what will happen in specific situations if one does perform it" (pp. 99–100). Rebecca suggested that when her teacher demonstrated the bowing for a specific section, it made more sense because the focus on bow direction was subsequently connected to the context of the performance itself. For Rebecca, her learning preference closely aligns with the act of modeling when coupled with time to reflect and make connections regarding how that model applies to a context. Modeling a bow-related task, at least for Rebecca, can be an effective means of conveying several complicated physical and musical tasks all at once. As Hamann and Gillespie noted (2018), "modeling provides for a nonverbal, or at least a limited verbal teaching event, and it is effective and efficient and tends to help keep students on task" (p. 139).

Participants such as Rebecca utilized the tacit complexity of interpreting a modeled activity in order to focus on several aspects of the lesson in an efficient manner. Mayu described this as a fluid process by which she navigated external challenges in response to her own intrinsic depiction of the modeled task. Though she was able to identify her own focus on right hand components of the lesson, she also paired that focus with other aspects of the model.

John: How did you apply the refining process you used into your own playing?

Mayu: So, once I started hearing how quickly [the model] was going, plucking wasn't going to do that. I figured that actually using the bow might make a more effective sound that is the equivalent of what [the model] was doing. So, I just picked it up and I did—like I had the fingers in my head because I was using them—so I just did the same thing. I was mostly listening and every so often I would actually look at [the model's] fingers which helped once I had it up. I also looked at [the model's] bow and synced up with that so that if there was a slur or there was not a slur I could do that more accurately.

Mayu's description of her learning sequence later in the piece—she finally applied the bow sometime during fig. 4—is a dichotomy of how fluid her learning process was in response to the modeled task. Her application of the bow was an effort to match the model's articulations and occurred only after she felt comfortable with the pitches. Rather than focus on specific bowing components, Mayu attended to the musical outcome of the modeled task. Here, she could have mentioned bowing directions or bow distribution—instead she mentioned the slurred outcome of the modeled performance. These large-scale components were not often the principal focus of participants, but learners such as Rebecca and Mayu were able to utilize their attention to the model's bow as a means of integrating technical or musical aspects of the lesson into their own playing.

Focus: Lesson and General. Lesson-specific focal points were often mentioned by participants (4.08%) albeit at a far lower frequency than musical or executive-based tasks. Participants that referenced these focal points were pointing out the usefulness—and their application of—various teaching methodologies during the lesson. These focal points are salient, however, when determining how students respond to learning tasks due to the possibility of variance among certain learning preferences. The abstract conceptualization-based profiles, such as Analyzing and Thinking, tend to value the analysis of both the task and the process of learning (Kolb & Kolb, 2013b). During the interview portion, participants mentioned the usefulness of repetitions (1.81%) as a means of grasping and transforming the lesson material. The act of modeling was also referenced by participants as a means of effective learning (1.59%).

John: Is there anything else you feel stood out to you in this lesson that helped you?

Anaya (11/F/Analyzing): Um, what stood out to me was that [the model] allowed you to play with them or after them. And [the model] always gave me time, too. And there's a difference when you're playing after [the model] and when you're playing with them. Because—when you're playing after them, you're going on what you heard and what you remembered. But, when you're playing with [the model], then you can really know the mistakes you are doing.

John: You're saying that playing with the model is more helpful than playing after them?

Anaya: Playing with the model didn't seem to work for me. It was—probably—more helpful but sometimes it wasn't. Because, when I make a mistake, I need to go figure out on my own what that mistake was—which I couldn't do when [the model] was playing. I'm sure you noticed that when I was playing, sometimes I would just stop. And I was like, "I did something wrong." And when I was on my own, I could figure out what I did *wrong without having to wait.*

Anaya's depiction of her use of the model is emblematic of how—for her—the model's effectiveness was tempered by her own learning preference. Additionally, her awareness of this fact allowed her to make real-time decisions based on her reaction to the learning context. Although focal points that included lesson execution components were the least frequently referenced, participants such as Anaya indicated that some learners might be interpreting and deviating from a model's intent simply based on their own learning needs and preferences.

Comparing Students' Response to the Model

Participants in this study included all four high school grade levels as well as seven of the nine learning profiles included in Kolb's (2013b; 1984) Learning Style Inventory. These variables—in addition to gender—potentially provide context to the different ways in which participants utilized the model. An exploration of the diversity or alignment among participants' responses might provide some clarity in the manner in which learners differ in their interpretations of a single experience. Kolb (1984) explained the possibility of such variability among learners via an investigation into individuality. "Rather, it appears that the physiological structures that govern learning allow for the emergence of unique individual adaptive processes [learning preferences] that tend to emphasize some adaptive orientations over others" (p. 62). The individuality inherent to such adaptive processes originated from an evolutionary framework. Kolb's epistemological reference to learners' evolutionary perspectives was grounded in socially-based components of interacting with various contexts. More specifically, the manner in which learners interact with their environment leads to greater specialization and preference for particular approaches. These interactions naturally vary in their cognitive complexity and suggests that a single experience, such as a modeled violin lesson, might be grasped and transformed by learners in different ways.

Approach. The most obvious variation among participants in response to the model was the applied approach throughout the lesson. The nature of the modeled lesson most likely limited the range of student approaches. Regardless, I divided participants' approaches into three categories—concurrency, tone generation, and instrument location. Concurrency refers to how participants interacted—or did not interact—with a modeled instance. Concurrency correlates with grasping or Concrete Experience (CE) phase of Kolb's (1984) ELT cycle. Tone generation referred to the manner with which participants produced sound on their instrument throughout the lesson. When participants manifested an aural response to the model—either concurrently or non-concurrently—they were executing activities that correlate to the transforming, Active Experimentation (AE) ELT phase. Instrument location indicates that a participant changed their performance position at a specific point in the lesson—these included rest, guitar, and playing position.

Throughout the lesson, participants made decisions in the moment designed to achieve the task of learning the model's melody. When the model was performing the piece, participants most frequently either concurrently performed along with the model or sat and listened. During each lesson, the model performed for the participant 26 times. Among the participants (n = 15), there were 390 opportunities to perform concurrently with the model rather than listen and reflect. Participants chose to perform concurrently with the model 226 times (57.95%). Though there was a slight preference for participants to perform simultaneously with the model, participants chose to abstain from performing slightly less than half the time. Interestingly, a third option emerged in contrast to the dichotomous concurrent or abstain performance options. During a small number of instances (2.56%), several participants performed previous lesson material while ignoring the model—e.g., Xavier continued to refine his fig. 1 performance rather than listen to the model introduce fig. 2.

Participants' mostly relatively dichotomous approaches to the lesson's task is indicative of how even a simple, straightforward modeling instance can yield two disparate responses. Furthermore, participants that apply either approach might simultaneously arrive at a similar outcome. Table 16—and all subsequent side-by-side qualitative depictions—compare two participants' responses during the same point in the lesson. Below, Anaya's and Thea's learning preferences share two adjacent ELT phases—RO and AC. On this, and all other side-by-side comparisons of student responses, I will italicize participants' specific parallel behaviors to facilitate analysis.

Table 16

Side-by-side Response of Anaya and Thea to Fig. 1

Anaya (11/F/Analyzing)	Thea (9/F/Thinking)
Anaya has been taking the instructions for the lesson tasks very seriously. She hasn't asked any questions and is very deadpan in her response to the general instructions and prompts. *During the model's initial performance, Anaya sits in rest position holding her bow and listens.* Afterwards, Anaya smiles a bit, plucks a single string to test out an internal theory regarding her interpretation of the performance but otherwise remains passive.	Thea has seemed optimistic in response to the instructions of the lesson's tasks. Indeed, though she didn't ask any questions, she seemed to have a clear image of the sequence and directions. *In response to the model's initial performance of the entire piece, Thea gets into playing position. Rather than playing, however, she just listens.* During the subsequent pause, Thea remains quiet but ready.
"I will now play the first fig.," states the teacher. *In response, Anaya remains in rest position and simply listens. Once the model is completed, she pauses a moment, gets her instrument into playing position, and immediately performs fig. 1* with the correct pitches and rhythms plus several correct bowings—though the slur is broken in measure 2.	"I will now play the first fig.," states the teacher. *Thea joins the model and performs fig. 1 with her bow. She immediately follows this concurrent performance with her own trial*—she successfully executes the correct rhythms, pitches, and even matches the model's vibrato speed. After this performance, Thea seems eager to continue but simply waits for the next model.
"The first fig. again," continues the teacher as Anaya returns to rest position. *Anaya reprises her previous listening strategy and makes no effort to produce a concurrent performance.* After the teacher concludes the modeled performance, Anaya returns to playing position and executes her own performance of fig. 1 with relative ease—it seems that Anaya is consolidating her transformation of the modeled skill into a more efficient performance even at this early stage of learning.	"The first fig. again," continues the teacher. *Once again, Thea performs concurrently with the model—though it is difficult to discern her accuracy against the model's own performance.* During the personal practice instance, Thea repeats her previous success—this time with increased bow speed. This additional refinement seems to be directed at incorporating her own personal musicality and decisions into her internal concept of the model's performance.

The teacher declares, "One more time." *Once again, Anaya listens. She then repeats her earlier approach and performs only when the model concludes their performance.* This time, Anaya's performance includes some vibrato on the final note—she is integrating her interpretation of the model with her own musical interpretation.	The teacher declares, "One more time." *This instance, Thea does not perform concurrently. Instead, she leans forward in order to better reflect and transform her internal conceptualization of the model's performance.* Once the model concludes their performance, Thea executes a performance similar to her previous externalizations—her rhythm and pitch are excellent, though her bow direction is not identical to the model's. Instead, she seems focused on her own applications of bow speed and distribution.

In the above comparison, Anaya and Thea have similar learning preferences yet widely differ in their approach to the content material. Regardless of their disparate approaches, they both arrived at an outcome that produced accurate rhythms and pitches with several bow direction errors. For both participants, individual strategies and responses to the model were less consequential than the process of learning—which yielded similar results in the above example despite disparate avenues of pursuit.

Other participants showed identical approaches yet widely varied outcomes. In Table 17, Maya (9th Grade/Female/Imagining) and Thelma (9th Grade/Female/Thinking) utilized almost identical approaches to the modeled instruction of fig. 3 but do so in profoundly different ways.

Table 17

Side-by-side Response of Thelma and Maya to Fig. 3

Thelma (9/F/Thinking)	Maya (9/F/Imagining)
Thelma has been doing well during the model's presentation of the first two figs. Although she remains jovial, she is vocal about her own progress and quite critical of herself.	Maya has had mixed results throughout the lesson. She is frequently unable to complete her own learning process as she is interrupted by the model. Despite this, Maya is able to make progress with regard to several portions of the lesson material.
"Now let's take a look at the third fig.," says the model. "Oh no! Ok!" laughs Thelma. Despite her relative success in figs. 1 and 2, she expresses humor as a means of deflecting her own self-doubt. *As the teacher demonstrates fig. 3, Thelma sits in rest position, listens, and reflects in much the same manner that enabled her to be successful in previous portions of the lesson. Once the model is finished, Thelma quietly sings the first portion of fig. 3 to herself while getting into playing position*. She begins playing but accidentally executes fig. 2. She stops almost immediately and realizes that her performance does not remotely match her own internal concept of the model.	"Now let's take a look at the third fig.," says the model. *Maya just listens and reflects in response. Her reflective processes must have identified the inherent challenge of fig. 3 and urgency required in order to make progress. She immediately makes two attempts at determining the opening pitch of fig. 3 and settles on the correct note.* However, rather than performing the subsequent ascending pitches leading into measure 5, Maya skips right to the repeated 'A's in measure 5 but stops before the 16^{th} note gestures. She makes a motion to continue but is interrupted by the teacher—a common experience throughout the lesson for Maya.
'I'll play the third fig. again," intones the model. *Thelma listens once again. During the ensuing personal practice time, Thelma remains closer to the target—she correctly performs the starting seven pitches of fig. 3 before making an attempt at the 16^{th} note descending gesture.*	"I'll play the third fig. again," intones the teacher. *Maya repeats her previous reflective approach and listens. Now that her internal concept of the fig. is more refined and complete, Maya incorporates more of the ascending 8^{th} note pattern leading into measure five.* Though she accidentally misses a pitch—she only plays a two-note pickup—she continues onwards to the repeated high

"No!" Thelma exclaims—laughing at her own trial.	'A' that served as an anchor in the previous instance. She does not attempt the 16th note gestures but it able to make progress refining both her internal model and her ability to externalize a more accurate performance.
"And again," continues the teacher. *Thelma utilizes a novel approach this time by performing concurrently with the model for the opening seven notes.* She drops out when the model reaches the 16th note gestures—then she just listens. Immediately afterwards, she shifts her focus towards those 16th note gestures—seemingly satisfied with her internal concept and external manifestation of the opening portion of fig. 3. Thelma focuses on identifying the opening pitch of each of the 16th note gestures through a quick trial and error strategy. She succeeds in getting both starting pitches of the 16th note groups as well as rough outline of the descending and ascending gestures. "Ok. Something like that?" Thelma declares as she expresses her own uncertainty.	"And again," continues the teacher. *Maya, once again, approaches this modeled instance by listening and reflecting*—a strategy with which she is becoming increasingly adept. Once the model concludes their performance, Maya performs the pickups—repeating her previous mistake leading into measure 5—but immediately stops. She starts over immediately without any quiet reflection period and correctly executes all three pickups into measure 5. She continues through measure 5 and finally attempts the 16th note gestures by making an attempt at the rough rhythmic and melodic contour of measure 6. Before she can refine that attempt, she is—once again—interrupted by the model.

This comparison is an example of how two participants' approaches might align superficially but diverge according to how the learners utilize components such as reflective processing, abstract comprehension, and external transformation. Thelma's ability to reflect, conceptualize, and execute in response to the model differed from Maya's proficiency at the same task. Despite their similar approaches, Maya and Thelma displayed conflicting abilities to successfully grasp and transform the model's performance due to subtle variances in their approach complexity.

Although the above examples represent relatively straightforward depictions of how participants compare in their approach to a modeled task, aggregated participant data is less clear. When viewing non-redundant, linear instances—those instances that did not review previous material—participants still preferred an active, concurrent approach (45.67%) to a reflective, listening-based approach (43%) by a slim margin. Table 18 and Figure 7 show the approaches used by participants throughout the course of the lesson.

Table 18

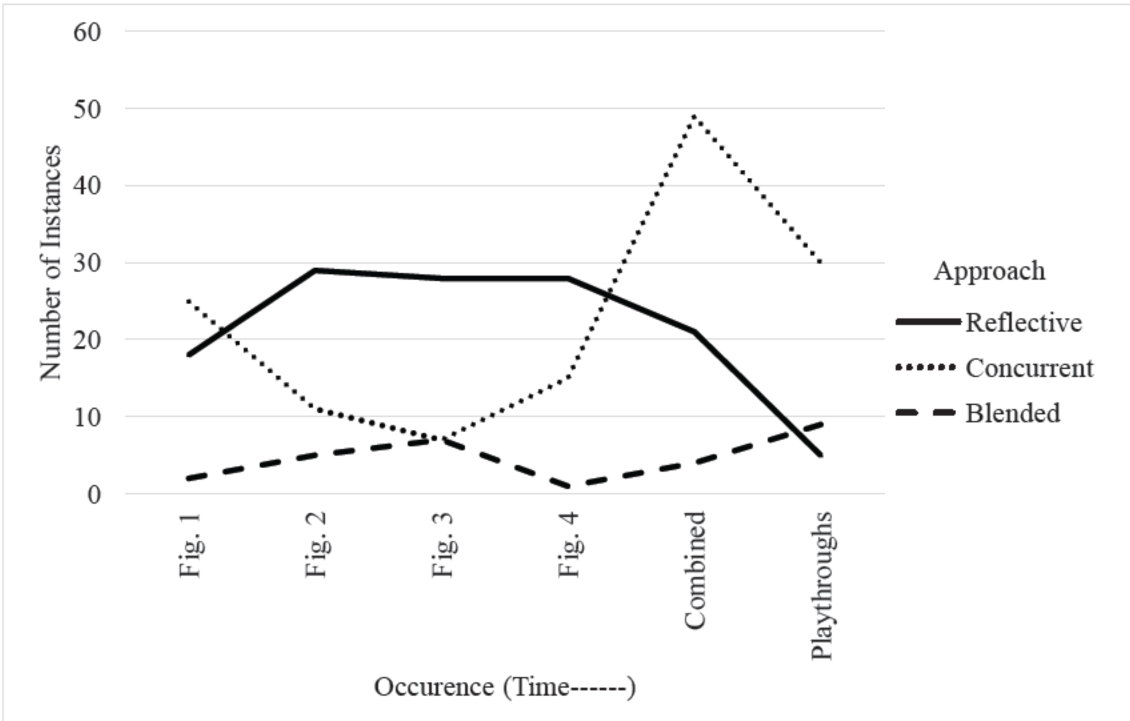
Frequency Distribution of Approach Type

	Reflective Approach	Concurrent Approach	Blended Approach	Other*
Fig. 1	18	25	2	0
Fig. 2	29	11	5	0
Fig. 3	28	7	7	3
Fig. 4	28	15	1	1
Combined	21	49	4	2
Playthroughs	5	30	9	0
Total	129	137	28	6
Relative Frequency	43%	45.67%	9.33%	2.00%

*The Other category includes the following approaches: Off-topic talking, continued or overlapping personal practice time (with no attempt to engage with the modeled performance), or a modified shadowbow activity that did not relate to the current model.

Figure 7

Relative Frequency of Approach Type Throughout Duration of the Lesson



Participants applied concurrent approaches less frequently during the challenging material of fig. 3—they listened and reflected more often. During fig. 3, participants seemed slightly more inclined to utilize more complex blended approaches instead Alternatively, participants steadily decreased their dependence on reflective analysis following the modeled fig. 2. Finally, both concurrent and reflecting approaches decreased when learners neared the end of the lesson and began working on holistic performances of the combined figs. More complex, blended approaches showed a slight increase in frequency at that point as well as in response to the challenges inherent to fig. 3. Table 19 represents a more detailed, instance-by-instance view of how frequently the approaches were applied by participants while Figure 8 is a display of the trendlines of those approaches at a polynomial order of three. Viewed holistically, although participants in the study applied concurrent and reflective approaches in mostly equal measure, those approaches are highly contextual based on the needs of the learner, lesson tasks, and ability to apply increasingly complex aspects of the ELT learning cycle. The labels on the far-left side of the table indicate in which modeled instance the approach was used—e.g., M: 1.3 indicates when the model performed fig. 1 for the third time; M: 3/4.2 indicates when the model performed figs. 3 and 4 for the second time, etc.

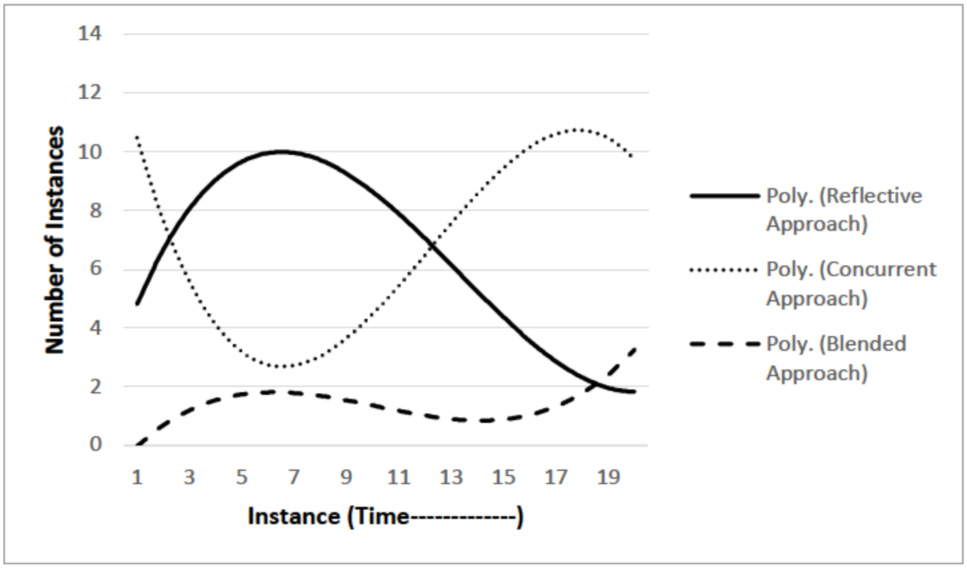
Table 19

Frequency Distribution of Approach Type by Instance

	Reflective Approach	Concurrent Approach	Blended Approach	Other
M: 1.1	6	8	1	0
M: 1.2	5	9	1	0
M: 1.3	7	8	0	0
Total Fig. 1	18	25	2	0
M: 2.1	13	2	0	0
M: 2.2	6	9	0	0
M: 2.3	10	0	5	0
Total Fig. 2	29	11	5	0
M: 3.1	12	1	1	1
M: 3.2	8	3	2	2
M: 3.3	8	3	4	0
Total Fig. 3	28	7	7	3
M: 4.1	13	1	0	1
M: 4.2	5	9	1	0
M: 4.3	10	5	0	0
Total Fig. 4	28	15	1	1
M: 3/4.1	4	9	2	0
M: 3/4.2	5	8	1	1
M: 3/4.3	4	10	1	0
M: 1/2.2	3	12	0	0
M: 3/4.4	5	10	0	0
Combined	21	49	4	1
M: PT.1	2	9	3	0
M: PT.2	0	12	3	0
M: PT.3	3	9	3	0
Playthrough	5	30	9	0

Figure 8

Frequency Distribution of Approach Type by Instance with Trendlines



Application. When actively experimenting and manifesting a performance, participants were allowed to freely choose their method of externalization. Of the 780 total instances among all participants (*n* = 15) in the study, responses included arco, listening, pizzicato, shadowbowing, and miscellaneous applications. Table 20 represents the distribution and relative frequency with which participants applied their externalizations.

Table 20

Frequency Distribution and Relative Frequency of Application Methodology

Application	Frequency	%
Shadowbow	30	3.85
Modified Shadowbow	7	0.90
Arco	380	48.72
Pizzicato	108	13.85
Listening/Null[a]	202	25.89
Miscellaneous*	53	6.79
Total	780	100

Note. [a]The Listening/Null application is higher here than in previous tables because it includes all instances and not just modeled or personal practice time.

*Miscellaneous refers to the following applications: Rest position (but still manipulating left hand fingers), Guitar position (not quite plucking but still manipulating left hand fingers), and a position where the bridge and strings of the instrument is facing the participant when they watch their own left hand.

The most frequently applied performance method was, unsurprisingly, with the bow (48.72%). Participants that performed this way were most likely drawing a direct parallel to the manner in which the teacher modeled the various figures. Kolb (1984) clarified the direct connection between the experience and how students process that experience stating that "learning, the creation of knowledge and meaning, occurs through the active extension and grounding of ideas [and] experience in the external world and through internal reflection about the attributes of these experiences and ideas" (p. 52). As the learners in this study observed the model performing with the bow, the most direct process of internalizing and extending the modeled performance utilized the bow. Any other applied performance method used by participants deviates from their perceived transformational internalization—though alternative application methods most likely served specific pedagogical needs of those learners. Regardless, participants—such as Indigo (12th Grade/Female/Initiating)—demonstrated a common sequence of arco application near the end of the lesson.

Indigo and teacher are nearing the end of the lesson. Indigo has recently struggled with the 16th note gestures but remains unrelenting in her responses to the tasks. She sits in playing position with the bow near the string, ready to continue her work.

The teacher starts, "Now the entire piece." Indigo sets her bow to the string and performs the entire piece along with the model. Once the teacher's performance is concluded, Indigo focuses on the first half of the piece. She performs figs. 1 and 2 again—Indigo's focus is on refining her intonation through careful performance as evidenced by the frequent adjustments of her left-hand fingers. The model indicates a second playthrough of all four figs. Indigo joins in again. She repeats her previous strategy on figs. 1 and 2 again while continuing to focus on intonation. She performs haltingly as she constantly compares her own performance with her internal concept of the model. Indigo holds certain notes out longer than needed in order to hear them and adjust her intonation accordingly.

"One more time," says the teacher. Once again, Indigo performs the entire piece with the model. Immediately afterwards, Indigo isolates the 16th note gestures in fig. 3 and loops them several times. Now that the teacher seems to be wrapping up the lesson,

Indigo's focus has shifted from her intonation on the first half of the piece to the 16th note gestures she had struggled with in previous instances. During this relatively frantic practice session, Indigo seems to be attempting to consolidate the gestures into more cohesive musical groupings in order to make them easier to recall or perform.

Indigo's application of the bow in the example above is representative of many of the participants in this study. Specifically, her application of the bow—as opposed to shadowbow, pizzicato, or some other performance methodology—allowed Indigo to more clearly imitate and mirror the model's gestures. Furthermore, her strategy of intonation refinement in the first two instances was only possible because she was able to sustain some pitches in order to hear them and reflect. Other participants were able to utilize bowed performances in other ways.

Because participants' use of the bow was so ubiquitous throughout the lesson, there was naturally a great deal of variation in its' specific use throughout the lesson. This was true despite any similarity or alignment of variables such as gender, grade level, or even learning preference. In Table 21, Mayu (CE/RO) and Rebecca (CE/RO/AC) differ in their use of the bow.

Table 21

Side-by-side Response of Mayu and Rebecca to a Playthrough Near the End of the Lesson

Mayu (10/F/Imagining)	Rebecca (10/F/Reflecting)
Now near the end of the lesson, Mayu has been a diligent learner. *Specifically, she remains hyper-focused on the 16th note gestures in fig. 3.* Most other participants moved on to other areas of concern—Mayu has isolated the 16th note gestures several times in an attempt to master the descending and ascending patterns.	Rebecca has adapted her strategies to the individual tasks throughout her time with the teacher and made steady progress. Now near the end of the lesson, *Rebecca has been focused on bowed aspects of her performance—bow direction, placement, and distribution.*
"Now the entire piece," says the teacher. *Mayu sets her bow to the strings and performs the entire piece along with the model. After the teacher is finished, Mayu returns to her work on fig. 3 and makes several more attempts at the 16th note gestures using a previous strategy*—high frequency repetitions of the isolated 16th note gestures while experimenting with the start and ending not of each descending and ascending pattern.	"Now the entire the piece," says the teacher. *Rebecca performs along with the modeled performance of the entire piece. It appears that she her attention is trained on the tip of her own bow throughout the performance.* Although her specific focus is unclear, based on her previous practice sequences, she seems to be attempting to match her own bow distribution and length to the model's. As the model concludes, Rebecca performs fig. 1 while staring at her own bow.
The teacher continues, "And again." *Mayu bows the entire piece again with the model. This time, something about the concurrent performance allowed Mayu to make a revelation regarding the 16th note gestures. She once again ignores figs. 1, 2, and 4 in order to make repeated attempts at fig. 3.* For each performance, Mayu makes an extremely minor change in her playing in a methodical approach to refining her understanding of the 16th note gestures in fig. 3.	The teacher continues, "And again." *Rebecca performs along with the model again—but she does not watch her own bow this time. Instead, she seems interested in comparing her own sound to the model's. She closes her eyes at times and seems to be actively alternating between reflecting on her own performance and that of the model.* Once the teacher is finished, Rebecca waits a moment—perhaps intent on shaping her internal concept of the performance. She then restarts fig. 1 and experiments with her bow directions.

"One more time," says the teacher as *Mayu concurrently performs the entire piece with the model. If Mayu recognizes that the lesson is nearing an end, she makes no indication of panic or stress. Instead, she remains focused on the isolating the 16th note gestures with her bow*—it is difficult to tell if she is making significant progress.	"One more time," says the teacher. *Rebecca performs concurrently along with the model again. This time, she leans forward a bit and carefully watches the recorded model the entire time. She then sits back a bit, smiles, and seems satisfied with her current extension of the piece.* Rebecca waits almost the entire time but seems to change her mind. She starts to play fig. 1 but is interrupted by the fourth and final check-up.

The above comparison represents how two learners might apply the bow in different manners in response to a single modeled task—in this case, the final playthroughs of the piece. For Mayu, the bow was integral when attempting to match her own performance of the 16th note gestures to the model. It allowed her to compare her bowed technique to the model and make small and consistent progress towards matching her internal concept of that task with her external performance. During the same portion of the lesson, Rebecca was far more concerned with her bow direction and distribution. Despite identical lesson points and modeling scenarios, these learners arrived at different approaches to the same bowed application. In this scenario, the learners' cognitive complexity was less influential than the appropriateness of their respective approaches. Rather, Mayu and Rebecca were able to select and apply approaches that matched their individual goals and learning style in order to create a positive learning outcome.

Alternatively, participants occasionally utilized pizzicato (13.85%) to focus on pitch-based musical components apart from rhythm. Pizzicato is often utilized by string teachers as a means of isolating left hand or musical issues absent the relative complexities of the bow hand (Hamann & Gillespie, 2018). Particularly for beginners, instructors frequently focus on technical components such as posture, instrument positioning, and left-hand shape using pizzicato as a means of producing fundamental musical performances. Several students utilized pizzicato at various stages of the modeled lesson despite several articulations—such as the slurs in fig. 3—preventing effective pizzicato performance. Xavier (11th Grade/Male/Experiencing), for example, applied a pizzicato approach at the onset of the lesson.

As the teacher begins the very first performance of the entire piece, Xavier stands holding his violin like a guitar. He occasionally plucks notes throughout the performance—most likely to determine various anchor points such as the starting or ending pitches. He doesn't seem intimidated by the overall difficulty level. After the initial play through is complete, Xavier gets into playing position slowly. It seems that he is either processing what he just heard or developing his strategic approach. Just as he is about to make a performance attempt, he is interrupted.

"I will now play the first fig.," interjects the teacher. As the teacher models the opening two measures of the piece, Xavier looks away from the recording and lightly bobs his head. When the model finishes the first isolation of fig. 1, Xavier continues to bob his head. It is becoming clearer that he is developing his internal concept of the performance. Once the model moves on to the second play through of fig. 1, Xavier maintains his stoic, silent approach. Only when the teacher moves on to the third and final performance of fig. 1 does Xavier finally make a performance attempt.

"One more time," says the teacher before performing fig. 1 a final time. Xavier, now in playing position but without his bow, looks up at the recording and quietly

pizzicatos along with the model. When the model finishes, Xavier continues to quietly pluck almost incessantly. His focus now is clearly on retention. He makes no changes in each run through of fig. 1 and does not stop between performances. This high intensity pizzicato continues as the teacher moves on.

"I will now play the second fig.," states the teacher, now moving on from fig. 1. Xavier will not be dissuaded, though. As the teacher models fig. 2, Xavier continually plucks fig. 1. Once the model is completed, Xavier moves on. During his performance time, he makes several attempts at fig. 2—though his performance is so quiet and rapid that his accuracy cannot be discerned.

The teacher continues with the lesson, "The second fig. again." Xavier now plucks along with the model in a clearer manner. It seems his rapid pizzicato strategy has paid off—he is much more accurate at determining the melodic outline of fig. 2. As the model concludes, Xavier is much more confident. He maintains his incessant pace yet plucks with more volume and intensity—repeating his previous approach towards retention he developed working on fig. 1.

In the above example, Xavier began plucking and simply did not stop. His pizzicato-based learning sequence continued for the next several performance instances. Xavier only picked up the bow when the model moved on to combine figs. 1 and 2. Additionally—and despite his early success—Xavier does not return to this pizzicato strategy later in the lesson. He, like many other participants, picked up the bow and never returned to pizzicato-based approaches.

However, Xavier's application of pizzicato early in the lesson allowed him to develop a strategic approach as the lesson unfolded.

John: Describe how your performance became more refined throughout the video.

Xavier: I mean—I think in the beginning—I was just kind of guessing, like, where to go. I knew the start and the ending, but I didn't know anything else. I think as [the model] played it more and more, I got to fill in the blanks. And I guess as it went on, I could understand it more and more.

Xavier's rapid pizzicato approach provided him the flexibility and frequency of repetitions needed to eventually work out—and eventually memorize or otherwise retain—the rhythm and pitches of figs. 1 and 2. Furthermore, Xavier was somehow able to work on retaining fig. 1 in addition to starting to develop an internal concept of fig. 2 at the same time. Notably, he was able to hear and reflect upon one modeled performance and simultaneously manifested and externalized his internal concept of another performance. As this opening sequence of instruction unfolded, Xavier utilized pizzicato as a straightforward means to develop both a strategic approach and method of task acquisition.

Indira (9^{th} Grade/Female/Initiating) found similar success using pizzicato in the early stages of the lesson. During the model's instruction of fig. 1, she mirrored Xavier's incessant pizzicato approach with similar success. Indeed, Indira confirmed her approach during the interview.

John: I'd like to focus on how you started to learn the song from the video. When the teacher did start playing, what was the first thing you focused on so you could learn the song?

Indira: Trying to hear what notes [the model] was playing.

John: So, like the actual pitches?

Indira: Yeah.

John: Did you start with the first note and then kinda…like what happened after you figured out the first note?

Indira: So, I figured out the first note and then I tried to figure out how high or low [the model] was going with the notes. And then, when I figured out it [the model] was going higher or lower, that's when I figured out what fingers I needed to use.

John: So, you figured out the contour of the melody and then kind of filled in the gaps?

Indira: Right.

Indira's focus—at least initially—was to make continual pizzicato attempts in order to make closer and closer approximations of the fig. as compared to either her own internal concept or the external model. However, Indira deviated from Xavier at an earlier stage.

Immediately after the model performs fig. 1 for a final time, Indira gets into playing position with the bow at the ready. It appears that Indira required one last informal, pizzicato check of the pitches and rhythms before committing to the bow. Before moving on to fig. 2, she make a quick attempt at fig. 1 using the bow but applies the wrong key signature—a mistake she was unable to discern previously using her pizzicato approach. She quickly hears the mistake and stops bowing.

Before Indira can make another bowed attempt, the teacher moves on saying, "I will now play the second fig." During this modeled performance, Indira returns to rest *position and just listens. Once the model finishes, Indira gets back into playing position and makes several very quiet attempts to determine the starting pitch of fig. 2. She is not successful and seems frustrated. The confidence she had accumulated in fig. 1 quickly dissipates and she returns to rest position to regroup and formulate a new strategy.*

"The second fig. again," continues the teacher as Indira sets her bow down. Rather than create and apply a novel strategic approach to fig. 2, Indira reverts back to her initial, rapid pizzicato strategy. She pizzicatos concurrently with the model and resumes her unremitting plucking response as a means to determining pitches and rhythms.

Indira's frustration—and subsequent strategic regression—is unique among other participants. Specifically, when she applied the bow for fig. 2, she was unable to discern the opening pitch and apply a strategy similar to her approach during fig. 1. It is unclear what about the bow prevented Indira from acquiring the initial pitch of fig. 2. More clear, however, is that pizzicato provided Indira a higher intensity approach increasingly congruent with her Initiating learning style. "The greatest strength of this orientation [Initiating] lies in doing things, in carrying out plans and tasks, and getting involved in new experiences. The adaptive emphasis of this orientation is on opportunity seeking, risk taking, and action" (Kolb, 1984, p. 78). Xavier's learning orientation—Experiencing—shares a similar AE/CE orientation that suggests a greater comfort level with trial-and-error strategies, less reflection, and greater importance on externalizing than internalizing.

Pizzicato strategies were prevalent, however, among a mixture of participants with varying learning orientations. For example, Balah (11th Grade/Female/Balancing) utilized pizzicato as the primary vehicle to interact with the lesson material. In fact, with the exception of the second check-up, Balah applied pizzicato throughout the lesson until the final three performance instances. During the interview, she indicated her preference of pizzicato was due to her comfort level with the approach.

John: I'd like to focus on how you started to learn the song from the video. When the teacher did start playing, what was the first thing you focused on so you could learn the lesson?

Balah: Uh…I do the pizzicato when I'm teaching myself. Just a little bit down here [Balah indicates guitar position] to make sure the pitches are right.

John: So, you were matching pitches using pizzicato? How do you think you incorporated that into your playing?

Balah: Um…then I would pick it up and play it quietly with my bow to make sure I was getting it right—the right notes. It feels different down here [in guitar position] than up here [in playing position].

For Balah, pizzicato was a strategy she had previously applied in previous tasks and was able to transfer the strategy to this lesson. She deliberately applied it to the lesson's tasks because it was a component of a sequence of strategies she was comfortable with. However, Balah seemed to have overestimated the amount of time she spent applying the bow during the lesson. Instead, she was able to efficiently cycle through a short list of eight strategies according to her personal learning needs despite performing pizzicato throughout the course of the lesson.

Although pizzicato was used among participants with varying degrees of dependence, its usefulness should not be underestimated. Theta (10^{th} Grade/Female/Thinking) summed up her application of pizzicato in response to the modeled performance stating:

Theta: I first looked at [the model's] fingers, then I played it pizzicato to see if I could get the notes under my fingers before I played with the bow.

John: So that was how you incorporated parts of the song into your playing?

Theta: Yeah.

John: So, you learned the notes first and then kind of worked the rhythm and all that other stuff as it came?

Theta: Yeah.

John: Ok, at what point did you make the decision to pick up your bow?

Theta: Um…after I had gotten the first phrase. After I had gotten those notes—I decided to play.

John: Did you ever feel like you wanted to put the bow back down?

Theta: Yeah—there were a few other times that I plucked to figure some things out.

Theta's preferred learning sequence was to use visual observations in order to construct internal abstractions. She then used pizzicato as an easy and efficient means of experimenting in order to match her concept of the model's performance. Theta only moved to the bow when she felt she had grasped the fundamental musical components of rhythm and pitch and occasionally considered reverting back to that previous learning sequence—most likely to tackle more difficult components of the lesson.

Compared to arco, participants applied pizzicato as a performance methodology far less. For most participants, pizzicato did not serve as the principal means of transformation via extension in response to the model. Instead, learners—such as the above participants—utilized pizzicato as a way to tackle unique challenges, perform concurrently while still hearing the model, or simply as a means of simplifying the lesson's task down to its most basic elements. Pizzicato did not indicate a decrease in approach complexity but rather a shift in learner needs. The above examples indicate the varied approaches that learners might use pizzicato as a means of overcoming individual challenges without sacrificing cognitive complexity.

In addition to the bow and pizzicato, some participants shadowbowed (3.85%) in response to the model. For participants that applied shadowbow in their lessons, their intention was similar to when participants applied pizzicato.

Xavier (11th Grade/Male/Experiencing) has been using an array of strategies and approaches in response to the modeled tasks. Although he has mostly applied the bow, he has utilized pizzicato and listening applications as a means of overcoming challenging portions of the lesson. The most consistent factor of Xavier's learning has been his constant focus on evolving his personal approaches and applications during this lesson.

"The last fig. is up next," says the teacher. Xavier listens to the model—a strategy he has previously applied as a means of reflecting on the task. During the ensuing personal practice time, Xavier makes three very quiet and quick rapid attempts at fig. 4. This trial-and-error effort is rewarded on the third attempt. However, Xavier's solution is

unorthodox—he has decided to shift up to third position for the final three notes.

The teacher continues, "I'll play it again." This time, Xavier shadowbows along with the model while leaning forward to watch the model more intently. He doesn't pay much attention to his own attempt, however—he is mostly in the upper bow and seems to simply be confirming the rhythm while trying to glean or confirm some other component of the lesson. Once the teacher has finished performing, Xavier makes a single, quiet attempt at fig. 4 including his previously executed shift. He nods confidently and his own playing, sits back, and waits for the next modeled performance.

At this point in the lesson, Xavier was not alone shadowbowing. Three other participants—Thelma (9^{th} Grade/Female/Thinking), Anaya (11^{th} Grade/Female/Analyzing), and Anissa (11^{th} Grade/Female/Analyzing)—also shadowbowed after the second modeling instance of fig. 4. Throughout the lesson, shadowbowing was infrequently applied by participants except as a means of checking very specific musical components—such as rhythm, bow direction, or bow distribution—while still transforming either the external model or their internal model via silent extension. The above example demonstrates a subtly varied application of shadowbowing as a means of meeting Xavier's learning needs. Indeed, although shadowbow was applied less frequently than pizzicato, learners—such as Xavier—utilized these approaches as an alternative means of grasping and transforming the challenges inherent to the modeled tasks. Although pizzicato and shadowbowing might seem less conventional—and even tangential—to the modeled lesson material, the above learners display how diversity intersects with utility despite a singular modeled experience.

Direct Comparisons Among Participants

The above application and approach analyses depict how participants fundamentally aligned or diverged in their response to the model. Viewed individually, however, these results present overly simplified, often dichotomous portrayals of how learners might react to a model. Instead, Kolb's (1984) ELT provides a framework to view and compare learner processes and responses on a more holistic scale. Participants' learning preferences, genders, and grade levels function as variables to compare diversity regarding how learners transform or grasp modeled experiences. A direct comparison of these grasping and transforming dimensions among participants' responses throughout the lesson yielded a clearer picture of how cognitive complexity varies according to individual learning needs.

Diversity Among Initial Strategies. At the beginning of the lesson—after I provided general instructions and guidelines to each participant—the videotaped model explained how the sequence of instruction would proceed. The model described their specific task—to learn the piece entirely by ear—and that a pause of eight seconds would follow each modeled performance. Immediately following those instructions, the model performed the entire piece for the participant before breaking it down into four smaller chunks. For the majority of participants (n = 12), this initial play through functioned as a framework to develop strategic responses—they listened, reflected, and began working on how they would respond. However, three participants—Rebecca (Reflecting), Xavier (Experiencing), and Mia (Imagining)—deviated from that majority by attempting a concurrent performance with the model that they had not previously heard. Specifically, they immediately began to perform with the model at the onset of the lesson.

Kolb's (1984) ELT framework suggests that these three learners' preferences might provide a deeper explanation into this unusual decision. Although Rebecca, Xavier, and Mia each exhibited three different learning preferences, each of those preferences overlapped the CE/RO quadrant. Kolb posited that this quadrant represents Divergent learning preferences whose learners specialize in viewing a single experience from multiple perspectives and consolidating those viewpoints into cohesive ideas. For these participants in this initial learning context, their incorporation of the Divergent learning quadrant is noteworthy due to the speed with which those specific learning might process immediate experiential lesson information. Essentially, their learning preference indicates that they chose to perform concurrently because they might be able to generate strategies and solutions in real time alongside with the model's performance—or at least in rapid, almost immediate, succession. In doing so, each participant was streamlining the grasping and comprehension process—most likely based on previous learning experiences.

This strategy was not a smooth process, however. Rebecca and Xavier each chose to pizzicato concurrently with the initial modeled performance—most likely as a method to better hear the model in addition to their own active experimentation process. Alternatively, Mia chose to perform arco. Regardless of their initial application methodology, each of these participants followed the initial modeled performance with a RO-Null instance. Indeed, all but one of the other participants who exhibited a learning preference sharing the Divergent quadrant also employed a RO-Null strategy following the initial performance. Following the initial performance, those divergent occupying learners might have required some extra time in order to consolidate or reflect upon either their performance or subsequent strategies needed to address the task.

Temporal Comparisons Among Similar Learning Preferences. A comparison among participant responses who share a learning preference orientation revealed mixed results. Specific variables—such as strategies, approaches, intensity, application methodologies, etc.—aligned intermittently among participants with the same learning preference. In the current study, four learning profiles were shared among multiple participants.

Indira and Indigo each exhibited the Initiating (AE/CE) learning preference. Kolb (1984) posited that learners with this profile prefer to participate and execute plans rather than create abstract models. Kolb paired these learners with "opportunity seeking, risk taking, and action… [these learners are] best suited for those situations where one must adapt oneself to changing circumstances" (p. 78). Their grade level variables were incongruent—Indira was a 9th grader and Indigo was a 12th grader.

At the onset of the lesson, Indigo and Indira displayed wildly varied responses to the model. Specifically, their strategies differed in intensity, application, and applied strategy in the first seven performance instances following the model's initial performance of the piece. Both participants—regardless of their differing responses to the model in the opening quarter of the lesson—were relentless in their pursuit of the task at hand. With only one exception immediately following the initial playthrough, both participants consistently performed concurrently with the model as well as fully utilized their personal practice time between modeled performances.

More similarities begin to emerge in response to the model's performance of fig. 2. Both participants begin to adjust or evolve their strategies as a result of fig. 2's novel challenges. Throughout the next several instances, both participants—particularly Indira—shifted their response to the modeled fig. 2.

"I will now play the second fig.," states the teacher. Indira—similar to most other participants—elects to simply listen and reflect to this performance of the novel task. In the subsequent personal practice time, Indira gets into playing position and makes several very quiet attempts to determine the starting pitch of fig. 2. Despite using the same strategies, applications, and intensities as her response to fig. 1, she is not successful. She seems frustrated and quickly returns to rest position and puts down the bow.

The teacher continues, "The second fig. again." Indira makes a subtle shift in her application methodology by plucking along with the model rather than bowing. After her concurrent performance with the model, Indira seems to go into overdrive. She makes an incredible amount of rapid attempts in order to acquire the opening pitch of fig. 2 before she forgets or loses her internal reference. In addition to this radical shift in intensity, strategy, and application, Indira also turns the instrument towards her own body to stare at her own left hand on the fingerboard—perhaps in order to better process and transform her own performance into an abstract conceptualization of the task.

"And one more time," says the teacher. Indira maintains her previous pizzicato application and makes wiggling motions with her left hand on the instrument neck. It is unclear her intent with these gestures but she does make several fragmented attempts to

perform concurrently with the model while leaning around her own instrument's neck to watch the model. During the following personal practice time, Indira maintains her high intensity—which must have yielded dividends. Although she lacks a distinct rhythm at this point, she seems to be on the right track when acquiring the correct pitches of fig. 2. She seems satisfied at some point, picks up the bow, and gets back into playing position. She takes a moment to repeat fig. 1 in an attempt to refresh her internal model of the previous portion of the lesson.

Among Indira's significant shift in her response to the model as compared to earlier in the lesson is most likely a result of her frustration in response to the novel challenge inherent to fig. 2. This frustration is emblematic of Initiating learners who would rather abandon a strategy than continue to analyze, reflect, and refine their approach. In this context, both Indira and Indigo are eschewing their previous response and transitioning to a new one. For Indira, that involved a significant change in almost every aspect of response. Indigo's change was more subtle—she stabilized her strategies and adhered to a more streamlined single strategy of pitch identification. Rather than pivoting between her previous five strategies used in response to fig. 1, Indigo maintained a single strategy.

Immediately after the above sequence of instances, Indira and Indigo demonstrated a remarkable alignment in their approach to the model's tasks for a lengthy duration of the lesson. Each participant applied bowed applications with extremely low intensities—often only a single repetition per instance—while choosing to listen and reflect in response to temporally similar modeled instances (e.g., the first several modeled performances of fig. 3). Additionally, both participants responded to the second modeled performance with the same rare blend of strategies.

Table 22

Side-by-side Response of Indigo and Indira to Fig. 3

Indigo (12/F/Initiating)	Indira (9/F/Initiating)
Indigo is struggling with fig. 3. *Like most participants, she correctly identified the difficulty of this section of the lesson and is attempting to transform the 16th note gestures into her own internal model and external performance.* Thus far, her preferred response has been to make multiple, rapid trial and error attempts at the beginning of the third fig. The model begins the second performance of fig. 3 while Indigo watches. Bow in hand, she observes the pickups to measure five and immediately launches into her performance before waiting for the model to finish. This specific focus on opening portion of fig. 3 via a blend of reflective and non-concurrent approaches is unique among participants and seems to indicate a specific, targeted internalized goal.	Indira is struggling with fig. 3. *Unlike other participants, however, she is still focused on her previous shortcomings in response to figs. 1 and 2. Specifically, Indira seems to be fixated on the descending melodic patterns in measures two and three.* When the teacher pivots to perform fig. 3, Indira seems caught off guard by the increased difficulty and reverts to her responses previously utilized in fig. 2. The model begins the second performance of fig. 3 while Indira watches. She observes the pickups to measure five and immediately launches into her performance before waiting for the model to finish. She immediately starts rapidly plucking to determine the pitches of the three ascending notes leading into measure five. Her clear focus on this specific component of fig. 3 led Indira to ignore other salient aspects of the modeled performance in lieu of her own immediate learning needs.

Indira's and Indigo's blend of listening and reflection in combination with a non-concurrent performance strategy was rare across all participants' responses in the lesson—rarely did each learner prioritize their own specific learning goals over the larger modeled performances. This unique non-concurrent strategy paired with gesture isolation in immediate response to reflective listening is a rare, perfect alignment of strategies made more noteworthy due to the alignment of learning preferences between Indira and

Indigo. Each participant attended to only a small portion of the model's performance and therefore deviate from any larger, implicit learning tasks in lieu of their own immediate learning needs. This represents a significant deviation from how the model or teacher might expect—or even require—a learner to react in response to a modeled performance.

Both participants seemed to shift strategies again starting at fig. 4. During the model's initial performance of fig. 4, both participants chose to listen and reflect on the task—a rarity for both participants throughout the lesson. In her response to this modeled performance, Indira applied a novel strategy she had not yet attempted in this lesson—systematic error detection. At the same point in the lesson, Indigo demonstrated increased introspective processing as demonstrated by her body language. Although Indira's behavior more clearly aligned with typical Initiating learners who might prefer to continue with trial-and-error strategies, Indigo began to apply more advanced components of the ELT cycle. Indigo—as a 12th grader with more performance and learning experience than Indira—might have been more able to apply increasingly advanced learning strategies at this later point in the lesson. Indeed, this implicit disparity was increasingly evident when the model asked Indira and Indigo to combine figs. 3 and 4. Indira became clearly overwhelmed and temporarily disengaged from the lesson. By contrast, Indigo applied more and more complex strategies—such as delayed synchronization rather than concurrent performance as well as a high-level blended strategy of tempo modification and gesture isolation—at the same point in the lesson.

This pattern continued throughout the rest of the lesson. Indira continued to adhere to a simple trial and error strategy with only minimal success whereas Indigo blended and applied novel strategic outcomes. Indira seemed resigned to struggle with the end of the lesson and became increasingly frustrated; Indigo instead leveraged her learning preference in order to experiment and continually tried out new strategies in order to overcome more varied challenges. Indira ran out of strategic options—perhaps as a result of her younger age or more limited performing or learning experiences—and was forced to maintain a single strategic response to the task. Her applied learning strategies drifted out of her comfort zone and potentially negatively impacted her efficacy and progress in the lesson. For Indira and Indigo—as Initiating learners—their relative success seemed largely dependent on their grade level.

Three learners—Andi (10th Grade/Female), Anaya (11th Grade/Female), and Anissa (11th Grade/Female)—shared the Analyzing (RO/AC) learning profile. Kolb (1984) posited that learners who demonstrate this propensity prefer to focus on theoretical models. In the context of the lesson involved in this study, these learners would most likely be focused on the strategy they applied to the task at hand rather than the outcome of the actual task. Concerned mainly with “ideas and abstract concepts” (p. 78), these learners would rather attend to the process of internalizing experiences.

Andi, Anaya, and Anissa began the lesson by applying non-active strategies—that is, they mostly seemed concerned with organizing their respective approaches to the task. For example, all three participants sat in rest position in order to listen and reflect in response to the model’s initial performance of the melody. Though that specific strategy was not unusual across participants of other learning preferences, each of these Analyzing participants’ actions and approaches in subsequent instances elucidate their internal processes. In response to the model's initial performance, all three participants took a moment to decide on their next step. Anissa simply got into playing position and waited. Andi took even less action—she sat still and waited for the next modeled instance. Only Anaya took any action—she simply plucked a single note to tentatively establish a reference pitch against the opening note. In the following instances—when the model isolated fig. 1 for the learners—Andi and Anaya each adopted similar strategies of identifying the opening pitch in a non-concurrent approach. It is noteworthy that Andi and Anaya each implemented a non-concurrent strategy so early in the performance. They were working against the desired outcome of the teacher's implicit goals by identifying and refining their strategy rather than directly engaging with the lesson material.

By the end of the model's presentation of fig. 1, Andi, Anissa, and Anaya had each settled on their unique strategic approach to learning the model's melody. Anissa—after sitting passively for the first four instances—utilized a modified shadowbowing application as a means of acquiring the majority of the content in the lesson. It should be noted that this modified shadowbowing strategy was—in fact—more akin to extremely quiet performing that might as well have been coded as conventional shadowbowing applications due to its barely audible nature throughout the modeled instances. Although this unique application had a large downside insomuch that Anaya was unable to confirm much of her pitch identification strategies against the model's performance, her Analyzing learning preference suggests that she might have been less concerned with the outcome of her learning and active experiments and more focused on the means with which she attempted to interact with the subject material.

Indeed, during instances subsequent to those in fig. 1, Anissa mainly worked on acquiring rhythmic components—only occasionally addressing pitch identification. Andi and Anaya adopted similar strategies featuring limited interaction with the model's shifting task difficulties and greater emphasis on their own processing and schema refinement. In Table 23, the pair alternate between applying pitch identification strategies and more holistic trial and error strategies between each model's performance instances.

Table 23

Side-by-side Response of Andi and Anaya to Fig. 2

Andi (10/F/Analyzing)	Anaya (11/F/Analyzing)
"I will now play the second fig.," declares the teacher. *Andi sits and listens to the model—she has worked diligently during the previous modeled instances to develop a sequence of effective strategies and is now able to apply them to this new contextual fig.* Once the teacher is finished, she waits a moment and then tries three quiet notes in quick succession to identify the starting note of fig. 2. She is correct on her third trial and error attempt but performs that pitch two more times to confirm that fact.	"I will now play the second fig.," declares the teacher. *Anaya sits and listens to the model—her strategies have continually evolved over the model's performance of fig. 1 and have yet to coalesce into a routine.* Regardless, after the model has finished, Anaya plucks a single note as a reference against some component of the model's performance. She then leverages this information into three quick bowed attempts to determine the starting pitch of fig. 2. She does determine the correct pitch and proceeds to perform fig. 2 with correct pitches—including the descending and ascending gestures in measure three.
"The second fig. again," continues the teacher. *Andi remains in playing position with her fingers on the string ready to play her newly discovered opening pitch. Indeed, as soon as the model completes their performance, Andi immediately makes two brief attempts at*	"The second fig. again," continues the teacher. When the model performs, *Anaya remains in playing position but only listens and reflects. Afterwards, she waits a moment then makes a single performance of fig. 2 just as she did in the previous instance.* The hesitation after the

fig. 2. Her second attempt contains more correct notes and rhythms but is ultimately incorrect. Nevertheless, she smiles at her obvious progress and strategic effectiveness.	model's performance suggests that Anaya seems to be checking her accuracy against her own internal model rather than the teacher's model.
The teacher moves on, "And one more time." *Andi leans forward to look more closely at the model's left hand but otherwise adheres to her listening and reflecting strategy. She remains in playing position—ready to perform her hard won first pitch of fig. 2.* Andi hesitantly resumes interacting with fig. 2 once the model is finished. She haltingly performs fig. 2 a single time but descends too far on the downward gesture in measure three—she ends the fig. on the wrong note. Although she immediately recognizes her mistake, she runs out of time as the model moves on to combine figs. 1 and 2.	The teacher moves on, "And one more time." *Anaya sets her instrument down into rest position while the teacher models fig. 2 for the last time. She seems assured with her ability to perform fig. 2—she just listens.* Once the model is finished, Anaya performs fig. 2 again with the correct rhythms and pitches. This time, she chooses to further refine her performance beyond the model—she adds vibrato to the final note of fig. 2.

When Andi and Anaya's responses are viewed through an ELT lens, their behavior during the modeled performances are indicative of their Reflective Observation learning orientation preference. They were, in essence, using the modeled performance as a means to refine their strategic approach to the task as well as their internal concept of the performance. During their personal practice sessions, they might have been reacting to how their reflective listening shifted either their concept of the task or their internal model—each driving their behavior between the modeled instances.

Anaya and Andi's strategic alignment continued throughout the first portion of the lesson. Anaya began to deviate from this pattern in fig. 3 by utilizing some more developed strategies in response to the model's second performance of fig. 3. Indeed, Anaya introduced more complex combinations of strategies in response to the increased complexity of fig. 3—gesture isolation, tempo modification, melodic contour, and even vocalization. However, Andi remained relatively static with her applied strategies regardless of the challenges inherent to fig. 3. Only after the third modeled performance of fig. 3 did Andi begin to deviate in her strategic response to the task. This relatively minor disparity between Andi and Anaya—two Analyzing participants—might have been due to their grade level. Anaya might have applied more advanced, novel strategies earlier in the lesson sequence as compared to Andi due to her one extra year of experience.

Near the end of fig. 4, Anissa hit a significant roadblock. In the instances leading up to this event, her strategic response had begun to align closer and closer to her fellow Analyzing participants. After the model's third—and final—performance of fig. 4, Anissa did not act for three consecutive personal practice instances. Whereas her fellow Analyzing peers refined their stable strategic patterns, Anissa's progress ground to a halt. During this period, Anissa acted only concurrently with the model and did not make any attempt during her personal practice time. She was—according to Kolb (1984)—"compiling and organizing into laws [her] observations of the various attempts by [herself] and others" (p. 65). Anissa was reassessing her strategy in response to the increased task complexity when the model combined figs. 3 and 4. Indeed, when Anissa finally began to apply her new combination of strategies several instances later, she seemed focused on mitigating damage caused by her inability to perform specific sections of the model's task within the time constraints of the lesson. Essentially, Anissa's new strategy was centered around performing various components of the melody while ignoring or avoiding the musical gestures she had deemed inaccessible. This was an important step for Anissa because it still allowed her to participate and grow in the context of the lesson, but she had self-determined that certain sections of the task were too difficult to acquire in the short-term. This approach—a unique but viable strategy—continued throughout the duration of the lesson whenever Anissa was asked to perform fig. 3 concurrently with the model.

Near the end of the lesson, when the model asked participants to perform all figs. in their entirety, Andi and Anaya finally began to deviate in their strategic responses to the modeled tasks. Up to this point—and despite Anaya's more developed learning strategies—Andi and Anaya had made almost fundamentally identical decisions in their responses to the task. When the model began to holistically demonstrate the entire melody, Andi and Anaya deviated from their previous approaches in unique ways as seen in Table 24.

Table 24

Side-by-side Response of Anaya and Andi to a Playthrough Near the End of the Lesson

Anaya (11/F/Analyzing)	Andi (10/F/Analyzing)
"Now the entire piece," states the teacher. Anaya joins as they both perform concurrently—Anaya correctly executes the 16th note gestures. *Now that she is finally comfortable with the larger melody, Anaya seems more willing to perform with the model—something she had done only five times previously in the lesson.* After finishing her performance with the model, Anaya makes a satisfied hum. She restarts fig. 3 again but slows down at the 16th notes in an attempt to	"Now the entire piece," states the teacher. Andi sets her hand for the opening pitch of fig. 1—she even briefly tests it to confirm and establish an experimental reference pitch before the model begins. She does not, however, join in. Instead, Andi adheres to her pattern of reflection during the modeled instance followed by gesture isolation or other straightforward strategic response during personal practice time. *After she listens,*

further refine or reflect upon her execution of those gestures. She continues on to fig. 4 but is interrupted by the model.	*though, she deviates from this strategy—she simply waits.*
The teacher continues, "And again." Anaya performs concurrently with the model. Immediately afterwards, Anaya pauses for a second. *"Hmmmm, OK," Anaya ponders aloud. The pause, followed by the vocalization, suggests that Anaya is reflecting and refining her own immediate learning need in the short-term.* Here, she seems appeased by her own performance but not completely satisfied. Subsequently, Anaya launches into her complete performance of the melody starting at fig. 1.	The teacher continues, "And again." *Despite the model presenting the entirety of the melody again, Andi decides that her time is better spent quietly working through the descending and ascending pattern in fig. 2.* She does this several times while the model is performing. When the model is finished, Andi just waits again.
"One more time," says the teacher before playing the entire melody a final time. *The teacher moves on to the last performance of the entire melody, but Anaya persists in her own immediate learning need. Her own performance overlaps model's—resulting in a blurred combination of sounds.* Once her own performance is complete, Anaya waits for the model to finish and then performs the entire piece again—she finishes just in time for the fourth and final checkup.	"One more time," says the teacher before playing the entire melody a final time. *Andi quietly plays along with the model—a rare concurrent performance—for figs. 1 and 2. She drops out after fig. 2 and ignores the model in order to focus on her own immediate learning needs—figs. 1 and 2.* When the model continues to demonstrate the rest of figs. 3 and 4, Andi repeats figs. 1 and 2. Afterwards, during her personal practice time, Andi waits yet again before being asked to perform for the fourth and final checkup.

In the above example, Andi reversed her previous pattern of strategic responses by performing concurrently at intermittent intervals while making no attempt to refine her external performance during her provided personal practice time. In contrast, Anaya increased the intensity of her responses by continues to introduce more advanced combinations of strategies—i.e., vocalization combined with trial and error; tempo modification combined with error detection, etc.—as well as now performing concurrently with the model. Andi and Anaya's shift in strategic response was most likely related to their perception of the lesson pacing. Their Analyzing learning preference suggests that they were primarily focused on the strategy involved with the learning context over the direct content of the lesson. Because of this, they were inherently aware of the looming proximity of the end of the lesson and made subtle shifts in their strategic responses. For Anaya, this meant increasing her intensity and strategic complexity in order to accommodate the approaching end of the lesson. For Anissa, her application of damage mitigation strategies might have also been due to her perception of the impending end of the lesson. To a lesser extent, Andi made a similar decision by focusing on figs. 1 and 2 at the expense of the second half of the melody in the waning instances of the lesson—as seen in the example above.

For Andi, Anaya, and Anissa—the Analyzing learners—the priority within the lesson was the learning process which seemed to occasionally work contrary to the desired learning outcomes and approaches of the model or teacher. Each Analyzing participant, at various points in the lesson, took a moment to make an overt decision about their own personal learning needs—often ignoring the modeled performance in lieu of their own short-term goals. Kolb and Kolb (2013b) posited that Analyzing learners "prefer teachers who model their thinking and analysis process in their lectures and interactions with [them]" (p. 203). In the current lesson, the model's teaching style did not align with this cerebral, metacognitive approach. In response, the Analyzing learners were forced to forge their own path via short-term learning goals and deviations from the teacher's objectives.

Three Imagining (CE/RO) learners—Maya (9/F), Mia (10/F), and Mayu (10/F)—were also present in this study. Learners with this preference possess an aptitude for "imaginative ability and awareness of meaning and values" (Kolb, 1984, p. 77). Specifically, these learners are able to view a single concrete experience from different points of view and potentially attend to multiple facets of depths of that single event. In response to those multiple viewpoints, these learners are to subsequently organize their observations into meaningful combinative and holistic concepts of the experience. It can be further noted that—similar to Andi, Anaya, and Anissa—two of these participants are one year more advanced in their grade level than the other.

From a holistic viewpoint of Maya, Mia, and Mayu's responses to the lesson, at least one of the participants applied a reflective, listening strategy to the model's performance in each instance throughout the lesson with the exception of the final checkup. Although this is aligned with Kolb's (1984) concept of Imagining learners, overall listening and reflective observation strategies were less prevalent than expected. In fact, Mia and Mayu acted very early in the lesson in order to experiment with strategies addressing the modeled task. Perhaps this early initiative is indicative of the efficiency with which Imagining learners can reflect and form multivariate points of view of a single experience. Other learners might require additional repetitions to attend to the same lesson components that Imagining learners—in this case Mia and Mayu—can grasp in just a few modeled experiences. Imagining learners, therefore, might be more efficient in combining Reflected Observations, but might struggle when manifesting effective or unique strategies to manifest those observations. In short, Imagining learners—such as

Mia and Mayu—might be better equipped to internalize concrete experiences, but potentially struggle when attempting to externalize those intrinsic models.

For almost the entire lesson, Maya applied a consistent cycle of Reflective Observation strategies. Her most common response to the modeled performances was that of reflection followed by a low intensity attempt to repeat what was just performed. Often the emphasis was on pitch identification, but strategies such as gesture isolation, melodic contour, and non-sequential performance were applied on occasion. In the below example, Maya deviates from this strategy.

"The last fig. is up next," states the teacher. While the model performs fig. 4, Maya sticks to her preferred strategy of Reflective Observation. Once the teacher is finished, Maya makes four quick attempts at the opening four-note gesture. Maya seems to have acquired the correct rhythm but is guessing wildly at the pitches. This sequence of observation followed by unfocused attempts at the modeled task has been the overwhelming majority of Maya's interaction with the lesson to this point.

"I'll play it again," interrupts the teacher. For the first time in the lesson, Maya makes an attempt at performing concurrently with the model. When the model begins, Maya sustains the opening pitch, fails, yet recovers and is able to rejoin the model. She succeeds in determining the correct pitches at the end of measure seven. Maya tries to then leverage that new knowledge as a basis for the subsequent tremolo pitch at the end of fig. 4 but is unsuccessful after two attempts. Although she was unable to perform along with the model for the majority of the instance, this experience yielded useful information for Maya. She uses the subsequent personal practice time to reflect on this experience

and develop a new plan moving forward.

"And again," continues the teacher. Again, Maya performs concurrently with the model. This time, she is able to match the model's rhythm but demonstrates few correct pitches. Immediately afterwards, Maya uses her personal practice time to reflect upon her previous performance.

Immediately surrounding the behaviors and responses described in the above example, Maya demonstrated some passive instances (Null) where no response to the modeled task was made. These passive instances were the only times where Maya made no activity during an instance. Although it is unclear exactly what caused these strategic shifts, they do represent a rather abrupt—albeit temporary—change in her response to the model. For this brief moment in the lesson, Maya performs concurrently with the model and chooses not to play in responses to that experience. Maya only demonstrates this novel strategic configuration during fig. 4 before reverting to her previous pattern of reflection during modeled instances followed by various strategies designed around pitch identification. Later, in the interviews, Maya noted that stress played a factor throughout the lesson. It is possible that the high stress of fig. 3 instigated—or necessitated—a shift in strategies. Most other participants—including her other Imagining learners—shifted strategies earlier in the lesson. Maya was unable to manifest novel strategic combinations until after the model moved away from the relative complexity of fig. 3. In short, Maya was impacted by the stress of the task which—in turn—delayed her ability to apply or explore more appropriate responses to the model until a later point in the lesson.

Throughout the lesson, Mia and Mayu demonstrated very little alignment with regard to their application of strategies. In fact, in only a single instance did the two Imagining learners align in their specific response to the model as seen in Table 25.

Table 25

Side-by-side Response of Mia and Mayu to Fig. 4

Mia (10/F/Imagining)	Mayu (10/F/Imagining)
"The last figure is up next," states the teacher. While the model performs fig. 4, Mia listens and reflects. In the ensuing personal practice time, she works to correctly identify and perform the opening pitch of fig. 4 but struggles to find the subsequent pitches. *She makes four attempts but stops at the third note. Mia was able to correctly identify the opening two pitches of fig. 4 but was unable to sustain that success throughout the duration of the figure.*	"The last figure is up next," states the teacher. While the model performs fig. 4, Mayu picks up her bow and gets ready to perform. She might be listening but seems to be focused on how she will respond to this novel challenge. *Once the model is finished, Mayu thinks for a moment and changes her mind—she sets down her bow and gets ready to pizzicato instead.* Before she can make a first attempt, she runs out of time.
"I'll play it again," continues the teacher. Mia repeats her reflective listening strategy. *She also repeats her previous pitch identification strategy by making several more attempts at the third pitch of fig. 4.* Mia remains unsuccessful but remains in playing position. It would seem that she narrowing her focus and sits poised to respond more actively to the model.	"I'll play it again," continues the teacher. Changing strategies again, *Mayu leans forward and plucks the opening pitch along with the model. She has confirmed the initial pitch by comparing the model's performance with her own brief external experimentation. Now, she seems focused on using visual data to determine her next strategy.* Once the model is finished, Mayu changes strategies yet again—she picks up her bow and performs fig. 1. Her inability to commit to a strategy or immediate performance goals indicates a great deal of indecision or confusion—perhaps a result of the challenge of fig. 3.
"And again," says the teacher. Again, Mia listens to the model perform fig. 4. *Immediately afterwards, she makes several more attempts to determine the opening portion of fig. 4.* Although she	"And again," says the teacher. Mayu rests the bow on the string and listens to the model perform fig. 4. *Immediately afterwards, Mayu finds the final note very quietly. She then quickly*

was not able to translate this sequence of strategies into greater success, Mia was able to establish a more reliable and consistent pattern of response—a step forward for her with regard to how she interacts with the model as compared to earlier in the lesson.	*determines the correct pitches and rhythms for fig. 4. She is even able to run through that figure two more times before being asked to move on to the next step in the sequence.*

In the above instance, both participants were working to identify the pitches of fig. 4 and decided to moderately increase the intensity of their repetitions in response to the model. Throughout fig. 4, Mia and Mayu demonstrated wildly different strategic responses to the model's performance of fig. 4. Mia was finally able to stabilize her strategies; Mayu demonstrated such instability in her response that she even included an attempt at fig. 1. However, both Mia and Mayu embodied one of the defining features of Imagining learners—their preference to observe rather than act. Instead of indecisiveness, Mayu might have been brainstorming her strategic response based on her learning preference. As a result, she was able to demonstrate a surprising ability to accurately perform fig. 4. Mia demonstrated similar success—albeit at a significantly diminished level—by continually experimenting with various strategic responses throughout the lesson and finally settling on the above pattern.

When comparing all other instances of Mia and Mayu, no other overlap was shown in their observable response to the model. Indeed, when including Maya's responses, all three Imagining participants demonstrated few patterns in their strategic response with the exception of Maya's initial—and rarely altered—sequence of reflective observation followed by pitch identification strategies. Though Mia, Mayu, and Maya might have excelled at combinative reflection in order to create a multi-view, holistic understanding of the modeled experiences throughout the lesson, their methods of externalizing those reflections might have required support. The lack of strategic pattern or consistency throughout the lesson between these three Imagining participants suggests that similar learners might require additional guidance or instruction regarding methods of creating or applying their talent. Indeed, only Mayu was able to apply more complex strategies frequently seen near the end of the lesson.

Furthermore, interview data among the Imagining participants supports the viewpoint that these learners more easily—or readily—attended to observational components of the lesson.

John: I'd like to focus on how you started to learn the song from the video. When the teacher did start playing, what was the first thing you focused on so you could learn the song?

Mia: The notes and his hand.

John: So, you were worried about looking at the model's hand and seeing where it was on the instrument?

Mia: Yeah.

John: Alright, and how did you incorporate that into your playing?

Mia: I tried to mimic the teacher's hand movements to see if I could get the notes right.

Mia's straightforward answers to the interview questions serve as an example of how all three Imagining learners in this study interacted with the model from a primarily observational basis. In short, visual data often drove their reflection and subsequent experimentation.

John: I'd like to ask you about the beginning of the modeling video. What was the first thing you noticed on the modeling video?

Maya: Um…the first thing I noticed on the video was that [the model] was very fluid with their movements. And I really couldn't see all their…[pauses]…usually when someone is playing, I look at their hands, but I couldn't really figure out what [the model] was playing by just looking at them.

John: Which hands do you usually look at first? Is it the bow hand or the left hand?

Maya: The…I guess it's the left hand.

John: The left hand—and so you're figuring out what notes they're playing?

Maya: Yes.

John: And you couldn't figure out what the model was playing just by watching their left hand here?

Maya: Yeah.

With few exceptions, Mia, Maya, and Mayu provided relatively brief responses to questions asking them to identify how they might have applied their observations to the tasks throughout the lesson. Here, although the Imagining participants' responses to the interview might not align in a clear manner, they do generally support their reflective approach to the lesson and highlight each participant's individual and unique struggle with the task—particularly during the later stages of the lesson.

The above analysis and comparison of Imagining, Analyzing, and Initiating participants yielded mixed results. Similarities do exist among participants with the same learning preference—though such alignments are inconsistent across larger groups of participants. Within the current study, four participants—Theresa (9/F), Theta (10/F), Thea (9/F), and Thelma (9/F)—all demonstrated a preference for the Thinking (RO/AC/AE) learning style. Kolb and Kolb (2013b) posited that these learners might exhibit "disciplined involvement in abstract reasoning and logical reasoning" (p. 15). Their ability to operate at an intrinsic level to pivot between theoretical and practical concepts indicates the ease with which these learners might manifest internal schemata. Subsequently, this presents a problem for the observer or teacher in learning contexts. Although there might be a great deal of internal development and thought, Thinking learners might prefer not to externalize their inner processing. The might, alternatively, lack the experience of tools necessary to do so. However, these learners might also be able to generate solutions or strategies more easily in response to their observations. Their weaknesses lie in the manifestation and execution of those models—they might simply be indecisive when it comes time to execute their multiple strategies in order to reconcile their internal task.

At the onset of the lesson, each of the four Thinking participants seem to have developed a consistent strategic response to the modeled tasks. Immediately after the modeled initial play through of the entire piece, Theresa and Thelma quickly devised a rudimentary pitch identification strategy. Alternatively, Theta and Thea each waited a moment before launching into their own strategy. In the very next instance, Thelma began to refine her response to the modeled performance by performing concurrently with the model before stopping abruptly in the middle of her attempt. This sudden shift in behaviors was unusual across participants—she pivoted strategies in the middle of a modeled instance. Instead of performing concurrently, Thelma chose to rely on her ability to reflect abstract, and experiment at this point—a decision that lasted for almost the entirety of the lesson. Theta, Thea, and Theresa aligned with Thelma throughout the model's performances of fig. 1 by applying similarly timid approaches in their applied strategies. All four Thinking participants—without exception—utilized low intensity, single repetition, variations on the basic rhythmic and melodic components of fig. 1.

During the next portion of the lesson, when the model was performing fig. 2, Theta and Thelma exhibit some unique responses. Whereas Theresa and Thea settled into relatively static strategic responses used in fig. 1, Theta and Thelma deviated from their previous patterns. Thelma—who had steadily developed her strategic response through an increasingly sophisticated and focus on component such as bow direction and intonation over the course of fig. 1's performance—reverted back to her original, timid strategy used at the beginning of the lesson. She quickly built on this previous fundamental strategic response through a series of uniquely complex blended strategies. For example, in response to the second modeled performance of fig. 2, Thelma isolated the scalar figure of measure three using her voice and then compared her performance to elements of her own signing. By the end of this short instance, her voice became an abstract drone against which she compared her own playing by slowing down the performance tempo in order to better compare her own two musical sources. The relative complexity and rapidity of her shift in strategy suggests that this approach might have been improvised—or at least hastily assembled from previous experiences outside this specific task. The other three Thinking participants did not make similar dramatic and noteworthy improvements on their own strategic responses. This combination of strategies was unique among all other participants.

Although other participants who shared a learning profile might have deviated from each other when comparing their responses to a singular instance of the modeled performance, Thelma's behavior is significantly different as compared to Thea, Theta, and Theresa. Thelma might have been applying components of the experiential learning cycle outside of her learning preference. Kolb (1984) suggested that there might be "increasingly specific environmental demands stemming from… the specific tasks that face us. These forces exert a somewhat stronger but more situation specific influence on the learning style we adopt" (p. 96). During fig. 2, Thelma—as compared to the other Thinking participants—utilized past experiences and strategies as a means to overcome the specific challenge she was facing. Although deviations away from preferred learning modalities did occur (Kolb & Kolb 2013b; Kolb, 1984), Thelma applied a remarkably complex combination of strategies that seemed completely antithetical to her learning preference—which would suggest she would rather reflect and introspect than aggressively apply strategies from past, external experiences. Her reliance on this intricate strategy was short-lived, however. Despite her apparent success, Thelma did not repeat this strategy until much later in the lesson (see below).

Theta demonstrated a similar, though significantly more subdued and less impulsive, change in strategies. In response to the novel challenges in fig. 2, Theta adapted her own strategic response. She was not confident with her new direction. Theta experimented with reflective listening, basic pitch identification via medium intensity self-practice, concurrent performance with the model, low intensity introspective self-practice, concurrent shadowbowing with the model, and finally settled on quiet and passive reflection and abstraction all during the three modeled performances of fig. 2. In keeping with Kolb's (1984) definition of learners who prefer Thinking modalities, Theta seems unable to decide on an adequate approach to the tasks inherent to fig. 2—instead, she constantly processes her own strategies and performance.

In response to the model's performance of fig. 3, each of the Thinking participants behaved in a fundamentally similar fashion in order to overcome the challenge inherent to the novel task. Indeed, similar to other participants, Thea, Theresa, Thelma, and Theta each listened to the initial modeled performance of fig. 3 and followed up with a hesitant, low-intensity self-practice session. At this point in the learning process, it is likely that each of these participants was focused on "the quality of [their] plan rather than achieving the actual goals" implied by the model (Kolb & Kolb, 2013b, p. 205). Only Theta deviated from this pattern of behavior by remaining passive during the provided personal practice time following the initial performance of fig. 3. Once the model began the second performance of fig. 3, each of the four Thinking participants applied their respective strategies with increasing complexity and confidence. Theta and Thelma each built upon their previous performance culminating with a unique application of at least three different strategies. Theta in particular tried to slow down the 16th note passages to determine the pitches, separated the slurred articulations, and experimented with several starting and ending pitches. She then used this new information to determine that the model's performance of fig. 3 utilized stepwise motion during the 16th note gestures. Thea, in turn, was able to grasp the majority of the basic and advanced musical concepts of fig. 3 almost immediately after the model's initial performance. It is unclear how she was able to develop such fluidity with the task so quickly. Kolb and Kolb (2013b) posited that because Thinking learners "value thinking things through and like to fit wide range[s] of data and information into concise ideas and models" (p. 205), Thea might have drawn from her frequently applied ability to access abstracted experiences. She then was able to combine those abstractions with her own practical models and reflections at an incredibly rapid rate in order to apply her advanced musicality and technique to manifest internal models in a polished and impressive fashion. In short—Thea was able to quickly master this task because her prior performance experience—and her ability to construct detailed internal schemata—gave her a head start when tackling this relatively challenging task. It was at this point in the lesson that Thea's strategies reached an equilibrium—with a single exception, she did not apply or develop novel strategies, amend her intensity, or otherwise deviate from her overall response following fig. 3.

Thelma, Theresa, and Theta also found a semblance of strategic stability after fig. 3. During fig. 4, all four Thinking participants began to adhere to their own preferred toolkit of two to three strategies. Additionally, all four Thinking participants seemed to successfully grasp fig. 4 at the same time. By the end of the second self-practice instance, each participant had executed a successful performance of fig. 4. In response to this success, they each choose to listen and reflect during the model's third performance of fig. 4 and follow up with a low intensity self-practice instance. This behavior suggests that the participants were unified in their specific behavior and response—namely, to develop a satisfactory externalization of their internal model, to check that performance against the external model's performance, and then confirm their own previous performance through reflection.

Near the end of the lesson, Thelma and Thea each had their strategic equilibrium interrupted in a similar segment of the lesson. During the model's combinative performance of figs. 3 and 4, Thelma and Thea both made significant, yet temporary, changes to their respective responses.

Thelma has chosen to reflect and observe during each of the modeled performances ever since her decision early in the lesson. It's a decision that has worked well for her—she's been able to transform the vast majority of the lesson content into her own performance through a variety of applied strategies during her personal practice time between the teacher's modeling. Her biggest obstacle throughout the lesson has been her inability to retain information she gleans from each modeled performance and personal experimentation. At this point in the lesson, the teacher has introduced each of the individual figures and is now presenting them in combinations of two or more within a modeled instance.

"I'll now play the third and fourth figs. together," says the teacher. Thelma sits in playing position with her bow on the string but simply observes and reflects—a continuation of the strategy she has exclusively used throughout the lesson up to this point. While doing so, Thelma sets the bow on the string and pivots it back and forth across the strings in response to the model's performance. She is most likely imitating the

model's string crossings. During the following personal practice time, Thelma seems confused for a moment—almost as if she forgot what she was meant to do. She eventually collects herself and starts to perform fig. 1 but is forced to stop by the teacher.

"And again," interrupts the teacher. Thelma laughs at her lack of focus in the previous instance—her levity seems designed to relieve some of the stress or tension she was feeling during this point in the lesson. In doing so, however, she misses the start of the modeled performance. Undeterred, Thelma sets her bow on the string and waits for the model to end. Clearly refocused, she launches into an attempt to perform fig. 3 once the model is finished. She makes three attempts but fails to make it past the 16th note gestures each time.

"Oh no! I don't remember it!" exclaims Thelma. Previously in the lesson, she had been able to perform fig. 3 with far more ease than she is currently able to. Still in good spirits, Thelma persists with her attempts at fig. 3. Whatever progress she had made several minutes ago has been lost—she was unable to make a lasting abstract conceptualization of fig. 3 and must now recreate her performance.

"One more time," continues the teacher. Thelma ignores this directive and continues her increasingly frantic attempts at the 16th note gestures in fig. 3. The model begins their performance of figs. 3 and 4 while Thelma carries on with her work on fig. 3, undeterred. When the model reaches fig. 4, Thelma somehow fluidly joins to perform concurrently with the last portion of the instance. Thelma's uncharacteristic pivot away from reflective observation during the modeled performance is followed by several extremely unusual behaviors. Once the model is finished, Thelma immediately sings the

descending 16th note sequence in fig. 3 several times. She continues to sing while performing that sequence at a much slower tempo than her previous attempts. She does this twice—most likely in an attempt to reacquire her ability to perform the descending 16th note gesture. Thelma reverses this process to reconstitute the ascending 16th note gesture. Her behavior now bordering on frantic, Thelma attempts to perform all of fig. 3 several times with increasingly positive results.

In the above example, Thelma eschewed her previous strategic approaches and patterns because she encountered an unexpected problem—she had forgotten her previous solution to fig. 3. To overcome this individual challenge, Thelma dismantled the 16th note gestures by singing and slowing them down. Subsequently, she matched the pitches to her instrument and then worked to recontextualize her work into the framework of fig. 3 and 4. Thelma's shift in strategies in the above example was so significant, complex, and sudden, that it almost disrupted her future responses—during the following instance, Thelma sat and reflected upon her dramatic shift in response.

Thea made a similarly drastic shift in her response to the model at the same point in the lesson. Once the model presented figs. 3 and 4, Thea chose to only perform concurrently with the model and sat passively during the self-practice sessions between the teacher's performances. During the majority of the lesson, Thea had reflected during the model's performance and refined her own externalization during the subsequent personal practice time. Although her performance and progress had reached a point of diminishing returns following the model's performance of fig. 4, Thea had made incremental improvements between each of the modeled performances. However, her decision to only utilize the model as a more direct means of refining her own performances was noteworthy due to the fact that she continued to make small adjustments for the duration of the lesson. This suggests that her internal model had reached a point where she perceived it as indistinguishable from the model's performance and was only able to make changes based on her own externalization of her internal model in real time—concurrently. Alternatively, this might indicate that Thea's performance had advanced beyond the point where her internal model could assist in making significant changes—she therefore must have shifted strategies in order to use the self-practice instances to reflect on her own performance. This reflection, in turn, allowed Thea to manifest and ultimately apply a more musical outcome. Indeed, Thea was one of the few participants able to focus on high-level musical components—such as vibrato—during the late stages of this lesson.

Overall, however, the Thinking participants demonstrate few common themes throughout the late stages of the lesson. The increasing complexity of the lesson tasks necessitated that each of them apply more advanced strategies in response. Though each of the four participants rose to the challenges, Theresa and Theta did so with tentative, low-intensity approaches for the latter portion of the lesson. Only Thelma demonstrated an increasingly intense application of her progressively complex strategies. By the time the model was demonstrating the entirety of the piece, she was focusing on and utilizing only a small portion of the teacher's performance as a means of refining a single component of her own externalizations—for Thelma, she chose to focus on and intensely refine the 16th note gestures of fig. 3.

Interview data among the Thinking participants was similarly mixed. Thelma, Theresa, Theta, and Thea each noted the frequency with which they utilized multiple sources of reflective data—namely their nuanced observation and application of both visual and aural data in response to the model. These Thinking leaners might be more suited towards building an internal model through multiple modalities of modeling. Kolb (1984) summarized the increasingly complex application of these learners' abstract conceptualization orientation stating that when Thinking learners encounter an experience, their usage of both the RO and AE phases enhances the AC phase. Specifically, when the intention (RO) and extension (AE) are resolved in response to an experience, "we find a unique resolution via the refinement of the concept to encompass greater differentiation via hierarchic integration—this is, an increase in [symbolic] integrative complexity" (p. 147). The advanced combinative application allows for more complex analysis and internalization. However, Thelma, Thea, Theresa, and Thea's brief alignment in their overall response to the modeled task, demonstrates how individuals—even those that share a moderately advanced learning preference—potentially differ in their ability to create appropriately complex interpretations and internalizations most likely due to the complex nature of both the experience and cognitive process. Specifically, Thea's ability to reconcile transformations via extension and intension by means of comprehension yielded different results as compared to her Thinking peers due to some factor beyond grade level, gender, or learning orientation.

Temporal Comparisons Among Different Genders. Xavier (11/M/Experiencing) represented the lone male participant in the current study—the other

14 participants were female. Xavier's various responses to the model will also be described through an Experiential Learning Theory lens via comparisons to other learning preferences. However, Kolb (1984) posited that gender is an independent variable when considering differences among learners. Though Kolb and Kolb (2013b) cautioned against over simplifying gender-based variable interactions, variance among LSI scores persist. Willcoxson and Prosser (1996) supported such restraint positing that gender variables are so fundamentally intertwined with societal and cultural norms that it can be difficult to extricate the impact of gender alone when considering an individual's learning response. Regardless, Kolb and Kolb's (2013b) analysis of LSI data indicated that gender—among other intersecting variables such as educational specialization, culture, and age—might impact how individuals utilize the prehension dimension of the ELT cycle. Therefore, an analysis of Xavier's responses to the model compared against other participants' responses functioned as a means of controlling these potential variable disparities despite Xavier serving as the single male gender variable.

Overall, Xavier's early responses to the model were unique when compared to other participants due to his general passive, reflective-based strategies. However, when his strategy shifted into a much more active stage near the end of the first figure, he demonstrated a uniquely intense series of instances (see above example of Xavier's shift in overall responses between figs. 1 and 2). This flurry of action paralleled similar shifts enacted by participants such as Rebecca (10/F/Reflecting) who also made an analogous increase in consecutive active strategies and greater performance intensities. Indeed, Rebecca demonstrated similar patterns of consecutive active responses beginning at the same point in the lesson as Xavier continuing throughout almost the duration of the lesson. During this lengthy stretch of performance instances, Xavier and Rebecca demonstrated a significant alignment in their strategic response to the model, their overall modality of response, and their application and rhythm of instances in which they focus on intrinsic reflection or abstraction. Specifically, Table 26 represents a significant moment in the lesson for both participants.

Table 26

Side-by-side Response of Xavier and Rebecca to Fig. 2 and Combining Figs. 1 and 2

Xavier (11/M/Experiencing)	Rebecca (10/F/Reflecting)
Although Xavier had remained passive and reflective during the first portion of the lesson, he has sprung to life in response to the second fig. For almost six consecutive performance instances, Xavier has been plucking non-stop regardless of the modeled performances and provided personal practice time. Now, as the teacher wraps up the final performance of fig. 2, Xavier makes another change.	Rebecca's responses to the first portion of the lesson has been centered on continually developing and manifesting her strategies in order to efficiently and effectively manage the modeled tasks. Her primary strategy has alternated between concurrent performances along with the model coupled with moderate-intensity attempts at refining the correct pitches of figs. 1 and 2. Rebecca has—to this point in the lesson—remained pizzicato.
"And one more time," concludes the teacher before performing fig. 2 for the third time. Xavier finally stops his frantic pizzicato session and seemingly reverts to his initial observational reflection strategy—he only watches and listens. As soon as the model concludes, Xavier resumes his high-intensity pizzicato modality. However, his strategy is much more cohesive. He appears to be repeating small chunks of fig. 2 in rapid fashion.	"And one more time," concludes the teacher. For the first time in the lesson, Rebecca does not attempt to perform concurrently with the model. Instead, she listens and seems to compare the modeled performance with her own externalizations by subtly moving her fingers on the fingerboard without producing any sound. During the subsequent personal practice time, Rebecca accurately identifies the initial pitch of fig. 2—she then plays through the fig. accurately. She applies her previous listening and reflection experience by confirming her pitch identification strategies and externalizing her

	now validated internal concept of the performance.
"Now put the first two figs. together," continues the teacher. Xavier stops his incessant plucking to ready his bow for the first time in the lesson. He sets his bow to the string but only makes very small sounds during the modeled performance. *Xavier does not, however, watch the recording. Once the model is finished, he lifts the bow off the string and reflects upon what he just heard.* Near the end of his personal practice time, he performs with the bow to quickly and quietly run through figs. 1 and 2. Before his attempt, Xavier was assembling his internal models of figs. 1 and 2 in order to manifest an attempt at the required task.	"Now put the first two figs. together," continues the teacher. *Rebecca repeats her immediately previous strategy by sitting and reflecting on the performance—her fingers move on the fingerboard again but she still does not produce any sound along with the modeled performance of figs. 1 and 2.* Immediately afterwards, Rebecca tries to recreate her earlier success but struggles to recall the 1st fig. Instead, she makes several errors until reaching fig. 2 which she performs accurately. This novel pattern of reflective listening during the modeled performance continues intermittently throughout the lesson but is increasingly applied throughout the next several instances.

Despite the previous lengthy sequences of active responses to the model, Xavier and Rebecca both used the final performance of fig. 2 to pause and reflect on the model's performance. As seen above, each participant seems to use this instance to check the validity of their own internal model with that of the teacher's example. Although both participants arrived at this respite in their active behavior in similar ways, slight variations in their intent might be present despite the immediately observable alignment. These slight strategic variations are amplified by the different in performance intensities—namely, Xavier's incredibly high intensity rate of performance. This disparity points to the potential that, despite the surface level similarities between Xavier and Rebecca's responses, their focus and approach might be different.

Further compounding this disparity, the model's performance of fig. 3 marks a departure in both participants' temporary alignment in responses. Indeed, the challenge of fig. 3 seemed to impact Rebecca more significantly than Xavier. During this segment of the lesson, Rebecca rapidly experimented and applied a variety of strategies in an attempt to address the increase in task difficulty. Xavier did not follow suit—his responses mirrored previous approaches to the model, albeit with a novel, bowed performance modality. In fig. 4, Rebecca and Xavier resumed their alignment demonstrating synchronicity in their strategies, performance modality, and even intensity.

Balah (11/F/Balancing) demonstrated similar responsive alignment with Xavier—and by extension, Rebecca. However, though Rebecca frequently aligned with Xavier's strategic applications, performance modalities, and pattern of responses; Balah mirrored—among other things—Xavier's performance intensity. Xavier and Balah demonstrated significant alignment in their performance intensity beginning at the end of fig. 1. Each participant increased and decreased their performance intensity at similar points in the lesson (e.g., the start of fig. 2, the first and second modeled performances of fig. 3, and the second modeled performance of fig. 4). Furthermore, there is a moderate amount of alignment in the pattern of each participants' response to the model—each reflect or act at similar points in the lesson in response to the model. Balah's overall strategic applications were more complex than Xavier's responses throughout the lesson, however.

Aside from these moderate similarities with Rebecca and Balah—which could also be attributed to adjacent learning preferences, learning preference complexity, or simply grade level—Xavier demonstrated a weak overall alignment with the remainder of participants in the study. For example, at the start of fig. 2, Xavier was only one of two participants that did not explicitly stop and reflect on the model's performance; Rebecca was the only other participant that did not reflect on the novel task material being modeled. During the initial modeled performance of fig. 3, Xavier demonstrated the same reflective observation seen in all but one other participant. Though it can be noted that Xavier blended this initial reflective observation strategy with a modified concurrent performance, this deviation from the field of participants is short-lived. His responses to the duration of fig. 3 followed a similar pattern compared with many other participants that alternate between reflective observation and low-intensity personal practice sessions designed at determining pitches. Xavier's response to fig. 4 follows a similar sequence. His pattern of concurrent performance followed by passive or low-intensity practice sessions near the end of the lesson was also not unique among participants; Balah, Andi, Anissa, Indira, and Thea all demonstrated similar alternating patterns of responses. It is, therefore, difficult to attribute gender variables to specific differences in how Xavier differed or aligned in his response to the model and lesson in comparison to other participants.

Temporal Comparisons Among Grade Levels. Kolb's (1984) independent variables regarding KLSI learning style results indicated that developmental level might impact ELT orientations or, at the very least, the complexity of learners' behaviors in response to an experience. An analysis of behaviors and responses across grade levels yielded common themes that suggest students of similar age level, developmental level, or experience level might internalize or interpret a modeled performance in fundamentally similar manners.

Maya (F/Imagining), Thea (F/Thinking), Theresa (F/Thinking), Thelma (F/Thinking), and Indira (F/Initiating) were all ninth graders at the time of the study. Though only three learning preferences were represented among the ninth-grade participants, a variety of Kolb's (1984) ELT phases were represented: CE/RO, RO/AC/AE, and AE/CE, respectively. Both fundamental and advanced developmental stages were present among this subset of grade level participants.

Each ninth-grade participant demonstrated little alignment in their specific strategies and approaches at the start of the modeled lesson. During the model's first fig. 1 performance, Indira, Theresa, and Thea executed a basic concurrent approach with the model. Alternatively, Maya listened and reflected whereas Thelma applied a blend of concurrent and reflective approaches. During subsequent instances, the ninth-grade participants demonstrated similarly limited alignment among specific and generalized responses to the modeled performance. Even the performance intensity among ninth-grade participants represented a wide array of responses—Indira displayed high repetitions during the provided practice time whereas three other participants made only a single attempt during each instance. By the end of the model's performance of fig. 1, an increase in overall alignment began to emerge. All but Indira listened and reflected on the final modeled performance of fig. 1. In the very next instance—the personal practice time—all five ninth graders demonstrated almost identical behaviors via a low-intensity arco performance modality with a focus on pitch identification. This significant alignment continued into the next instance when all five participants applied a reflective, listening tactic in response to the model's initial performance of fig. 2.

Though the ninth-grade participants demonstrated only mild alignment in response to fig. 2, the teacher's model of fig. 3 yielded a unique concurrence of behaviors. All five ninth graders reverted to their original respective approaches seen at the start of figs. 1 and 2 when the model moved on to fig. 3. Only Maya demonstrated a slight deviation in behaviors by approaching fig. 3 non-sequentially. That approach was short-lived, however—all five ninth graders listened to and reflected on the model's second performance of fig. 3. Indira was the only ninth grader to make a performance attempt after listening to this portion of the model's performance—she made short, rapid attempts to identify the pitches of the first several notes of fig. 3 before the model has even completed their performance. All five participants applied identical behaviors until the end of the model's performance of fig. 3. Their previous overall trend of unified, low-intensity, and low-complexity strategies throughout fig. 3 finally dissolved near after the final modeled performance of fig. 3. The ninth graders demonstrated a unique variety of behaviors ranging from Theresa's passive, action-free response to Thelma's complex combination of gesture isolation, melodic contour identification, and medium-intensity. In short, the end of the model's sequence at this point in the lesson elicited a different response from the ninth-grade participants—most likely caused by the relative task difficulty throughout this sequence of instances.

These five participants seemed to transfer their individual experiences in response to the challenges inherent to fig. 3 to the new challenges found in fig. 4. At the onset of the model's performance of fig. 4, four of the five participants demonstrated a novel pattern of behaviors when compared to their previous response sequences. Maya, in particular, showed an uncharacteristic increase in performance intensity at that point and even made a unique—at least to her own learning behaviors—concurrent performance for the first time in the learning sequence. Similar to other significant shifts in learning behaviors, these novel behavioral patterns had given way when the freshmen participants reverted back to their previous strategies. Only Indira was able to make progress by increasing the complexity of her trial-and-error strategy via an increasingly fluid approach to the model's task. She no longer waited for the formal practice time to begin—she slipped into small trial and error attempts intermittently throughout the rest of the lesson.

After fig. 4, the five ninth-grade participants demonstrated little to no alignment between each other's behavior for the duration of the lesson. A single exception occurred near the end when the model was revisiting and combining figs. 1 and 2 and later figs. 3 and 4. In the span of these four instances, several behavioral correlations occur. In response to the model's performance of figs. 1 and 2, four of the ninth-grade participants performed concurrently with the model—an unremarkable occasion in isolation. During the immediately following personal practice instance, Indira, Theresa, and Thelma each increased their performance intensity in an attempt to quickly reassess and compare their external performance with their internal model. The next instance—when the model performed figs. 3 and 4—Theresa, Maya, and Indira each refined their internal model by reflecting on the model's performance while the remaining participants made a concurrent attempt with the model. Three instances later, Maya and Thelma utilized a unique combination of gesture isolation and another strategy with moderate intensity. More so than participants in other grade levels, the ninth-grade participants responded more actively to the subtle increase in task difficulty near the end of the lesson—perhaps motivated by their perception that the lesson was drawing to a close.

The most common alignment among ninth-grade participant responses to the model was their respective adherence to behavioral patterns established at the start of the lesson. Few deviations occurred throughout the lesson among individual participants' responses. When novel behaviors did manifest—often in response to increase task difficulty—the ninth graders largely failed to refine or build on those strategies in order to create more adaptive, appropriate, or complex responses as the demands of the lesson increased. This is most likely the single defining feature of these ninth-grade participants' behaviors throughout the lesson—their strict adherence to their initial response and reticence to make lasting changes in response to an increasingly difficult task.

If the grade nine participants were only aligned in their reversion to previous response modalities, 10th-grade participants would be expected to see slightly more adaptive behaviors across the scope of the lesson. Kolb (1984) suggested that learners with more developed or advanced learning orientations exhibit more flexible approaches to a greater variety of learning contexts. In essence, rather than static approaches—or, in the case of the ninth graders, persistent observance of initially applied strategic approaches—participants of each subsequently higher grade level should display increasingly adaptive or complex strategies in response to the model's lesson. Though all five 10th-grade participants were also female, their learning preference profiles were more varied than the ninth-grade participants: Imagining (Mia and Mayu), Thinking (Theta), Reflecting (Rebecca), and Analyzing (Andi). These four learning profiles encompass all four ELT phases—though the AE/CE dimension is absent.

At the start of the lesson, only Rebecca and Mia did not reflect during the model's initial performance of the overall melody—noteworthy due to only a single other participant in the study who also attempted a concurrent performance strategy during the model's initial play through. The majority of the other participants applied reflective listening strategies during that initial performance—including Mia, Theta, and Andi. Occasional alignments occurred between the 10th graders' responses throughout the model's focus on fig. 1. All 10th-grade participants applied a low intensity, methodical approach towards identifying the pitches of fig. 1. This deviated from the ninth graders approaches due to the immediate and deliberate strategic approaches exhibited by each of the five Grade 10 participants. Whereas the ninth-grade participants demonstrated little alignment in their early strategic approaches and applied various strategies regardless of their appropriateness, 10th-grade participants utilized a firm foundation of learning strategies at the start of the lesson and used that feedback as a basis to refine their plans. Indeed, after the model's second performance of fig. 1, Mia, Mayu, and Andi added on to their pre-existing strategies by either increasing the practice intensity or adding an additional layer of strategies in their attempt to determine the pitches of fig. 1. For example, Andi attempted to better reflect on her own performance by slowing down the tempo of her attempts. Mia executed a similarly advanced blend of strategies in an attempt to discern the pitches—she reduced her performance to the melodic outline in order to detect errors in her playing as compared to her internal model. Both participants demonstrated a moderately faster development of their respective strategies than the other Grade 10 participants. Two instances later, Mayu applied the same blend of melodic outline and error detection in a noteworthy alignment of strategies. In direct contrast to this discernable process of strategic escalation, Andi and Theta applied internally-based, passive approaches at the end of fig. 1. At this early stage of the lesson sequence, there was no clear evidence of Grade 10 participants exhibiting more developed strategic processes as compared to ninth-grade participants.

Alternatively, the Grade 10 participants did not revert to their initial strategic approaches at the onset of fig. 2. Instead, they unilaterally increased their performance intensity during the personal practice instances in response to the modeled tasks. Theta, in particular, demonstrated a notable behavioral shift in response to the model.

"I will now play the second fig.," the teacher states. During this initial performance of fig. 2, Theta adheres to her previously applied routine of intrinsic, reflective listening strategy. Immediately afterwards, Theta tries a new sequence of strategies to overcome the model's novel challenges. She makes brief, almost casual, attempts at the pitches, rhythms, and style of fig. 2. Her noodling actually produces meaningful outcomes—she is able to closely mimic the model's performance. Theta seems satisfied with the results gleaned from her newfound approaches and wait for the next modeling instance.

The teacher continues, "The second fig. again." For the first time, Theta performs concurrently with the recording and is relatively accurate. Afterwards, she puts her *instrument down into guitar position and plucks fig. 2. This casual approach is, fundamentally, similar to that of her previous personal practice instance—namely, her central goal is focused on reconciling her external performance with her internal concept of the model. Although this novel performance modality is unusual, it seems that Theta is not making large changes to her previous performance attempts. Instead, this pizzicato instance is built on the principle of reinforcing her progress thus far.*

"And one more time," says the teacher. Theta returns to playing position and sets her bow on the string. When the model begins, Theta only shadowbows along with the model—allowing her to further refine her internal concept of the model with the actual modeled performance. Theta makes this comparison all while manifesting a shadowbowed approximation of her externalized performance. After this process concludes, Theta sits and reflects on her activity—she makes no further attempt to perform.

Theta's relatively passive—most likely intrinsic—approaches to the early modeled performance in the lesson shifted to medium intensity, bowed modalities centered on increasingly efficient interactions between the model, her internal concept, and her own performance. The other Grade 10 participants applied similar levels of discipline at the start of fig. 2, as well. Similar to their response to fig. 1, Grade 10 participants methodically approached fundamental skills such as pitch identification and rhythm. In fig, 2, these tasks did not increase in complexity—only intensity. Throughout this portion of the lesson, the participants demonstrated limited temporal alignment of their intrinsic, reflective strategies. However, each of them did apply some sort of intrinsically focused listening or reflection strategy at least twice during the fig. 2 instances.

With only two exceptions, none of the 10th-grade participants extended their strategies beyond what was previously applied during fig. 1. Andi explored a more fundamentally-based melodic contour strategy when she performed the outline of fig. 2's overall pitches during her third personal practice attempt. Her previous work with fig. 2 yielded mixed results—the melodic outline strategy provided a more holistic concept of her own performance in comparison to the modeled performance. Theta—as seen above—experimented with shadowbowing techniques as a means of comparing her internal model to that of the model's external performance. These mild deviations from previously applied strategies were in stark contrast to the wild, seemingly random strategies seen by grade nine participants at the same point in the lesson. Indeed, the 10th-grade participants' strategic applications seemed increasingly deliberate as the lesson progressed and lacked the arbitrary nature of their grade nine counterparts.

In response to the difficulty of fig. 3, the Grade 10 participants demonstrated increased unity. At the onset of fig. 3, all but one Grade 10 participant listened and reflected. Mayu chose to perform with the model and is able to immediately isolate the difficult 16^{th} note gestures. Her behavior at that point in the lesson was incongruous with all other participants—regardless of grade level—and was most likely a result of her ability to match pitches with increasing efficiency as the lesson progressed. She described her process in the example below.

John: I'd like to ask you about some of the things you learned from the video. Describe how your performance became more refined throughout this video.

Mayu: Like how I thought about it or how I actually started playing it?

John: Either…or both!

Mayu: Ok. So, on my instrument—most of the time, I go by kind of fingering on the E string. I still don't know all of the notes up in the fifth position and everything. Well, I know them, but I have to think about them a bit because I always have to figure out where my 1st finger is. So, I was listening to how when [the model] had the notes playing pretty quickly—it sounded like slurs—how they were very in order. I would try to just remember that [the model] was just kind of quickly picking up and putting down their fingers. At first, I was plucking and was trying to see if I could get the pitches and see which notes match that. But once [the model] got into the third chunk, and I picked up my instrument, it became a bit easier. I was hesitant at first to play it on my instrument. Then, playing on it helped to further keep everything in my brain and hear it.

Above, Mayu depicted how she attended to specific components of the model's performance, identified challenges, and developed effective responses to overcome those challenges. She decided to concurrently perform with the model because she had previously identified the third chunk—or figure—as a particularly difficult section and she found it easier to match pitches when she actively experimented with the subject material. Mayu's behavior, however, was an outlier when compared with all other participants. Although Mayu might have demonstrated an unusual response at that point in the lesson, the other Grade 10 participants eventually followed suit by continuing their overall pattern of pitch identification strategies combined with a gradual increase in complexity. In contrast to fig. 2 where the 10th-grade participants only increased their individual performance intensity, fig. 3 forced each Grade 10 participant to develop advanced strategic responses. Rebecca and Theta each applied a gesture isolation strategy for the first time in the lesson. Mia isolated the 16th note gestures and worked non-sequentially in order to try to determine the order of the pitches. By the end of the model's focus on fig. 3, Rebecca had attempted a shadowbowing strategy for the first time while Theta attempted an incredibly complex blend of tempo modification, gesture isolation, and trial and error strategies when experimenting with pitch identification and articulations.

In immediate response to the model's performance of fig. 4, the Grade 10 participants reverted to their methodical, medium intensity approaches. At this point in the lesson—however—they seem to have developed beyond their responses to fig. 3 and have become more efficient in their performance strategies. By the second modeled performance of fig. 4, all five Grade 10 participants reduced their performance intensity. Although it is unclear why this occurred across all five participants, Rebecca's specific behavior indicated she was still focused on refining her performance of fig. 3. The overall difficulty of fig. 3 demanded a great deal from the participants. At fig. 4, these participants might have perceived that the challenge was less and therefore required less strategic complexity and intensity. Indeed, throughout the rest of the model's performance of fig. 4, the 10th-grade participants represented an uncharacteristic lack of strategic complexity as compared to the previous three figs.

Throughout the rest of the lesson—beginning when the teacher modeled multiple combinations of various figs.—the Grade 10 participants demonstrated gradual increase in strategic complexity. In addition to an increase in overall strategic complexity, Rebecca also focused on more varied musical components—including more refined articulations, vibrato, and even general musicality. Only Andi maintained a consistent focus on reflection and internalization demonstrated by her alternating reflective listening during modeled performances followed by moderate to low intensity personal practice sessions in response to the combinative modeled performances. When the teacher started to model the entire melody, Andi inverted her strategic response by only performing concurrently with the model and remained passive during the individual practice sessions. When compared to her fellow Grade 10 participants, her overall behavioral responses seemed gradual less complex. Instead, her shifting strategy might have indicated an increase in strategic complexity due to her increasingly fluid interactions between her internal model and external performance. Her other Grade 10 participants, on the other hand, were more evidently complex in their strategies throughout this later phase of the lesson. Each participant reached a stasis at some point near the end of the lesson. This stasis represented a state of behavioral equilibrium for each participant. They no longer attempted new strategies but instead settled into a routine of strategic patterns in response to the modeled tasks. For Rebecca, Theta, and Mia, that occurred when the model performed the entire melody for the second time. Mayu reached this equilibrium two instances later.

Throughout the lesson, the Grade 10 participants demonstrated a subtle yet increasingly systematic approach to the model's lesson. With the exception of fig. 3, each of the 10th-grade participants' approaches were relatively progressive with few novel strategies. The ninth-grade participants largely responded to any increase in modeled task complexity with an unfocused, potentially random manifestation of strategies and responses. Grade 10 participants were—by comparison—far more disciplined with their strategies. By gradually increasing the performance intensity, and—eventually—the strategic complexity, the 10th-grade participants made slow but steady progress in their ability to internalize the subject material and develop appropriate behaviors.

Kolb (1984) posited that more highly developed learners—those with more complex combinations of learning preferences such as Experiencing (AE/CE/RO) or Reflecting (CE/RO/AC)—might exhibit greater flexibility in response to a wider variety of learning experiences. As seen in the above descriptions of the Grade 9 and 10 participants' responses to the modeled lesson, behavioral variances among grade level subgroups exist on a larger-scale, holistic level. The more methodological, systematic approaches seen from 10th-grade participants was a significant deviation from the more unfocused, relatively disorderly response to stress or task difficulty displayed by the ninth-grade participants. Although Kolb did not directly attribute developmental or cognitive complexity to age level—and by extension grade level—the intersection of learning and experience function as the primary factors for how individual modalities impact integrative complexity. "The human developmental process is divided into three broad developmental stages of maturation: acquisition, specialization, and integration." (p. 141). Similar to Piaget's (1971) stages of childhood development, Kolb theorized that individuals make unique growth in their response to experiences via increasingly complex and fluid combinations of learning styles over the course of their lifetimes.

Instead of specific ages, Kolb suggested that development is increasingly impacted by cultural, occupational, educational, and personal experiences. Additionally, development is contextual and complex; progression or regression is possible according to throughout the course of a lifetime.

Based on an extrapolation of data from Grade 9 and 10 participants, those in Grade 11 might, therefore, be expected to exhibit either an even greater level of strategic discipline or more appropriate and unified shifts in strategic response to the model's lesson. The 11th-grade participants represented both genders, all three level of developmental complexity, and all four phases of Kolb's (1984) ELT cycle. At the onset of fig. 1, these 11th graders—Xavier (M/Experiencing), Balah (F/Balancing), Anissa (F/Analyzing), and Anaya (F/Analyzing)—each immediately set into motion a clear and cohesive strategy. After the model's initial performance of fig. 1, Xavier took several moments to clarify his internal model of the experience in order to better approach his task. His pause—relatively common among other participants—represented the effectiveness of reflective observation as a task management strategy as well as analysis tool. Xavier used his reflective experience as a means to collect himself before launching into a non-stop sequence of personal practice and concurrent performance over the course of six instances without a single moment's pause. Anissa exhibited a similarly deliberate approach—albeit one with less initial reflective processing. She took several instances to also determine an effective strategic approach and develop her internal model before initiating a slow but steady development of strategies. Balah and Anaya required even less planning—they each executed a unique approach concurrently with the model's initial performance of fig. 1. Anaya alternated between a slowly developing strategy in direct response to the requirements of the task during the personal practice time and reflection and listening during the model's performance. Balah immediately applied a barrage of strategies—identifying the general melodic contour, error detection, and pitch identification. These strategies formed the core of her subsequent responses for the duration of the lesson. Balah applied increasingly complex strategies to the myriad challenges of the model's tasks but always utilized and built from these core strategic approaches as a means of cyclical growth.

By the start of the model's presentation of fig. 2, each of the Grade 11 participants established their preferred strategic approaches to the task. Xavier continued to pizzicato non-stop in a contiguous, cyclical learning process. He incessantly pursued the goal of matching his internal model of both fig. 1 and 2. Because he delayed applying his respective strategy at the start of the lesson, Xavier was forced to play catch up—he continually alternated between attempting figs. 1 and 2 until he finally paused to listen and reflect at the end of the mode's focus on fig. 2. Anissa built upon her shadowbowing strategy from fig. 1 and slowly incorporated other, more nuanced strategies. Although there did not seem to be a routine to her approaches, she evidently attempted to make a connection between the model's performance, her internal abstraction of the task, and her externalized performance. During the second modeled performance of fig. 2, Anissa maintained her consistent shadowbow approach but slightly delayed her gestures out of sync with the model. Here, Anissa no longer performed concurrently but slightly behind the model in order to reconcile her experience with the model's performance and her own externalization of her internal construct of the task. The difference was subtle, but Anissa's intent was made evident based on the timing of her non-concurrent strategy followed by a passive, null response which suggests that she was processing and interacting with both the model's performance and her own externalizations.

During the same series of instances at fig. 2, Anaya maintained her approach from fig. 1 wherein she alternated between reflection during the model's performance and varied strategic responses during her own personal practice time. During those practice instances, her strategies were closely tied to her reflective observations—she was almost ruthlessly efficient in her approaches after each instance of listening. Furthermore, her focus shifted throughout fig. 2 to also incorporate pitch identification at the start of fig. 2. She then checked her own note accuracy in the subsequent practice session after refining her internal model during the second modeled performance. In her final personal practice instance of fig. 2, Anaya applied more advanced musicality factors by introducing vibrato into her own performances. Balah, on the other hand, demonstrated consistent developmental sophistication throughout the model's focus on fig. 2. By building on her core of strategies, Balah fluidly responded to the model's challenges by identifying specific pitches when building towards the general melodic contour of the fig.—this time with increased performance intensity. She further developed these approaches by including a non-sequential strategy near the end of the focus on fig. 2. This specific out-of-order strategy was most likely in response to her reflective listening in the immediately previous modeled performance. She refined her internal model of fig. 2 using the mode's performance as a concrete experience. Balah then compared that intrinsic abstraction against specific components of fig. 2 that she identified as troublesome. Indeed, all four Grade 11 participants paused during the third modeled performance of fig. 2 and reflected upon the model's performance. This represented a rare alignment in strategies between the 11th-grade participants. There, Anaya executed her pattern of alternating reflection and personal practice whereas the other three participants most likely compared their own performance of fig. 2 to the model's performance. Regardless of their respective learning orientation, each participants' behavior applied the same specific act of reflecting on the model's performance in order to determine the accuracy of their own performance by means of their internal construct of the task.

During the model's focus on fig. 3, each participant did not shy away from their respective established strategic rhythms despite the challenge inherent to that particular pattern. Xavier incorporated slightly more reflective listening during this sequence but otherwise maintained his fundamental and single-minded approach towards pitch identification. It seemed that his response to the challenge inherent to fig. 3 was to actually perform less and listen more in order to refine his concept of the task. It is unclear how exactly he might have been conceptualizing or abstracting the task. This specific approach was not shared by Anissa. Instead, she demonstrated a steady increase in strategic complexity throughout the focus on fig. 3 by building on her shadowbowing strategies. Unlike her grade nine and ten counterparts, Anissa built on her previous strategies rather than reverting back to previously applied combinations of approaches. During the model's second performance of fig. 3, for example, Anissa blended several strategies through concurrent performance and shadowbowing in response to her need to identify the opening pitches of fig. 3. During the same instance, she quickly pivoted to a reflective listening strategy in order to internalize the 16^{th} note gestures.

Anaya did not deviate from her routine even when confronted with fig. 3. Instead, she demonstrated an immediate increase in strategic complexity after hearing the initial fig. 3 model. During her personal practice time, she immediately slowed down the 16^{th} note gestures and attempted to determine the general contour of the melody. Specifically, Anaya tried to identify the starting and ending note of each sequence of four 16^{th} groupings. She repeated this specific strategic sequence during the subsequent model and personal practice time but built on it by experimented with several four-note gestures in order to determine which matched her internal concept of the model's performance. Balah similarly identified the challenge inherent to fig. 4 and immediately got to work isolating the 16^{th} note gestures in order to identify specific pitches. She slowly became more efficient with this strategy until the third modeled fig. 3 where she blended a concurrent performance and reflective listening similar to Anissa. The 11^{th} graders' ability to quickly identify the increased task difficulty early in the sequence of the model's presentation of fig. 3, coupled with their general adherence to respective strategic sequences, indicates a more confident behavioral response as compared to the younger participants. Additionally, the subtle increase in response complexity is uniquely appropriate to the demands of fig. 3. Rather than panicking, pivoting, or otherwise deviating from established and practiced response, these 11^{th} grade participants refined, developed, and blended their behavioral patterns in order to overcome fig. 3.

At the start of fig. 4, each grade 11 participant continued to demonstrate the same pattern of developing their previous strategies—with the exception of Anaya. She temporarily deviated from her pattern of reflection and personal practice for the first time in the entire lesson. Indeed, at the start of fig. 4, Anaya was one of the few participants that did not stop to reflect during the model's performance. Instead, she was still working on fig. 4 and was caught off guard by the model's performance. Her individual need to complete her work on the previous fig. impaired her progress on the subsequent lesson component. Anaya attempted to catch up during the personal practice time after the model finished fig. 4. Rather than regressing back to her established reflective listening strategy, she chose to bow concurrently with the model. It was unclear why she deviated from her established behavioral pattern at this point in the lesson, but perhaps the relative ease of fig. 4 in comparison to fig. 3 gave Anaya increased confidence to explore novel strategies. Conversely, Anaya might have developed new strategies in response to fig. 3 and was determined to preclude additional struggles with a more proactive approach midway through fig. 4. Her experiment was short-lived. By the third modeling instance of fig. 4, Anaya had reverted to her reflective listening behavioral pattern. Anissa and Xavier showed predictably cumulative complexity in their responses throughout the focus on fig. 4. They each applied unique blended strategies that temporarily built upon their previous responses. Balah, on the other hand, began to apply a more intrinsic approach throughout fig. 4. She reflected during all three of the model's fig. 4 performances and demonstrated limited increases in overall strategic sophistication during personal practice instances. Balah's regression away from her established patterns was similar to Anaya's deviation during the same portion of the lesson.

At the end of the lesson—when the model was performing playthroughs of the entire melody—three of the grade 11 participants established a rhythm of concurrent performance with the model followed by a passive response during the personal practice time. It would seem that these three participants had hit a point of diminishing returns with their own personal practice without the model's performance for direct comparison. Balah, Anissa, and Xavier might have also determined that their individual internal concept of the model's performance required no further development. Therefore, each participant needed to only refine their own execution of the abstraction and could most efficiently do so in concurrence with the model's performance. Indeed, Anissa—who had struggled with the majority of the lesson—was focused on damage control as she attempted to identify how best to overcome her inability to successfully perform various tasks in the melody without stopping entirely. The overwhelming consistency seen between these three learners was the steady development of their own strategies over the course of the lesson regardless of the increases in task difficulty. Rather than revert back to previous strategic applications or perform subtle tweaks with their approaches—as seen in grade nine and ten participants, respectively—the Grade 11 participants continuously developed and refined their responses to the various tasks according to their own individual needs.

Though there was very little casual alignment between Anaya, Anissa, Balah, and Xavier throughout the lesson, a significant underlying factor was evident regarding their individual ability to learn as much about the modeled experience in addition to the manner in which they each reacted, responded, and developed their approaches throughout the lesson. Moreover, the 11th graders' ability to self-identify their learning needs might have led to more coherent and consistent strategic responses throughout the learning experience. Regardless, it is clear that the 11th graders showed more stable progress in their behavioral complexity across the lesson as compared to the Grade 9 and 10 participants.

Indigo (F/Initiating)—the only 12th-grade participant in the study—showed similar patterns of growth throughout the lesson. Due to the single data point, it was difficult to extrapolate patterns and comparisons among participants in other grade levels. However, Indigo's overall learning process during the lesson and subsequent interview responses yielded more salient results—particularly when compared to overall patterns among other participants.

From the very beginning of the lesson, Indigo picked up fundamental pitch and rhythmic components extremely quickly. Small secondary details—such as bow direction, intonation, and articulations—initially escaped her notice. Indigo's early success was most likely attributed to the variety and fluidity with which she pivoted between strategies. Unlike younger participants, Indigo applied novel strategies in direct response to specific challenges within the lesson throughout the learning process. This process allowed her to quickly grasp pitch and rhythm as well as allowing for fluid approaches to refining each fig. individually. She also had little problem recalling the melody throughout. This retention—as well as focus on pitch and rhythm—led to an incredibly efficient learning process during figs. 1 and 2.

John: I'd like to ask you to think about a situation when your teacher modeled something for you during class. What kinds of things do you feel you learn from those models?

Indigo: I learn the techniques—like the amount of bow that [my teacher] was using when they were playing. And also how [my teacher] holds the bow—like if [my teacher] is pushing the bow to make it louder or if [my teacher] is a little lighter on the bow to make it sound a bit softer.

John: That's great. Is there anything else you feel stood out to you in this lesson that helped you?

Indigo: Um, [the model's] amount of bow they were using on different notes like slurs. I concentrated more on the amount of bow [the model] was using on the last note. Like, I noticed that the teacher was using the top half of the bow instead of the middle half which I was using. So, as we started going on, I switched how I was using my bow.

The above level of specificity and clarity in thought reflects Indigo's ability to identify details from the model and apply them to her own performance. It was clear from her performance outcomes throughout the lesson that she was able extrapolate similar observations—both external and internal—to other portions of her learning process.

Indeed, efficiency was a noteworthy indicator for Indigo—there was very little downtime. She consistently compared her concurrent performance with the teacher's model. She then refined that performance using her own internal interpretation of the melody in an extremely clear example of the fundamental ELT cycle. During the earlier figs., where Indigo's internal conceptualization of the melody was less stable, she focused on establishing that internalizations when identifying fundamental performance components. Once that foundation was set, however, Indigo began to shape concepts such as intonation, style, and technical components. In fact, when Indigo struggled with the 16th note gestures in fig. 3, that process broke down and forced her to reassess her strategy. During this struggle, Indigo relied on her internal model by slowing down the passage and comparing those tempo-modified attempts with her internal representation. In fact, the teacher's model seemed to interfere with that process several times in the later stages of the lesson.

One of the most prominent differences among different grade level participants' behavioral responses to the lesson was the overall efficiency and appropriateness of strategies applied towards discrete, individualized learning goals. Although ninth-grade participants mostly experimented with strategies and approaches throughout the lesson, older participants were able to utilize their experience to apply more efficient learning strategies. Additionally, older participants seemed to be increasingly able to identify their own respective learning needs in response to the model's challenges. These two outcomes—appropriate strategies combined with increased intrinsic knowledge of learning processes—indicate that grade level impacted how participants incorporated and internalized the teacher's model.

Temporal Comparisons Among Disparate Learning Preference Orientations. Individual responses to a single modeling experience among multiple participants who shared a learning preference yielded mixed results. Participants with learning preferences representing opposite ELT dialectic orientations showed similarly mixed results. Analysis of these responses demonstrate the depth and breadth of how learners responded to a singular learning instance through a comparison of applied phases of the ELT cycle. Moreover, when comparing participants' behaviors and responses, common themes emerged indicating that learning preference contributes to how learners interpret and internalize experiences.

Xavier (11/M/Experiencing)—whose responses to the model were compared to the other 14 female participants—represented the opposite experiential dialectic as Thinking learners Thelma (9/F), Theresa, (9/F), Theta (9/F), Thea (9/F). The Thinking learners' responses were previously compared with each other above. Kolb and Kolb (2013b) portrayed these alignments as diametrically opposed in their preferred approach to a single learning context. Kolb and Kolb suggested that Experiencing learners—such as Xavier—prefer "finding meaning from deep involvement in experience" (2013b, p. 14) whereas Thinking learners prefer more intrinsic, reason-based methodologies. In reference to Kolb's (1984) model of structural dimensions inherent to experiential learning, however, both Thinking and Experiencing learners might demonstrate equivalent predilections towards the transformation of knowledge—namely the manner in which they reflect or experiment in response to a singular experience. The principal difference is the means with which the two learning orientations attempt to grasp knowledge. The dominant prehensive strategies applied are either external (Experiencing) or internal (Thinking). Though an Experiencing learner might prefer to interact with an experience by externalizing and performing, a Thinking learner might rather comprehend and work to better understand the facets of the performance. In short, Experiencing learners seek to find meaning in an experience by manifesting their own behavior in order to interact with it. Thinking learners would prefer to internalize and process the experience in order to understand it.

At the start of the lesson, however, Xavier demonstrated contradictory behavior to Kolb's (1984) theorizing by performing minimal overt action in an attempt to learn the model's melody. Within the first six instances, Xavier only produced sound once—as a tentative, concurrent attempt of the model's initial play through of the melody. This is in direct contrast to the Thinking participants who manifested external performances—either concurrently or during personal practice time—54.17% of the time during the same six instance window. After that initial window, Xavier sprang into action and applied a variety of repetition intensities—mostly high-intensity repetitions—with a singular goal of pitch identification until the first check-up. Though Thea, Theresa, Theta, and Thelma also engaged in similar—and often more strategically varied—acquisition methods, the intensity with which Xavier engaged with the subject manner is in direct contrast. Indeed, the Thinking participants diverged from Xavier in their often overly deliberate, hesitant approaches to learning in the early portion of the lesson.

Conversely, Xavier's comparatively rigorous approach to the modeled lesson was broken up by occasional sequences where he chose to only listen and then followed up with little to no action during the provided participant rehearsal time.

"Now put the first two figs. together," instructs the teacher. Xavier deviates from his previous pattern of high-intensity responses to stop and ready his bow for the first time in the lesson. When the teacher is performing, Xavier makes no attempt to watch or listen to the model. Instead, he makes very small sounds with his bow during the

recording. After the model finishes, Xavier lists the bow off of the string and reflects on some component of his own performance or learning strategy. After a moment, his internal processes trigger the need to perform the start of fig. 1 before continuing on to quietly run through fig. 2.

When the teacher increased the task difficulty by including both figs. 1 and 2, Xavier responded by decreasing his performance intensity, listening, and reflecting. In the subsequent fig. 3 instances, Xavier shifted his learning strategies (see above). During these instances—and perhaps in response to the shift in task difficulty in the vignette immediately above—Xavier seemed to collect his thoughts, reflect on his approach, and adjust his strategic approach. This behavior seems like a mature, seasoned line of action in response to unexpected challenges. These actions, however, do not align with Kolb and Kolb's (2013b) depiction of an Experiencing learner. In fact, during the model's performance of fig. 3, Xavier's behaviors are more aligned with his Thinking counterparts than at any other part of the lesson. He paused to reflect during the same instances and seemed to focus on the same components of the lesson in order to overcome the challenge inherent to fig. 3. His behavior is only differentiated from Thea, Thelma, Theresa, and Theta by a slight increase in repetition intensity and the lack of diversity in his approach throughout fig. 3.

Xavier's strategic approaches, though occasionally contrary to his learning preference, do demonstrate occasional alignment with the Thinking participants. This might be a result of the overlap across the Transformation dialectic axis—insomuch that the active experimentation and reflective observation are both important components of all five participants' preferred responses to this singular learning experience. The difference lies in the manner in which Xavier manifested his transformations and the more cautious, internally focused strategies taken by Thea, Thelma, Theresa, and Theta.

Following the second check-up, Xavier performed a strategy unique to any other participant in this study. In response to the model's first performance of fig. 4, Xavier utilized an experimental tactic. In contrast to any visual or aural data provided by the model, Xavier attempted to perform the fig. in a position other than first position.

"The last fig. is up next," continues the teacher. Xavier applies what he has learned following fig. 3 and just listens. He does not, however, watch the model during the performance. Immediately afterwards, Xavier very quickly and quietly makes three rapid attempts at fig. 4. He is correct on his third attempt. His solution is unorthodox—he shifts up to third position for the final three notes of the fig. 3.

Xavier continued this shift for the final three notes for the duration of the lesson regardless of how many times he heard and saw the model perform that specific portion of the fig. This solution is an unusual manifestation of active experimentation. It is, by all accounts, contrary to the model's performance and indicated the start of a pivot away from his previously applied strategies of acquiring the lesson material. Immediately after this incongruous approach, Xavier significantly decreased his repetition intensity, began to apply novel strategies not previously applied throughout the lesson—including additional sections where he chose to shift rather than remain in first position—and became increasingly introspective in his responses to the lesson.

There are several explanations to Xavier's dramatic shift in responses—

particularly when compared to the Thinking learners:

1. As the lesson tasks became increasingly complex and longer in duration, Xavier might have struggled to adapt to the overall challenge level as compared to the Thinking learners. Thea, Theta, Theresa, and Thelma each used portions of the lesson to refine their strategic approaches to reach a general static pattern of responses to the modeled tasks. Xavier's headlong approach to the task might have yielded positive results at the onset of the lesson but left him unable to apply a wider array of strategies, modalities, intensities, or approaches.
2. At this relatively late stage of the overall lesson, Xavier might have experimented with more advanced, developed strategies that encompassed more holistic components of the ELT cycle—namely, he might have demonstrated behavior outside of his learning orientation. These behaviors, though appropriate to the task, required Xavier to function in more deliberate, measured patterns—behaviors that Thea, Theta, Theresa, and Thelma might have found more comfortable by comparison.
3. Xavier was reeling from his failed experimental attempt to expand his application of upper positions to other portions of the lesson and was forced to reduce his performance intensity when continuing to manifest novel strategic approaches.

Regardless of the potential explanation, Xavier's strategies remained erratic throughout the remainder of the lesson as compared to Thelma, Thea, Theresa, and Theta.

Despite applying an increasingly more diverse array of strategies, Xavier rarely overlapped with any of Thelma, Thea, Theresa, or Theta's responses. Xavier's deviation from a consistent, high-intensity response at the onset of the lesson to more holistic, lower intensity behaviors never overlapped with the Thinking participants' responses with the exception of fig. 3. Instead, his dramatic shift towards strategic diversity in the second half of the lesson can be more directly paralleled to how Thelma, Thea, Theresa, and Theta each developed their own assortment of strategic responses during the initial portion of the lesson. In short, Xavier and the Thinking participants each underwent a process of distinct strategic refinement albeit at different portions of the lesson by means of reflection and experimentation. Thelma, Theta, Thea, Theresa, and Xavier represented opposing learning preferences who also shared a dialectic dimension—transformation—yet demonstrated limited alignment in behavioral responses to the modeled lesson.

Anaya (11/F), Anissa (11/F), and Andi (10/F) were each identified as a fundamental learning preference—Analyzing—who prioritize the RO and AC phases of the ELT cycle. Their preference directly contrasts with Indigo (12/F) and Indira (9/F) who represented the Initiating preference indicative of an inclination towards AE and CE ELT phases. Each subset of learners has been previously described individually (see above). Because the Initiating and Analyzing profiles are fundamental profiles that only utilize two adjacent ELT phases, they do not share a dialectic dimension. According to Kolb and Kolb (2013b) Analyzing learners prefer to engage in inductive reasoning and theoretical models. They each proved to be remarkable due to the efficiency with which they utilized their reflective observation and listening instances. Alternatively, Initiating learners have proven to utilize a wider variety of strategies and solutions to address the fluctuating challenges of the model's tasks. At a surface level, Kolb and Kolb suggested that these learners might be directly opposed in their approach to the lesson.

At the onset of the lesson, however, each of the five Initiating and Analyzing learners displayed identical behaviors—they simply listened to the model's performance. Few similarities could be found during subsequent instances throughout fig. 1. During the model's demonstrations of fig. 2, however, a common pattern began to emerge between participants of both learning preferences. At the start of the teacher's modeling of fig. 2, Indigo, Indira, Anaya, Anissa, and Andi each made a temporary adjustment to their strategic response by focusing on listening and reflective strategies. Though not unique among the field of participants, each of these five Initiating and Analyzing participants utilized reflective observation as a means of deviating from their previous pattern of strategic responses. The model's novel tasks related to fig. 2 required each of them to reassess and explore new solutions as seen in Table 27.

Table 27

Side-by-side Response of Anissa and Indira to Fig. 2

Anissa (11/F/Analyzing)	Indira (9/F/Initiating)
Anissa has been applying a shadowing modality as a means of interacting with the modeled performance throughout fig. 1. She has only once, in fact, performed an audible pitch and has solely focused on rhythms and bow directions at this point in the lesson.	Indira has been busy throughout the teacher's demonstrations of fig. 1. *She has been relentless performing both concurrently with the model and experimenting with trial-and-error* attempts during her personal practice time. Her high-intensity approach has yielded positive results even though she has relegated herself to pizzicato.
"I will now play the second fig.," states the teacher. *For the first time, Anissa takes a moment, leans forward, and just listens to the model.* Afterwards, Anissa	"I will now play the second fig.," states the teacher. *Indira returns to rest position and—for the first time—just listens to the model.* Afterwards, she

leans back, returns her bow to the space above her strings, and resumes shadowbowing. She has, however, gleaned a new focus from this reflective observation—she now clearly imitates the style of the model by imitating the bow speed and length when performing the silent rhythms of fig. 2.	returns to playing position, picks up the bow, and makes several quiet attempts to determine the starting pitch. She is not successful and immediately seems frustrated. Indira quickly sets down the bow and returns to rest position.

Indira and Anissa each deviated from their established patterns of responses by applying a reflective observation strategy but quickly reverted back to a previously successful strategy. For Anissa, this reflective listening yielded new insight and further refinement of her interpretation of the model's performance. Indira's reflective listening led her to experiment with a new bowed modality but was forced to quickly revert back to her previous methodologies. Although this reflective observation triggered a cascading sequence of strategic evolution over the course of the next several instances for Indira, each participant's immediate, measurable response to their respective reflective observation was indicative of how participants with disparate learning preferences utilize even a singular phase of the ELT cycle in different manners. Andi seemed to mirror Anissa and Indira's deviation in response in a similar portion of the lesson. At the start of fig. 2, Andi significantly increased her performance intensity. Her high output was short-lived, though—by the end of fig. 2, Andi had reverted back to her typical low-intensity approach. Anaya also made limited gains during fig. 2. She demonstrated an increase in strategic variety during this period but eventually simplified her strategic approach just before the first check-up.

Andi, Anissa, Anaya, Indira, and Indigo all demonstrated a similar shift in tactics as the model began to demonstrate fig. 3. Each of these five participants—in response to the novel task challenge of fig. 3—made significant changes to their strategy, performance intensity, or approach yet slowly reverted back to their individual previously applied responses. These changes included an increase in listening and reflection during the model's performance instances, more varied strategies during each participants' personal practice instances, generally increased performance intensity, and even shifted in performance modality from three of the five participants. While no relationship between participants' specific applied strategies was observed as a direct response to the model's performance of fig. 3, their similar generalized reaction to the model was noteworthy. Furthermore, these participants' changes in approach were temporary. By the second check-up, each participant retained few of the overall changes they individually made in response to the model's performance of fig. 3.

A similar shift was seen among these participants in response to the model's performances after fig. 4. However, few similarities existed between the participants when analyzing the specifics of their overall deviation from previous individual behaviors. The Analyzing participants—Andi, Amaya, and Anissa—demonstrated similar behavioral responses to the model's relative increase in complexity when combining fig. 3 and 4. At this point in the lesson, they each demonstrated common patterns of increased listening and reflection prior to applying more advanced and combinative approaches to the modeled tasks. Andi exemplifies this process below.

"I'll now play the third and fourth figs. together," states the teacher. Andi sets her left hand on the neck of the instrument in preparation for fig. 3 but decides to wait and listen to the modeled performance instead. Once the performance is finished, Andi

immediately makes a single attempt to determine the opening pitches of fig. 3. Her continued inability to discern and recall this sequence of notes is clearly frustrating her.

"And again," continues the teacher. Once again, Andi waits—a response aligned with her previous pattern of responses. After the modeled performance concludes, Andi quickly makes two attempts at the pickups to measure five but fails. She simply cannot find the opening pitch and makes another frustrated face.

The teacher proceeds with the lesson saying, "One more time." During this performance, Andi tries something new. She taps her bow on the string while trying different pitches during the modeled performance. Her frustration has led to innovation—she subtly makes sounds on her own instrument concurrently with the modeled performance in order to decrease her dependence on her own internal model. After the teacher has finished performing, Andi gets to work trying to determine the opening sequence of fig. 3 with the information gathered from her new strategy. She continues to struggle with several different trial and error combinations of the pickups to measure five. In one of her attempts, Andi finally lands on the correct note of measure five and seems immediately relieved. Her face quickly settles back into mild frustration as she is unable to reverse engineer the pickups leading into that note.

Andi's modified concurrent approach was unique among all other participants—including her other Analyzing colleagues. By increasing her overall strategic complexity in response to her struggles with the task, Andi was able to make small—but important—gains in her learning experience. Anissa and Amaya, though demonstrating less overall frustration and adversity, also manifested increasingly complex strategic responses to the model during the same point in the lesson. Indira and Indigo—the Initiating participants—each deviated from the holistic responsive development seen in their Analyzing counterparts. In fact, each Initiating participant maintained their strategy throughout this latter portion of the lesson regardless of the increase in overall task difficulty. During the model's performance of both figs. 3 and 4, Indira adhered to her lengthy reflective period while Indigo demonstrated few strategic patterns at all.

Even near the end of the lesson when the teacher modeled the entire piece for the participant, there was little evidence of strategic or responsive alignment between Analyzing and Initiating participants aside from the general streamlining tactic seen among many other participants across the study. As suggested by Kolb (1984), the Analyzing and Initiating participants demonstrated few noteworthy parallels in their response to the model's lesson. Indeed, the singular pattern that emerged among the Analyzing and Initiating participants was the temporary adjustment made in response the developing nature of the lesson. Each time the model introduced a new fig. or increased the overall task difficulty, Andi, Anissa, Amaya, Indira, and Indigo made changes to their individual learning response.

Temporal Comparisons Among Overlapping Learning Preference Orientations. Due to various limitations caused by the COVID-19 outbreak and restrictions, certain learning orientations were not represented in the second phase of the study. However, when comparing multiple variable sets, specific combinations of learning preferences, gender, and grade level were less frequently reported than others. Whereas this might have been a result of the overall reduced sample size, another possibility is that performance in an orchestra ensemble—specifically violin performance—might attract or deter specific learning orientations or genders. This study looked at high school students—earlier stages of string instruction might include more varied learning orientations. In phase two of this study, only six students demonstrated a preference for the more advanced orientations of Experiencing, Thinking, and Reflecting. There was no representation for the Acting (AC/AE/CE) learning preference among any of the phase two participants; the Thinking and Experiencing learning orientations can be contrasted due to their dialectically opposed nature according to Kolb's (1984) ELT. The lone Reflecting participant—Rebecca—cannot be directly compared to any such dialectic opponent. Instead, Rebecca shared several phases of the learning cycle with the Experiencing (Xavier) and Thinking (Theresa, Theta, Thelma, and Thea) participants. Kolb and Kolb (2013b) posited that the Reflecting learner is characterized by "connecting experiences and ideas through sustained reflection" (p. 15). According to theorizing of Kolb and Kolb, Rebecca might have demonstrated passive, internally focused behavior more so than any other participant.

While sustained reflective observation might be a strength of Rebecca and other Reflecting learners, the lesson presented by the model did not provide prolonged opportunities for lengthy introspective musings. Each pause between the model's performance was only eight seconds long. Instead, this lesson tested Rebecca's preference to adapt and transform the external experience to internal conceptualization. At the onset of the lesson, Rebecca immediately applied her learning preference: She applied a passive, null instance in response to the model's initial performance. Although no behavior was observable during this time, her learning orientation suggested she was reflecting on the model's performing experience in order to both internalize the event and manifest the best course of action in order to learn the task. In essence, she was reflecting on the task at hand. However, the following instances contained little to no reflection. There are several possible reasons for this:

1. Rebecca's reflection after the model's initial performance was so effective, she did not require any further acts of transforming. Instead, she chose to focus on her need to manifest and experiment—her area of weakness according to Kolb's ELT cycle.
2. Rebecca demonstrated such efficiency with her reflection that she was able to incorporate the model's performance when performing concurrently or even during her personal practice instances.

Either possibility suggests that Rebecca's fluency with reflective observation opened up strategic avenues not seen from other participants. Overall, Rebecca demonstrated far fewer listening and null/reflective instances than even Xavier—the Experiencing learner. Rebecca applied strategies with moderate intensity and preferred to pizzicato throughout the lesson. Although many other participants also chose to pizzicato during both the concurrent and personal performance instances, Rebecca's application of the strategy indicated that the use of pizzicato—among all participants, for that matter—might serve a specific purpose. Namely, when a participant plucked concurrently with the model, they were able to hear both their own approach and compare it to the model's performance in real time. More advanced participants might have been able to apply their reflections of their performance in real time in order to make adjustments both in the moment and during the personal practice tie between modeled performances.

Rebecca only stopped to apply overt listening and reflective strategies at the end of the model's performances of fig. 2. The context of the first such reflective strategy suggests that Rebecca was refining a specific component of her performance and was checking to compare her potential solution to the model's. The latter reflective strategy was most like due to the change in the model's performance context and overall task difficulty when the model combined figs. 1 and 2 for the first time. However, her behavioral response to the model's combination of figs. 1 and 2 indicated that Rebecca was merely double checking her skill at retaining the subject material.

Like most other participants, Rebecca stopped to listen and reflect on the model's initial performance of fig. 3. However, she also demonstrated an unusual behavioral confluence during the model's third performance of fig. 3 with her fellow peers exhibiting complex learning orientations. This unusual alignment in strategy was compounded by a novel deviation from Rebecca's established typical strategic patterns. Perhaps, like many of her fellow participants, she was being forced to apply new and potentially more complex strategies in response to the relative task difficulty of fig. 3. This instance seemed to be when Rebecca pivoted to more advanced combinations of strategies. Not only did she pick up the bow for the first time in the lesson, she also began to apply blended strategies of tempo modification and pitch identification during her personal practice time as well as delayed concurrent synchronization in conjunction with pitch identification within two brief instances.

Rebecca's use of her bow represented a new stage of her interaction with the model. She did not put it down for the duration of the lesson. Though this slowed down the intensity of her personal practice instances, it also allowed her to focus on components of the model's performance she was previously unable to address. When the model combined figs. 3 and 4 for the first time, Rebecca clearly utilized visual data to refine her bow direction during her concurrent performance with the model. This seemingly innocuous adjustment is an example of the fluidity with which Rebecca reflected on the model and her own performance—often at the same time. She was able to transform the experience and compare it to her own internal construct and schema of the even in real time in order to make corrections that positively affect her learning. This behavioral pattern continued throughout the duration of the lesson—Rebecca performed concurrently with the model, made changes to her playing during the model's instances, and refined or reinforced those changes during her personal performance time. This systematic pattern was far more pronounced than her peers' learning cycles and seemed to shift according to her own personal observations. There might not have been an overt plan or continually applied strategy, but Rebecca's efficient ability to reflect on her interaction with the experience yielded positive results.

Rebecca's behavior rarely aligned with other participants with advanced learning orientations—but that might be expected. Her learning orientation did not emphasize either dimension of prehension. Instead, her strength lied in the act of transformation—specifically reflection. Whereas Thinking and Experiencing learners might have needed to dedicate more time to reflective cycles in order to comprehend or apprehend the knowledge inherent to a lesson, Rebecca was more focused on manipulating both the experience and her abstraction of the concepts in order to influence her own learning cycle.

One of the rarest learning orientations in all ELT studies, a Balanced learning preference indicates that the individual has developed a fluid response to experiences that apply to a variety experiential learning cycles. These learners show no single preference towards the dimensions of the learning cycle but rather adapt their learning style to best suit the context. Kolb and Kolb (2013b) suggested that Balanced learners "[adapt] by weighing the pros and cons or acting versus reflecting and experiencing versus thinking" (p. 15). A Balanced learner might, therefore, exhibit a variety of transformative and prehensive behaviors within a single learning experience. Balanced learners represent the most advanced, holistic approach to learning orientations. However, other advanced learning preferences in the current study—Thinking (Theresa, Theta, Thea, and Thelma), Reflecting (Rebecca), and Experiencing (Xavier)—might align in some of their behaviors due to the shifting adaptations of the Balancing participant.

Balah (11/F) indicated such a Balanced learning profile. Her response to the model's initial performance mirrored that of the Thinking participants' responses—namely, that she simply listened and then took no observable actions. Aligned with the Thinking participants, the lack of overt behavior did indicate a passive response. Indeed, Balah's rapid and shifting responses throughout fig. 1 suggested that a great deal of strategic planning occurred during the quiet moment of introspection after the initial modeled performance of the entire melody. In this window of instance during fig. 1, Balah demonstrated a moderate level of intensity when applying pizzicato both in concurrence with the model and during her personal practice time. This is somewhat aligned with Rebecca's response early in this lesson. If this is truly the case, Balah demonstrated the same ease and fluidity of reflection that Rebecca exhibited during fig. 1. As such, Balah did not need to dedicate large chunks of time to reflections—she could do so when simultaneously performing other tasks and strategies.

By the time the model was demonstrating fig. 2, Balah already had started to develop more advanced, layered strategies not typically seen by participants until later in the lesson. She worked non-sequentially in an immediate response to the model's first fig. 2 performance and further developed that strategy by abstracting the general melodic outline with a high intensity during her personal practice time after the second fig. 2 modeling instance. Although the specific strategies applied by Balah did not align with any of the advanced profile participants' strategies, her early and frequent application of advanced strategies indicated that she was adapting various strategies in response to her perceived needs. These early adaptations are indicative of Kolb and Kolb's (2013b) definition of a Balanced learning profile insomuch that Balah was fluidly—and oftentimes rapidly—progressing through her own learning cycle to fit the needs of the task.

Balah's response to the model's fig. 3 performance temporarily aligned with the majority of the advanced participants—only Rebecca's specific response deviated from all other participants. Balah's strategic timing of her listening and reflecting strategies almost mirrored that of the Thinking and Experiencing participants—namely, the participants that preferred the prehensive dialectic. Balah stood out, however, due to the intensity and variety of her strategies despite the increase in task difficulty inherent to fig. 3. Balah rose to the challenge by applying more varied strategies in greater volume with a sustained intensity few other participants matched. By the end of fig. 3, Balah implemented an interesting shift in strategies. She begun by only performing concurrently with the model for the easier portion in measure five and then stopped to listen. During the subsequent personal practice time, Balah demonstrated no outward behaviors. However, Balah was undergoing some significant internal processing event. She, like all other participants, struggled with the 16^{th} note gestures at the end of fig. 3 and most likely spent those two instances refining her own internal model by comparing the model's performance to her own intrinsic concept of the performance. Several participants with the Thinking orientation demonstrated similar behavioral patterns at this point in the lesson. This alignment most likely indicated a similar internal refinement process as a result of more focused task management or needs.

Balah also demonstrated some interesting behavior during the second check-up. Prior to this instance, she had been applying a pizzicato strategy similar to Rebecca's concurrent reflective strategies—a response potentially designed to mitigated issues caused by bow control. In short, the pizzicato strategy made it easier for participants to focus on fundamental performance components such as pitch and rhythm when comparing their own externalization to the model in real time. During this specific check-up, Balah moved to playing position and performed concurrently with the model using her bow. At first, it seemed that Balah was simply following the model's directions.

During the subsequent personal practice time, Balah returned to guitar position and resumed her pizzicato strategy. This process continued unabated for an extend duration of the lesson except for a singular unique instance when the model performed fig. 4 for the second time. Balah applied an interesting combination of reflection and concurrent performance with the model—all while utilizing the bow for this instance. It is unclear why Balah chose to use the bow for this instance only. Within the context of the surrounding instances, Balah seemed to be struggling with the pitch identification of the open gestures of fig. 4. Perhaps her fluid application of various strategies resulted in a temporary shift in performance modalities in order to approach the problem from a different angle. The outcome of which, however, seemed dissatisfactory for Balah—she immediately returned to pizzicato for her next strategy in the following personal practice time with the much greater success.

Interestingly, as the lesson progressed and the task difficulty generally increased, Balah began to streamline her strategies application—though she maintained her moderate to high practice strategy. Indeed, after the point in the lesson when the model combined fig. 3 and 4, Balah reached an equilibrium with her response to the various tasks. This was in direct opposition to her advanced peers' responses. It was at this point in the lesson where most other participants—particularly the Thinking, Reflecting, and Experiencing participants—began to apply increasingly complex and layered strategies. Furthermore, this decrease in strategic complexity aligned more with the participants that demonstrated the fundamental learning orientations. Behavioral responses indicating an observable decrease in strategic complexity might not correlate to specific learners' struggle with a given task, as seen in Balah's long-term strategic sequencing. Rather, a shift in strategic complexity, or stasis, could be caused by an equilibrium of the ELT learning cycle. By the end of the lesson, Balah's above behavior—which might be interpreted as either an increase in learning efficiency or as subtle disengagement with the subject matter—reached a strategic equilibrium yet maintained a moderate level of performance intensity. Indeed, Balah's behavioral patterns began to align with Thea and Xavier's rhythm of concurrent performance with the model followed by a passive, outcome-free personal practice instance beginning when the teacher modeled the entirety of the melody.

Based on a comparison of how participants with advanced learning profiles responded to the modeled performance, it can be concluded that these learners tended to demonstrate increased adaptive strategies, particularly over longer durations of time. These advanced learning profile participants also were increasingly inclined to self-moderate their own specific behaviors and strategies in order to address individual learning needs. Although there was limited evidence that these participants adhered to their respective dimensions of the ELT cycle more than other participants, the fluidity with which advanced profile learners navigated various strategies indicated that they were not impaired by strategies utilizing dialectics outside their strengths. Kolb (1984) described how learners with this advanced, more generalized stage of development process experiences on a different level than other learners, stating that learners applying more complex combinative approaches or strategies often have greater metacognitive awareness. As learners apply more integrative complexity, they often can employ additional viewpoints when experiencing a wider variety of contexts. Once learners achieve this level of metacognitive awareness, they open up the potential for long-term goal planning, more creative or flexible responses to an experience, or carefully mitigated risk-taking. Balah's interview responses supported Kolb's view that more advanced learners might view or interpret modeled experiences differently than other learners. Here, she indicated several unique observations regarding how modeling is useful to her that were not approached by any other participant.

John: I'd like to ask you to think about a situation when your teacher modeled something for you during class. What kinds of things do you feel you learn from these models?

Balah: I'd say more like the feeling of the music. Because you can definitely read the way it's supposed to be played on the page, but I like to listen to it and hear it—as well as see it—so I can internalize how I should be playing it.

John: Can you talk more about that? What specifically goes into that "feel?"

Balah: Well, if you ever look at someone while they're playing—like they really enjoy it. You can see it in their body language and the way that they're playing the instrument. Definitely that helps too—because I don't want to say—they play out more. They play the song the way it was supposed to be written because they know what it's supposed to sound like—and they know what's right.

Balah's observation of intangible components of modeling—musicality, emotion, and other larger end-product ideas that comprise successful performances—far transcends other participants' observations. This distinction indicates that some learners, such as those with more advanced learning profiles, might utilize a teacher's model in profoundly different ways while simultaneously attending to fundamental musical component crucial to success at all levels.

Summary

During Phase I, mean score data from the KLSI test indicated that the violinist participants preferred each phase of Kolb's (1984) ELT dimensions to a greater degree than the total normative group samples reported by Kolb and Kolb (2013b). The grasping and transforming dialectic scores were similarly more extreme among participants in the study than Kolb and Kolb's overall average findings. Overall Cronbach alpha scores were slightly lower than Kolb and Kolb's reported averages. Using a two-factor, varimax rotation factor analysis, I found weak correlations and relationships among all four-dimensional values. A more intensive four-factor, varimax rotation factor analysis among the individual participants responses to the KLSI indicated overall greater correlations among associated dimensional values—though the AE dimensional correlations were less confident than other dimensional values.

Among participants, the Reflecting (CE/RO/AC) and Analyzing (RO/AC) learning orientations were the most frequently reported preferences—Deciding (AC/AE) and Acting (AC/AE/CE) were the least reported. The specific RO ELT (Kolb, 1984) phase was the most frequently indicated orientation whereas AE was the least represented. A Chi-Square test of Independence indicated a significant relationship between gender and ELT dimensions. Additionally, male participants demonstrated a greater proclivity towards the Deciding (AC/AE) orientation than female participants.

The results of a mixed-MANOVA among ELT Dimensions, Grade, and Gender yielded no significant results. Bivariant analysis indicated a significant interaction between the ELT Dimensions and Gender variables, however. Subsequent four-paired *t* tests revealed that female participants reported significantly greater applications of the Reflective Observation dimension than male participants at a medium to large effect size.

Phase II data utilized specific students to represent subsets of the KLSI orientations in order to measure individual learner responses to a teachers' model. Six emergent themes were identified—Strategy, Focus, Intensity, Response to Model, Approach and Application, and ELT complexity. Participant responses indicated that—on average—AE/CE and CE/RO strategies were most frequently used to transform the modeled lesson material. Additionally, participants mostly reflected on musical components of the model's lesson via low intensity performances. Participants most frequently performed with the bow during the lesson—though non-observable, reflective approaches were also utilized with relative high frequency. Qualitative data indicated a varied approach even within coded categories among individual participants. Even among participants that utilized similar strategies, intensities, responses, or applications, alignment and correlations were unclear. Not only did participants' transformations and comprehensions along Kolb's (1984) dialectic dimensions differ, the specific means, intents, and applications of those combinative dimensions indicated that participants interacted with the model according to short- and long-term goals and needs. Finally, there was moderate to limited evidence that individual participants' grasping and transformation of the teacher's model varied in cognitive complexity from one another. However, generalized qualitative data yielded specific patterns describing how participants of various learning orientations internalized and incorporated modeled content in order to address self-actualized goals as well as how those goals manifested and shifted in response to various lesson stimuli.

CHAPTER FIVE: DISCUSSION, RECOMMENDATIONS, AND CONCLUSIONS

The purpose of this study was to compare how students interpret and internalize a teacher's model in a high school string classroom. I explored how learners utilized a model in order to observe, internalize, and conceptualize individual learning goals and tasks as well as how those behaviors potentially deviated from expected responses using data from Kolb's (1984) Learning Styles Inventory. A secondary goal of my study was to compare KLSI data among high school string students to extant data typically focused on collegiate or older learners. The KLSI data provided a means to compare participant profiles within this study as well as interpret the processes—both overt and implicit—learners used to acquire the modeled lesson material.

Discussion

Comparison of ELT Data to Previous Research

The quantitative results of the Phase I analysis addressed research question one regarding the distribution of LSI profiles among high school violin students. Comparison of participants' mean scores in this study demonstrated that these high school violin students tended to prefer reflective observation and concrete experience orientations with greater frequency as compared to Kolb and Kolb's (2013b) normative group scores across multiple studies (Appendices J, K, L). Explanation for this deviation from the overall norm can be broken down according to the following factors: participant's age, gender, and educational specialization.

Participant Age

Participants' average scores deviated from Kolb and Kolb's (2013b) reported averages of KLSI 4.0 scores of the same age group (<19 years) and the next closest reported age group (19–24 years). This comparison yields mixed results and suggests that the violin subset of participants under the age of 19 tend to prefer grasping via apprehension (CE) with the same frequency of other participants of the same age—participants over the age of 19 tended to slightly prefer comprehension (AC) dimensions. Conversely, these violin participants were more closely aligned with the older participants in their overall preference for transformation via intention (RO) than Kolb and Kolb's composite averages of under 19 participants.

Although Kolb (1984) did not identify specific age as a determining factor regarding learning orientations, an analysis of Kolb and Kolb's (2013b) normative and age subgroups means indicated that cognitive development—and by extension, adaptive complexity—is differentiated by age group (See Appendix J for age group normative values). Extending beyond Piaget's initial theory of childhood development, Kolb (1984) posited the experiential learning theory of development, stating:

> The human developmental process is divided into three broad developmental stages of maturation: acquisition, specialization, and integration. By maturation stages we refer to the rough chronological ordering of ages at which developmental achievements become possible in the general conditions of contemporary Western culture. Actual development process will vary depending on the individual and his or her particular cultural experience. (p. 141)

Participants in the current study represented a very specific cultural subset of the under-19 age group in a very specific region of the country—ninth- to 12th-grade violin students in the Delaware, Maryland, and Virginia region of the U.S. Although violin participant means were almost identical to Kolb and Kolb's (2013b) normative values, the mixed results and lack of statistical significance found among age and the interaction with other variables suggest inconclusive results. Age might be a factor in learning orientation and adaptive complexity but without significant findings between age and dimensional or dialectic orientations, further research is needed. Results along the AE-RO dimension support Kolb and Kolb's (2013b) findings that KLSI participants under the age of 19 exhibit a wide amount of variance in their level of active and reflective orientations though not at a significant level. Overall, the lack of significant age-related findings regarding the high school participants potentially support Kolb's (1984) suggestion that application of the KLSI is only recommended for learners over the age of 18.

Participant Gender

Analysis of current participant dimensional means along gender variables were statistically significant and overall supported Kolb and Kolb's (2013b) summary normative values of gender orientations (See Appendix K for gender normative values). Specifically, female participants in the current study exhibited a slight preference for concrete experiences and reflective observation as compared to Kolb and Kolb's composite female averages. Female participants in the current study—and indeed, all participants in the current study—preferred reflective orientations more frequently than normative values. Male participants in the current study were also similar to Kolb and Kolb's overall values with only a slight preference for the concrete experiential dimension. Both female and male participants in this study matched overall normative female and male averages in their location within the learning-style type grid (Kolb & Kolb, 2013b). Female averages tended to land in the Diverging (CE/RO) quadrant close to the x-y origin. Male participants—both in the current study and Kolb and Kolb's overall findings—landed in the Assimilating (RO/AC) quadrant also relatively close to the x-y origin.

Several factors related to gender in the current study should be considered when summarizing these results. First, only 18% of participants in the current study were male. Although gender was found to be a significant factor among dimensional values—and by extension, learning orientations—overall dialectical values were not found to be significantly impacted by the same gender lines. The small sample size might have impacted the dialectic—and potentially the dimensional—averages among all participants. On a larger scale, Iliff's (1994) meta-analysis of KLSI data found a significant difference between male and female AC-CE results and mixed results regarding overall dimensional values. Perhaps a larger sample size of high school violin students would yield clearer significance between dialectic orientations in addition to the already demonstrated statistical significance of the dimensional variables.

Mainemelis et al. (2002) suggested an alternative hypothesis regarding gender delineation along the prehension dialectic. They posited that a significant difference between genders along the AC-CE variable was "a result of the much replicated findings that women tend to be more oriented to experiencing while men are oriented towards conceptualizing" (p. 22). The high school participants in the current study might not have fully developed or have been exposed to gender roles to the extent that they impact learning style preferences. The lack of significance along gender and dimensional variables within the current study might, therefore, be contributed to a variety of factors including age—in addition to sample size, and other potentially unmeasured variables. Regardless, the results of the current study indicate that gender is a determining factor for learners' learning preference orientation and provides a potentially interesting contextualization for previous overall findings—particularly along the prehensive/grasping dimension. It is unclear why dimensional variables were significant along gender variables while dialectic variables were not.

Participant Educational Specialization

Kolb (1984) and Kolb and Kolb (2013b) identified educational specializations and professional careers as specific forces that impact individual learning preferences. In the current study, all participants were in public and private high schools and experiencing typical, generalized learning contexts. A great deal of Kolb's (1984) ELT is based on the impact that major experiences have on an individual's learning preference—particularly vocation and training expertise. Whereas most K–12 experiences aren't focused on a specific vocation or area of expertise, learners might begin to develop a proclivity towards skills or specialties that potentially influence their learning style. As supported by Kolb (1984), this study's pre-collegiate participants, therefore, were not impacted by factors specific to individual fields of study. Instead, composite averages of participants'

AC-CE and AE-RO scores can be viewed as dialectic preferences unaffected by external vocational or advanced social variables. The sole unifying—and perhaps noteworthy—factor these participants shared was their participation in an orchestra and dedication to the violin. Although these participants were high school students, they should be viewed as a specialized sub-group of high school students who voluntarily self-selected to participate, train, and perform in a string ensemble on the violin.

A comparison of this study's participants' mean AC-CE and AE-RO scores to other educational specializations and vocations yielded little overlap with other occupational areas (See Appendix L for educational specialization normative values). Kolb and Kolb's (2013b) reported composite averages in the Fine and Applied Arts field and Humanities did not necessarily align with the current study's participants. Participants' AC-CE scores were similar to two occupational fields: Education and Physical Education. Participants' AE-RO scores were not close to any reported composite educational dimensional averages—the nearest was Languages. In short, the violin performing participants' overall dimensional scores in the current study were not closely related to their related educational specialization based on overall comparisons to extant data sets.

Several participants' individual dimensional averages—CE, RO, AC, and AE—approached the normative values of Kolb and Kolb's (2013b) occupational specializations. The overall CE and AC scores for this study's participants were higher than any other previously reported composite average educational specialization. Participants' mean AC dimensional scores were also high compared to the overall educational specialization composite averages but was closest to several key vocations—i.e., Accounting, Architecture, and Computer Science and Information Science. The AE dimensional mean among participants was closest to the composite average of all educational specializations and was closest to Accounting, Engineering, Health, Medicine, Nursing, and Physical Education. Overall, the high school violin participants in the current study exhibited greater extremes across all four ELT dialectic dimensions than previously reported averages from specific educational specializations as reported by Kolb and Kolb (2013b).

Kolb and Kolb (2013b) also reported averages of CE, RO, AC, and AE dimensions as well as AC-CE and AE-RO scores according to educational level. Participants' AC-CE dialectic average was closest to the Primary and Secondary School participants. Composite participant averages from higher education—University, Master's, and Doctoral degrees—scored higher in that dimension indicating a greater preference for grasping via comprehension (AC) as learners progress deeper into their respective educational journeys. On the other hand, current participants' AE-RO dimensions scored lower than any other educational level. Specifically, Secondary School composite averages were notably higher than current study participants. According to Kolb and Kolb's (2013b) composite data across all educational levels, the AE-RO dimension was largely the same. The large difference between Kolb and Kolb's composite averages indicate that the current participants prefer to engage with transformation via intention (RO) more than the majority of other participants from previous ELT research. Current participants' AC-CE dimensional scores are in keeping with previously reported averages of students with similar levels of education. Participants' AE-RO dialectical scores, on the other hand, deviate from means previously reported by researchers (see Kolb & Kolb, 2013b for a summary of previous findings).

Mean LSI data among violinists in the current study did relatively align with Zahal's (2016) LSI data from string students. Although data were collected from a variety of college level musicians in Zahal's study—not just violinists—the composite LSI data revealed that string students preferred the RO/AC and CE/RO learning styles. This more closely aligns with participants' learning orientations from the current study who preferred Reflecting (CE/RO/AC) and Analyzing (RO/AC) profiles. Though Zahal's study used an earlier, four-vector LSI profile format—as opposed to the more recent, nine-vector delineations—those findings support those of the current study. In short, violinists—or more generally, string students—tend to prefer Reflective or Reflective/Abstract learning dialectics over other dimensions of the learning cycle.

Alternatively, an analysis of the relative frequency distribution of the current study's violin participants produced disparate results from Gumm's (2004) reported findings of similarly aged chorus students—the only other extant data of a similar subgroup under age 19 music students. Although the largest percentage of Gumm's participants preferred AC/CE learning profiles, the majority of the current study's participants preferred Reflecting (CE/RO/AC) or Analyzing (RO/AC) profiles. Indeed, Gumm's chorus student participants indicated preferences antithetical to the current study's violin participants. This might indicate that chorus music ensemble contexts encourage, create, or otherwise invite learning styles that emphasize the AE and CE dimensions of Kolb's ELT particularly as compared to violin ensemble members that similarly emphasize the opposing RO and AC dimensions. Alternatively, these contrasting results could indicate the relative volatility of high school KLSI results resulting in learning orientations representing greater extremes of the ELT cycle.

Descriptions of Participants' Responses to a Model

Across all responses to the Phase II modeled violin lesson, strategies applied throughout the lesson was an emergent theme among participants. I categorized these reflective and transformative strategies based on their alignment with Kolb's (1984) ELT cycle—CE, RO, AC, and AE—in order to address research question two concerning the ways in which students attempted to reflect upon and transform a modeled concrete experience. Kolb correlated similar strategies according to learners' application of unique styles of learning using the game of pool as an example. In the example, Kolb suggested that apprehension and extension (AE/CE—Initiating) combine to describe how a pool player might draw on contextual instinct rather than calculated theory regarding the positioning of the balls on the table. By relying on instinct and making small adjustments, that player is primarily utilizing the AE and CE phases on the ELT cycle. In the this reference, Kolb identified a specific billiards-related example as a means to explain the intersection of two dimensions of the ELT cycle and how a particular, hypothetical learner's behavior might be explained using those ELT phases.

To the best of my knowledge, there are no researchers studying music learners who have used ELT labels to identify strategy. Though Danyew (2015) utilized the ELT phases in a music education setting, the musical activities were still traditionally identified piano learning strategies. Kolb (1984) and Kolb and Kolb (2013b) provided a framework for how the ELT phases might be applied to more generalized contexts and conditions via specific learning style profiles and descriptions. These detailed descriptions depict generalized contexts and how individuals with that learning style might prefer to respond (see Appendix F for a concise list of such descriptions or see Kolb and Kolb, 2013b, Appendix 9). For example, Kolb and Kolb (2013b) suggested that individuals who prefer an Initiating (AE/CE) learning style, might rather act on experience and directly engage with the current context rather than consider alternatives or otherwise reflect. Using descriptions such as these—as well as additional qualitative depictions of individual learners—I was able to label specific strategies according to their relative location on the ELT cycle.

Across all participants, the most frequently used strategies were related to the Initiating and Creating learning styles. Participants also frequently used advanced, combinative Experiencing learning styles as compared to any other learning style strategy. These findings suggest that—despite average violin participant learning profiles indicating a preference for Reflecting orientations (CE/RO/AC)—participants were largely able to utilize strategies outside of their preference. A participants' learning profile is not a predictor of their behavior when presented with a specific task. Additionally, it is likely that the modeling task presented in the video lesson necessitated CE-related learning strategies regardless of the participants' learning orientation as supported in researchers investigating observational learning theory (see Carroll & Bandura, 1982). The most popular CE-related strategies included Pitch Identification, Listening, and Gesture Isolation.

Though modeling might have encouraged all participants to engage in strategies that included grasping via apprehension with greater than average relative frequency, participants also frequently used AE-based strategies. There was an overlap between these percentiles though participants incorporated AE- and CE-based strategies more frequently than strategies that included RO or AC ELT phases. In response to the modeled lesson, the violin participants preferred to apprehend and extend their learning activities. Though strategies utilizing reflective, intentional transformation were utilized often by participants, the opposing dialectic (AE) was used marginally more frequently. It should be noted that RO-based strategies—particularly reflective observation—might have been used in conjunction with more obvious strategies but were uncounted due to the prevalence of the more observable CE or AE strategy. This viewpoint is supported by neuroscience researchers Schenck and Cruickshank (2015), who attempted to reconcile obstacles such as cognitive load with the often-implicit nature of the ELT cycle. The overall data from participants, however, suggest a nuanced, complex, and often fluid learning cycle based on both observed and unobserved behaviors.

Participants utilized a variety of strategies across the ELT cycle despite their composite average KLSI profiles. Furthermore, overall qualitative data yielded no patterns or otherwise predictive data with regard to individual learning preferences and applied strategies. Instead, participants tended to largely experiment with strategic patterns or sequences until yielding positive results. For some participants (e.g., Maya (9/F/Imagining), Indira (9/F/Initiating), and Thelma (9/F/Thinking), these strategic patterns formed quickly and rarely deviated throughout the lesson. Other participants (e.g., Xavier (M/11/Experiencing), Mayu (10/F/Imagining), and Balah (11/F/Balanced) applied more fluid strategic approaches in response to specific tasks. As the lesson task difficulty increased, participants demonstrated mixed abilities to respond and increase their relative strategic complexity. These findings are supported by Wuyts and Buekers (1995), who found that individual learners' possibility processing capabilities differ and potentially directly impact their ability to respond to a visual and auditory model. For example, participants such as Indigo (12/F/Initiating) and Anaya (F/11/Analyzing) demonstrated increasing complex applications of strategies according to their individual needs particularly during the challenging fig. 3 portion of the lesson—a series of responses that were only possible due to their unique abilities, past experiences, or some other combination of variables.

Overall, participants made adjustments to their strategic response to both the modeled lesson and their own externalization of the modeled task. These strategic responses varied in terms of both their position on the ELT cycle and their developmental complexity. For example, fundamental, two-phase combinations of the ELT cycle strategies made up more than half of participant responses to the modeled lesson. Alternatively, the violin students utilized more complex, advanced strategies more than a third of the time. Although participants largely utilized fundamental strategies, advanced and balanced strategies were applied relatively frequently according to individual needs. Though few temporal patterns emerged from the qualitative data indicating how and when students might utilize these advanced strategies, the application of strategies of greater complexity indicates that these learners fluidly, organically, and often creatively generated unique responses to the model and their own playing in order to overcome specific challenges. Kolb (1984) supported such findings, stating that the more basic, fundamental strategic approaches are the starting point for how individuals differ in their interactions with an experience. Alternatively, the more advanced, combinative strategies are how individuals begin to innovate and truly develop their own relationship with the experience of learning. “The conscious focus of experience that is selected and shaped by one’s actual developmental level is refined and differentiated in the zone of proximal development by grasping and transforming it” (p. 146). All participants were able to utilize the advanced, secondary strategies because they were individually reflecting upon and transforming their own responses in addition to the static teacher’s model. The result of these individual strategies and outcomes, in turn, yielded ever branching experiences that interacted with the teacher’s model in distinctive ways requiring unique responses in a constantly evolving, constructivist progression of experiences.

Comparisons of Participants’ Responses to the Model

The extent to which students’ transformations and comprehensions align with, or potentially deviate from, teacher intent was also analyzed during Phase II of the study in response to research question three. During the modeled video lesson, participants were invited to perform concurrently with the model, after the model, or only during the necessary check-ups—any strategy, focus, or approach was welcome. Because of the open-ended nature of how students could respond, there was a wide variety of combinative transformations and comprehensions as a result of the modeled lesson. This variance among participants' responses—both their overt answers to interview questions as well as their tacit actions during the lesson—indicated that these violin students might fundamentally differ in their overall interpretations of both the teacher's explicit instructions and modeled performances.

During the interview portion of the study, several participants cited the manner in which the model demonstrated the subject material. The chunking method used by the teacher during the lesson in particular was reported by participants such as Theta (10/F/Thinking) and Mayu (10/F/Imagining) to help with their approach to the lesson. Other participants such as Thea (9/F/Thinking) mentioned non-performance, environmental features as large focal points during the teacher's instructions. These factors—coupled with internal factors such as stress, efficacy, and confidence—comprised the various self-reported areas of focus by participants after the modeled lesson. Participants' alignment, therefore, with the teacher's intent and direct instruction was mixed. Although many participants reported little deviance from teacher stated goals and methods, others reported that external and internal factors might have impacted how those students interpreted or otherwise attended to the model's instructions directly supporting Matthews (2014) who suggested that teacher intent is often independent of student outcome regarding modeling activities.

Participants also demonstrated variance with regard to their performance intensity following a modeled instance. After a modeled performance, participants were provided eight seconds of personal practice time to use as they deemed necessary. During this personal practice time, most participants were able to make a single attempt of the immediately modeled figure. Students also frequently utilized silent, reflective intensities. Overall, participants performed one to three repetitions in response to the modeled chunk during the majority of personal practice time. Perhaps due to the brevity of the personal practice time, participants performed more than four or more repetitions rarely. This variance among intensities indicates that, in response to a singular modeled event, these violin participants preferred to utilize at least three different performance intensities—none, low-moderate, or high. A teacher observing and responding to these participants might interpret such a variance—particularly the relatively high frequency of silent, reflective responses—as misalignment to their intended learning goals. Instead, each of these participants utilized various performance intensities to their own individual needs as a means to overcome teacher-modeled challenges throughout the lesson. These findings align with Cribari (2014) who found that low aptitude learners were continually focused on basic components of a modeled performance and were unable to conceptualize more complex performance aspects. These low aptitude performers, therefore, focused on and internalized components of the modeled lesson according to their own, self-determined goals regardless of any implicit or overt teacher modeled targets. Though aptitude was not measured during the current study, participants were similarly self-deterministic in their responses (such as intensity) according to their own unique needs. They did not often feel the need to align their own intensity to the model's rate of performance.

During the coding process, I identified five overall areas of focus that participants attended to throughout the modeled lesson: musical, left hand, lesson execution, right hand/bowing, and holistic observations. Participants spent the majority of time focused on musical components which was comprised of pitch identification, rhythm, articulation, dynamics, style, among other related focal points. These musical components were typically directly related to the lesson task wherein participants were attempting to interact with the modeled subject matter. As such, participants were aligned with teacher intent—in this case, the modeled lesson material—the majority of the time given the instructions to learn the piece by ear. Participants were able to incorporate supplementary focal points into their learning cycle in addition to these foundational musical components such as right and left hand-related details as well as holistic lesson execution factors. Although each of these areas of focus comprised less than 10% of all focus-related codes, it suggests that students were able to either (a) supplement fundamental musical focuses with additional, exploratory components; or (b) briefly pivot or expand their own learning cycle to incorporate these supplementary focal areas as a means to develop or problem solve modeled tasks. Although teacher-alignment was the most common response among participants, students occasionally (and for many potential reasons) explored novel avenues of learning or simply deviated from the prescribed task. Pedrosa de Jesus et al. (2006) found similar results among high school students who often tailored the complexity of learning goals according to context, task difficulty, and individual need. The researchers found that learners also expanded beyond the explicit learning goals and applied more complex, advanced learning strategies than set forth by the teacher's task. Within the current study, participants' brief extensions into adjacent—or even non-related—focal points suggest that educational context is more highly prioritized for high school learners than learning preference.

Aside from a focus on fundamental task components of pitch identification and rhythm, participants responded to the modeled task in a diverse manner. The next highest focal points—vibrato and intonation—each comprised a small amount of identifiable participant areas of focus. This dispersion indicates that, although the majority of participants' responses observed teacher
directives throughout the modeled lesson, just over a third of participant focal areas diverged from teacher expectations and intention. Indeed, the overall diversity of responses (ranging from the foundational components of bowing and technique to the advanced concepts of emotion and stylistic considerations) indicate that the violin participants frequently explored their own, more immediate learning needs. Qualitative data from participants such as Theresa (9/F/Thinking) and Rebecca (10/F/Reflecting) each focused on articulation and bow directions before they were able to correctly identify and match pitches from several figs. Again, although the majority of participants utilized some sort of internal hierarchy of task management that prioritized rhythm and pitch identification, interview data from participants such as Indigo (12/F/Initiating), Indira (9/F/Initiating), and Mia (10/F/Imagining) demonstrated that focal areas such as articulation, bowing technique, and dynamics were incorporated into the learning sequence despite each of these participants' difficulty with the modeled tasks. These results are potentially in contrast with Cribari (2014) who found that low-aptitude learners were unable to effectively attend to more complex and abstract musical performance components. In the current study, participants demonstrated varied

hierarchies of musical components, sometimes eschewing fundamental performance focal points to attend to more complex musical aspects.

Comparisons of Participants' Responses to Each Other

Participants in the current study each represented three subgroups: high school grade level, gender, and Kolb's (1984) LSI profiles. Kolb's Experiential Learning Theory is based on a balance between dialectic states of transformation (AC-CE) and grasping (AE-RO) which suggests that individual learners might differ in their ability to adapt to and organize specific learning scenarios based on their preference for particular phases of the ELT cycle. As reported by Kolb (1984), Mainemelis et al. (2002), and Kolb and Kolb (2013b), factors surrounding gender and age level impact learners' balance of transforming and grasping dialectics potentially independent of KLSI data. In order to explore research question four regarding how students' grasping and transformation of a teacher's model vary in cognitive complexity from one another, I compared their responses to the model along gender, grade level, and LSI profile data.

Participant variability among approaches was the clearest delineation among how the violin learners diverged from each other. Several sub-groups comprised the larger approach coding category including concurrency (i.e., along with or independent of the model) and the location and means of how participants performed during the lesson. Throughout the study, the violin students chose to perform with the model (concurrently) just over half the time. Qualitative data indicated that these concurrent performances with the model often varied in both process and outcome. Even when participants utilized similar approaches, their individual goals and learning outcomes produced wildly differing outcomes indicating that concurrency is a poor means of comparison even among learners in identical modeling contexts. General trends did occur as a result of the natural flow of the lesson and accumulating difficulty level but individual approaches remained contextually-based according to participants' specific needs and ability both as a performer and a holistic learner. Weidner (2018) supported such an autonomous and student-centered pedagogical philosophy when attempting to address the multiple viewpoints, needs, and backgrounds within a single music ensemble. As a contextually-based learning construct, Weidner highlighted the decision-making process inherent to modeled performance as a crucial component of the learning cycle.

Throughout the lesson, participants applied their bow more than any other modality. This is unsurprising: The model performed with the bow for the entire duration of the lesson. Any deviation from this performance modality indicates participants' willingness to incorporate external strategies in order to either (a) better serve their own individual learning needs, or (b) experiment with modalities outside of the modeled bowed exemplars in order to overcome particular challenges. However, a great deal of variety existed among participants utilizing identical bowed applications as seen by Mayu (10/F/Imagining) and Rebecca (10/F/Reflecting). Such variety towards an end goal was supported by Haddon's (2014) findings, which suggested that learners' self-reported responses differed regarding how they learned in a musical observation context despite a clear and unified understanding of the ultimate lesson targets. As such, two learners might be utilizing a bowed application in pursuit of an identical goal yet display an incredible diversity of observation, conceptualization, or externalization schemata.

Similar to approach, participants' applications provide an incomplete means of comparing learners due to the incredible variety existing among how learners utilized these performance modalities (e.g., bowed, pizzicato, shadowbow) as a means to interact with the modeled task.

Whereas approach and application provided only a partial means of understanding how learners differ in their grasping and transforming dialectics, a more direct comparison among LSI, gender, and grade level variables provided further holistic and increasingly richer comparisons of learners' variance and depth along Kolb's (1984) dialectic dimensions. Several specific comparisons throughout the lesson indicated unique overlaps among participants according to those variables. Ultimately, these overlaps indicated that variance among participant responses was far more frequent than the temporary, convergent patterns of responses reported in Chapter 4 among two or more participants. The above vignettes, interviews, and examples demonstrate that within a given modeling context, there is an incredible amount of observable and unobservable activities occurring on a moment-to-moment basis even when participants utilized similar or identical approaches. Kerns's (1991) findings supported this understanding of modeling's complexity—and by extension the learner outcomes and responses as a result of that modeling. Although modeling might have an effect, the observer is receiving incomplete information due to a variety of unseen components inherent to that task. To be sure, in a musical context, these invisible components are myriad. This understanding is tempered by Armstrong and Mahmud (2008), who suggested that learners that demonstrate higher levels of all four learning dimensions are able to respond to the tacit knowledge inherent to activities such as modeling because of their increased adaptive flexibility to a wider variety of contexts and experiences. Such a connection between LSI profile and success, variety of application, or diversity of response was not holistically found in within the current study.

During the opening portion of the lesson, participants were provided with identical instructions and then heard the model perform the entire melody. Though it can be assumed that each individual learner entered this context with vastly differing experiences, abilities, and systems of understanding, this initial part of the lesson is prior to learners' branching or developing strategies. As such, it served as a means to best view participants' strategies as a direct outcome of their learning preferences rather than any contextual factors or influences. Recursive investigation of this opening sequences among participants' dialectic preferences indicated that LSI data might have been an indicator of specific, uncommon strategies among several participants. It should be noted that any overlap between unusual responses and a participant's learning preference was most likely circumstantial and not clearly linked to any specific dialectic preference. For example, Mayu (10/F/Imagining) utilized a unique combination of humming (AC/AE/CE), a reference pitch (AE/CE/RO), and pitch identification strategies (AE/CE) despite preferring CE/RO learning phases. Her dialectical preferences are not predictive of her initial responses to the lesson. This is supported by several ELT researchers (Kolb & Kolb, 2013b; Kolb, 1984; Rubie & Stout, 1991). Kolb (1981) stated that "danger lies in the reification of learning styles into fixed traits, such that learning styles become stereotypes used to pigeonhole individuals and their behavior" (pp. 290–291).

The KLSI is a useful descriptive tool, however. The non-conforming behaviors of these several students during the opening portion of the lesson can be better explained by their overlapping dialectic preferences within the ELT cycle. Furthermore, subsequent qualitative data within the same, initial portion of the modeled lesson indicated that these learners were simply using a preferred learning strategy as a means of pursuing an individualized learning need—even at this early stage of the lesson. These participants' divergent approaches and strategies were not seen in learners with identical learning preferences. This indicates that although individual dialectic preferences might explain behaviors, they are not predictive of those behaviors—a view that serves as a fundamental component of the LSI and ELT according to Kolb (1984). Learning preference, gender, and grade level provided a great deal of combinative insight into individual learners' processing but served as an incomplete means of understanding how learners vary in their strategic variety and complexity.

An analysis of how participants developed and shifted their strategies in response to the model later in the lesson further compounded the lack of insight provided by learning preference, gender, and grade level variables. Similar to the above conclusions regarding the opening sequence of the lesson, KLSI data provided a great deal of insight into why learners might pursue specific strategies over others. For example, the Thinking learners (Theta, Thelma, Theresa, and Thea) occasionally demonstrated moderate alignment in both strategic and complexity of response due to a temporary need for each of these learners to construct internal conceptualizations of the modeled task. However, these exceptions were certainly not the norm. Throughout the lesson, comparisons among participants of the same—or even directly contrasting—learning preferences yielded limited alignment. The overlaps that did occur can be explained using an understanding of how those learners grasped and transformed specific contexts. Just as frequent, however, are the scenarios wherein participants with a specific learning preference chose strategies, applications, or approaches that differed from their learning preference.

Of note across all participants' responses are the diversity of complexity in responses to the modeled lesson. Gender and grade level qualitative comparisons yielded similarly casual alignments. While Xavier (the lone male Phase II participant) occasionally aligned with the other female participants, disparities among participants cannot be attributed to gender alone. A comparison of qualitative data along the grade level variable yielded moderate holistic alignment. As a whole, Grade 9 and 10 participants demonstrated only moderate growth and complexity of their learning strategies as the lesson progressed. Indeed, they mostly adhered to their initial strategic responses with only moderate variance while the lesson's difficulty steadily increased over time. The 11^{th} and 12^{th} graders, by contrast, seemed to identify the increasingly challenging lesson material and, for the most part, adjusted their strategic tactics accordingly. These findings once again support Pedrosa de Jesus et al. (2006), confirming that high school learners fluidly apply phases and combinations of the learning cycle according to context, task difficulty, and need. The current study expanded upon this important understanding, however. These 11^{th}- and 12^{th}-grade participants within the current study continued to develop and refine their strategies in contrast to how the younger participants were unable or unwilling to evolve along with the task difficulty—

demonstrating that age, previous experience, or some other developmental facet might impact adaptability or flexibility regarding possibility processing structures.

The qualitative comparisons indicate that individual participants' complexity is, at least in part, described by an intersection between grade level and KLSI data. The data also indicate that, in addition to learning preference and grade level, individual learning needs specific to context is a major factor explaining how learners differed in their grasping and transformative complexity. This is supported by Stutsky and Laschinger (1995) who posited that the most adaptive and effective learners are capable of responding to individual learning contexts with the appropriate modality and dialectic according to both the situation and their individual needs. As such, although KLSI, grade level, and gender are adequate descriptors and starting points to understand why learners might differ in their grasping and transformations of a single modeling experience, additional determinant factors could include specific learning contexts and individual short-term and long-term needs.

Recommendations

The following limitations, threats to validity, implications, and recommendation for future research are based on the above discussion in addition to recursive reflection of the procedures and results.

Limitations of Study

This study aimed only to determine if there were differences in how high school violinists reacted to a modeled task. If this study were replicated using a different instrument or age group, the results might vary. This study was designed to determine how students differ in their interpretations of a modeled task. When processing qualitative transcript data, I ignored components such as experience level, performance level, and proficiency. Though future researchers might consider performance ability as a means to delimit participants when observing reactions to modeling, I determined that relevant variables should be limited to those related to Experiential Learning Theory (Kolb, 1984). While I used Kolb's Learning Style Inventory to delimit the approaches learners might utilize when encountering novel educational contexts, other methods (e.g., the Myers-Briggs Type Indicator, the Gordon Musical Aptitude test, or the Minnesota Multiphasic Personality Inventory) could be used to delimit students' baseline tactics when learning new skills or otherwise provide context to describe behaviors.

This study was performed in high schools in the Delaware, Pennsylvania, and Maryland area and is limited to the cultural and societal constraints of those areas. Researchers should exercise caution when generalizing the results of this study to other populations. As with most empirical research dealing with students, much of the interview and recorded data was based on the interpersonal relationships that I fostered with the participant. Despite my steps to put the participants at ease in this one-on-one context with previous visits and conversation, I was not these students' teacher, the modeling videotape also featured an unfamiliar person, and the context of the lesson and subsequent interview may have felt unusual. These feelings may have contributed to some abnormal responses or guarded behaviors during the qualitative component of data collection.

The outcomes of the LSI 3.1—as with all other variants of the KLSI—are a result of participants' self-reporting. It requires participants (in this case, high school students) to be aware of their own learning habits and think critically about how they perceive and respond to various learning contexts. Veres et al. (1991) found that very few participants changed their learning style during an eight-week period. However, Rubie and Stout (1991) found that, when re-tested, just under half of students changed their learning style grouping. Kolb and Kolb (2013b) suggested that the results of the LSI are highly contextual and perhaps intrinsic to the nature of the test itself (Mainemelis et al., 2002).

Although Kolb's (1984) ELT is a framework to better understand and appreciate the inner processing of learners, the current study remained highly dependent on contextual understandings of student thought—before, during, and after the reflective or conceptualizing instance. Even by triangulating this contextual data with student interview data, it is impossible to truly understand how and what individual participants were doing during reflective or passive instances. Kolb's (1984) ELT is also merely a theoretical lens to interpret and delineate student responses. Student responses—both during the KLSI 3.1 in Phase I and the interviews in Phase II—are highly contingent on participants' understandings of their own inner processes. As seen in aggregated research by Kolb and Kolb (2013b), younger learners might be less capable of intrinsic review and yield skewed results. The current study, however, was focused on investigating how students interpret and internalize a model. Although confirming the fluid nature of younger learners' intrinsic understandings of themselves is a noteworthy finding, the principal focus was on the diversity of student responses to a single modeling experience.

I did not gather performance ability data prior to, during, or after the study. Any codes or mention of student performance skill, success, or failure was a result of data collection focused on the effectiveness of a specific student response. My intent was to determine the diversity of ways in which string students interpreted and internalized a modeling instance rather than their performance skill impacted such an activity. Within a given string classroom, students possessed a diverse array of ability levels impacted by innumerable factors. This study was designed to bypass those variables to investigate how individual learners respond through the ELT framework.

Throughout the study, several factors limited participation. In the initial recruitment stage, I contacted the principals and orchestra directors of 38 high schools with string programs within a 50-mile radius of my geographical location. Just under half of the schools never responded to the three recruitment invitations. Those that did reply but declined all cited the overworked nature of their educators or programs. Participation for Phase I of the study was, therefore, slightly lower than I had intended at the onset of the research. In between Phase I and Phase II, however, the COVID-19 outbreak forced all of my research sites to shut down in-person learning. Because of this, my Phase II research procedure had to be adjusted. Once I was finally able to resume data collection, I—and several of the participants' directors—had limited or no contact with many of their students. Whereas my original research design was to collect Phase II data from a matrix of participants representative of the three variables (gender, grade level, and learning preference), I accepted any and all participants that were willing to sit on Zoom with me. Phase II data, therefore, was limited to volunteers in the months immediately following the COVID-19 shutdown in 2020, which resulted in several participants that had identical gender, grade level, and learning preference demographics. I decided that the Phase II participants—even with overlap among variables—would be sufficient to compare learners' responses to a modeled violin lesson.

During Phase II, only a single participant represented the male gender variable. Though there were more male participants in Phase I (n = 18), only Xavier agreed to Phase II data collection. This disparity is notable as compared to female participants between Phase I and Phase II. ELT researchers (Boyatzis & Mainemelis, 2010; Brew, 2002; Hickcox, 1991; Kayes, 2005; Kolb & Kolb, 2013b; Kolb, 1984) have identified gender as a variable that impacts dialectic orientation. This suggests the possibility that learners of one gender or another might utilize specific orientations either empirically or casually. Though a single data point, such as Xavier, might yield unreliable comparisons, I decided to include the sole male viewpoint as a means of juxtaposing participant responses along gender lines. As a means of qualitative contrast, Xavier's data provided unique insight into behaviors and responses.

Xavier also represented the only Experiencing (AE/CE/RO) learning style in Phase II. I included a comparison of his responses to other participants as a means to both delimit the descriptive qualitative data along learning style and gender variables and to include Xavier's unique interactions. However, as a single data point representing the male gender variable in Phase II, Xavier's responses cannot be viewed as empirically indicative of how other male learners might respond to a similar model. Instead, his responses provide greater insight into the remarkable variety of how different learners interpret and internalize a violin model.

Threats to Validity

As mentioned above, COVID-19 required rapid changes to my data collection procedures—all reported and approved by the BU IRB. Most notably, I was no longer able to meet with students in person in order to develop rapport for the Phase II portion of the lesson. Instead, my Phase II data collection was relegated to Zoom. Students expressed anxiety before, during, and after Phase II data collection; they were now performing in response to a videotaped violin lesson on a device in their home. Though participants did not specifically mention the digital format as a source of their anxiety, I felt that the novelty of the data collection task only compounded feelings of isolation that might have manifested as a result of the quarantine and digital learning experience. Despite the informal setting, there were many variables I could not control that might have impacted student responses both musically and during the interview. I determined that I would record and code overt instances of anxiety in order to determine if student responses were impacted by their nervousness.

Implications for the Field of Music Education

Researchers have largely disagreed regarding the effectiveness of modeling in a music classroom. Although researchers such as Henley (1999), Linklater (1997), Dickey (1991), and Sang (1987) found largely positive effect sizes comparing modeling and non-modeling conditions, researchers such as Haston (2004), Morrison (2002), Woody (2006), and Quindag (1992) were unable to conclude that modeling resulted in significant positive results in student performance. Conventional, teacher-focused modeling methods and research might be unable to attribute consistently positive and significant impacts on student performance because students simply interpret and internalize models in fundamentally different ways. Data from this study indicate that student responses to a single model can vary in strategy, application methodology, intensity, approach, modality, and focus while resulting in vastly different outcomes. Researchers and music educators may therefore need to consider the myriad ways in which students experience, reflect upon, conceptualize, and act upon models in order to accurately measure how even a single teacher's model impacts both the classroom at large and individual student performance.

Although patterns emerged among both applied strategies and areas of focus, it was clear that each participant had unique needs both internally and externally. In short, each participant learned differently from the model because their actions varied due to their internalized learning needs and preferences. Cribari (2014) drew similar conclusions regarding far more specific components of modeling stating that "students who are overly focused on the physical aspects of recorder performance may be prone to performances that are less musical by failing to audiate the very music they are attempting to create" (p. 15). For Cribari, factors—such as musical aptitude—force some learners to focus on fundamental components of musical performance and bypass other, possibly more salient, components of the model. Additionally, the lack of technical skills might result in similar misalignments between student and model. For the current study, the qualitative data among the violin participants suggest that there are factors beyond executive skills and musical aptitude that impact how effective modeling might be. Moreover, those factors result in variations among the ways that learners applied the aforementioned strategies, approaches, applications, modalities, etc.

When those factors are compounded by previous experience, student responses to a model encompass myriad possibilities. Music educators and researchers may, therefore, need to understand and account for the possibility that learners will deviate from expected responses to a model. Modeling is, after all, shown to be an effective means of conveying complicated musical components and meaning. As Dickey (1992) wrote:

> Music discriminations are not effectively taught through verbal description. For example, students do not learn to discriminate between timbres by being told that sound are rich or bright or thin; kinesthetic response cannot be improved through discussions of tempo, meter, and subdivision… It is necessary to provide a series of models, and opportunities to imitate those models, in order to facilitate increased music discrimination abilities. (p. 37)

Because of the complex nature of modeling (there is always an immense amount of information conveyed in the tacit act of music modeling), learners will differ fundamentally in how they respond. The above qualitative depictions of violin participants provide an example of how those responses might differ within a string classroom.

In order to manage student responses, it may be important for teachers and researchers to be explicit and clear in what students should attend to during a teacher's model. Matthews (2014) agreed when comparing learners' responses to rhythmic modeling recommending that band instructors be explicit regarding learner focus before modeling an example. By differentiating (or at least appreciating systemic learning differences) among students regarding ability and goals, band instructors might consider the appropriateness of a specific modeling strategy. For example, modeling musicality or stylistic components before learners have grasped rhythmic or pitch components might yield diverging outcomes among performers. My study's data indicated that learners indeed prioritized their own learning needs over the goals of the teacher. Because of that, music educators are recommended to ensure that fundamental skills—such as rhythmic and pitch accuracy, intonation, and technique—are well established prior to modeling for more advanced music components such as tone, musicality, bow direction, dynamics, articulations, or more advanced technical considerations. Ineffective modeling instances potentially arise when learners interpret and internalize modeled components according to their own individual needs without the necessary fundamental skills.

Implications for the Field of ELT Research

A great deal of Experiential Learning Theory research has been compiled and disseminated through Kolb and Kolb's various manuals as a means to support and contextualize the Learning Style Inventories (see manuals published in 1976; 1985; 1999; 2011; 2013b). The consistently updated manuals and databases at the Institute for Experiential Learning, and ELT research surveys by Iliff (1994) and Hickcox (1991) serve as a compendium for research conducted using Kolb's (1984) ELT as a theoretical framework. Aside from Gumm's (2004) research on middle and high school chorus students, there has been no research regarding the LSI in secondary school music education. Data presented by Gumm—combined with data from Phase I—suggested that smaller subsets of learners under the age of 19 present might yield data that contradicts aggregated data presented by Kolb and Kolb (2013b), for example. Though Kolb (1984) posited that educational specialization impacts how learners prefer to engage with experiences, these variables do not seem to impact learners under the age of 19; they have not yet had time to be influenced by external factors such as these. Instead, other variables (e.g., social groupings, family connections, recent experiences, or available opportunities) might be more significant factors in learners under the age of 19.

Two potential explanations reconcile how data from Gumm (2004) and this study contradict aggregated KLSI data from Kolb and Kolb (2013b):

1. The learning preferences of learners under the age of 19 is highly fluid and contextual; or
2. Certain experiential contexts such as music education classrooms attract, maintain, and potentially reinforce specific learning preferences for learners under the age of 19.

These explanations, although not mutually exclusive, are supported by both theoretical (Kayes, 2002; Kolb, 1984; Kolb & Kolb, 2013b; Kolb et al., 2000) and empirical (Boyatzis & Mainemelis, 2010; Hodges, 2010; Mainemelis at al., 2002; Zull, 2002) researchers.

Using Dewey, Lewin, and Piaget's work as a theoretical basis, Kolb's early conception of the LSI was designed to pick up where Piaget's cognitive development stages end. Kolb (1984) initially reported LSI norms for learners ranging from age 18 to 60 as a basis for establishing validity and reliability of the inventory. Initial data from these norms seems to confirm Piaget's (1971) developmental theory suggesting that learners below the age of 18 are still manifesting systems of assimilation and accommodation in response to experiences. Later LSI manuals (Kolb & Kolb, 2013b; Kolb, 1999, 2005) present learning style data as a means of showing the trends in the development of the two diametric poles along age variables.

Several ELT researchers, such as Boyatzis and Mainemelis (2000) and Kolb and Kolb (2013b), have conducted research on how learning preferences and ELT components are represented in specific subsets of populations. Normative values vary among populations along variables such as educational specialization, job role, and level of education as well gender, age, and culture. The lone empirical ELT research conducted in the field of music education (Gumm, 2004) yielded data that mildly deviated from Kolb and Kolb's (2013b) norms of learners under the age of 19. Data from this study also largely varied from the reported normative values of learners under the age of 19. Participants in the current study represent a very small subset of learners—and values are, therefore susceptible for variance based on the small population size—yet indicate that subsets of learners under the age of 19 might vary more widely than other age populations. ELT researchers studying population groups under the age of 19—particularly if they represent specialized subsets of larger populations—should exercise caution when comparing aggregated LSI data against previously reported norms.

Recommendations for Future ELT Research

Based on the data from this study, the following recommendations are salient to the fields of Experiential Learning Theory research. Subset alpha reliability coefficients of specific ELT cycles were low as compared to previous research norms established by

Kolb and Kolb (2013b). Future researchers may want to further investigate the alpha reliabilities of ELT phases among learners under the age of 19 in order to determine if the KLSI is an appropriate device for high school students. Investigators could consider both the appropriateness of the KLSI for high school students as well as the potential reasoning for why alpha reliabilities may be low among high school learner's ELT dimensions. Qualitative data from this study suggested that participants had a tentative grasp on their own internal schemata, particularly in hindsight. Future researchers might consider that the KLSI is a self-reported inventory and explore the effectiveness of such assessments for younger learners. Specifically, the nature of the KLSI as a self-reported inventory required high school student to reflect and rank their responses—a task that might have been unintentionally challenging and therefore less accurate than for older participants.

Although participants in this study demonstrated an overall propensity for the RO phase as compared to previously reported by both overall and age-specific norms, additional data are needed to determine if this preference is unique to the sub-group of string (specifically violin) students. Future researchers might consider the multitude of variables impacting high school students that potentially substitute for Kolb's (1984) implications regarding education specialization. Additional—and more diverse—data are needed that accounts for how various learning contexts impact high school students' learning preferences. These additional data might reconcile the period of time between the end of Piaget's cognitive developmental theory and the start of Kolb's (1984) Experiential Learning Theory.

In this study, grade level (e.g., age) and KLSI learning preference indicated a large effect size. Kolb and Kolb (2013b) reported similar results along gender-related variables. Data from this study indicated only a moderate effect size between gender and KLSI preferences as compared to previous researchers' findings, particularly along the AC-CE dimensional dialectic. Future researchers might investigate how variables reported by Kolb (1984) that impact learning preference (age, gender, educational level, educational specialization, and culture) influence learners under the age of 19.

Recommendations for Music Education Research

The following recommendations are relevant to the field of music education. Modeling researchers have largely been focused the effect size of modeling in various contexts. Future researchers might explore the variability among learners in response to a model in order to further describe—and potentially anticipate—how students' responses might diverge from lesson goals or expected behaviors. Furthermore, future modeling researchers, when exploring modeling effect size, may need to consider potential variance among learners' interpretations and internalizations as a factor impacting the delivery of the model itself. More specifically, rather than exploring how modeling impacts learners, researchers might pivot to explore student-centered investigations utilizing more constructionist epistemologies.

Data from the current study suggest that modeling functions vastly differently for individual learners based on variables that are only partially described here. This study delimited variables to only grade level, gender, and learning preference based on Kolb's (1984) Experiential Learning Theoretical framework. Other researchers have considered and posited the significance of both musical and non-musical skills. Cribari (2014) posited that musical aptitude (as determined by Gordon's (1995) MAP inventory) impacts how learners reflect or fail to reflect upon modeling instances. Alternatively, McPherson (2005) posited that proficiency with visual skills (e.g., observing a modeled performance via sight) is an important variable impacting learner response to a model. Undoubtedly, future researchers must continue to explore, compare, and analyze the impact of additional variables on learners' responses to a model.

This study utilized Kolb's (1984) ELT as a basis to better depict and understand violin students' internalizations and interpretations in response to a model. Future modeling researchers could build on the qualitative depictions of violinists' responses to a model by investigating other string instrumentalists or by branching out to consider band and vocal students. It is unknown if responses from participants in the current study are distinctive to high school violinists or can be generalized to other sub-groups of high school instrumentalists.

Finally, this study established that learners do respond to a teacher's model in fundamentally different ways. Future researchers might consider that a particular teacher's model—while effective due to consistency of performance, high level of quality, and timeliness—fundamentally differs from a student or peer model. It is recommended that researchers compare student and teacher model effect sizes as well as consider the social implications of modeling in group settings—a consideration unaccommodated for in the current study.

Conclusions

To investigate how high school violin students differ or align in their interpretations or internalizations to a modeled violin lesson, I compared their various strategies, approaches, applications, and responses using Kolb's (1984) ELT as a framework to better understand how individual learners might interact with a model. Previous researchers have fundamentally disagreed on the effectiveness of modeling and its impact on student performance (Anderson, 1979; Cribari, 2014; Haston, 2004; Morrison, 2002; Quindag, 1992; Woody, 2006; Zurcher, 1972). Rather than focus on how teachers apply modeling in various classrooms, I sought to determine if and how students differed with regard to the manner in which they experienced modeling in a string classroom.

Phase I Data: Kolb's Learning Style Inventory

Aggregated quantitative data from the violin participants in Phase I did not align with much of the extant findings from previous researchers (Iliff, 1994; Kolb & Kolb, 2013b; Mainemelis et al., 2002; Kolb, 1984) regarding learners under the age of 19. The extremely narrow focus on high school violinists within an experiential context that potentially reinforces a unique combination of learning preferences could explain deviations from researchers who focused on broader populations. However, these findings relate to previous results from Highhouse and Doverspike (1987), who posited that artistic endeavors tend to encourage concrete experiential learners. The reflective, visual, and aural nature of string playing (particularly violin playing) might further encourage reflective observation rather than active experimentation due to the myriad technical and musical skills needed to play an instrument. Rather than the AE/CE preferences found by Gumm (2014) in choir students, the experience of a string classroom—as opposed to a chorus classroom, for example—creates a different recursive environment that reinforces CE/RO skills.

Overall composite scores of individual dimensional averages (CE, RO, AC, and AE) were close to or higher than all previous results (see Kolb & Kolb, 2013b for a review of findings). However, the AC-CE dialectic average was similar to composite averages of Primary and Secondary School participants. The AE-RO score was notably lower than all other age groups and educational levels. Gumm (2014) found that choir students' learning preference—particularly along the transformative, reflective/active dialectic—changed rapidly throughout middle to the end of high school suggesting that these younger students were highly malleable with regard to their individual learning preferences.

The overall internal reliability for the current results were similar to Kolb and Kolb's (2013a) KLSI 3.1 alpha values. Individual dimensional reliability levels were also all below previously reported alpha values, particularly that of the AC dimension. Gumm (2014)—who also reported similarly lower than average alpha reliabilities utilizing a similar under 19 age group of musicians—attributed the lower reliability level to the fact that completing the LSI ranking tasks was too complex for high school students. In the current study, however, only a single participant's results were discarded; they failed to rank answers 1 through 4. This suggests overall reliability might be lower among high school students due to their rapidly shifting learning preferences, often disparate learning contexts, or some other combination of variables. Kolb (1984) stated that the KLSI was designed to be self-descriptive in nature. Namely, self-reporting would result in more descriptive behavioral depictions than performance tests. High school students might be less able or willing to identify their own proclivity to conceptually abstract and function internally. They might simply know or understand less about their internal and intrinsic processes at this particular stage of their learning journey. As such, the LSI might be a less appropriate means of determining learning preferences for high school students.

Alternatively, gender and ELT dimensional interactions yielded results similar to previous ELT researchers (Iliff, 1994; Mainemelis et al., 2002; Kolb & Kolb, 2013b; Kolb, 1984), specifically the individual dimensional orientations. The results of the current study, however, yielded tempered results with regard to the AE-RO and AC-CE dialectics along gender and grade level interactions. Kolb's ELT (1984) provided a framework to better understand how individuals accumulate and respond to learning contexts based on their experiences. Mainemelis et al. (2002) summarized how gender specifically impacts learning preference stating that female learners generally adapt more fluidly to a wider variety of contexts than male learners. Moreover, female learners are also more likely to display a balance between AE-RO and AC-CE dialectics due to cultural or environmental factors imposed on them throughout life. Disparity among dialectical results in the current study indicated that there might have not been enough time for those experiences to significantly influence participants' learning preferences in a specific direction.

Overall, the KLSI data above support previous Kolb (1984) and Kolb and Kolb

(2013b) findings, suggesting that the ELT is a system of better understanding how individuals interact with learning contexts as well as how those learners might grow and adopt novel systems of interacting with experiences in the past, present, and even future. Kolb (1984) described the developmental theory inherent to the ELT as a three-stage process wherein learners individually manifest acquisition, specialization, and integration functionalities within specific areas of the ELT cycle and their larger learning preferences. Although Boyatzis and Mainemelis (2010) described additional adaptive or growth-centered modes of performance, learning, and development, recent researchers (Kolb & Kolb, 2013b) suggested that learners' developmental process is far more fluid over the course of an individuals' life—developmental progression and regression can occur in equal measure.

It is safe to say that within a single string classroom, there would be a multitude of developmental modalities as well as learning preferences—despite the previously mentioned narrow sub-population of music performance learning contexts. As such, and perhaps because of, the fluid process of experiential development, educators might consider designing "educational programs in a way that teaches around the learning cycle so that learners can use and develop all learning styles in a way that completes the learning cycle for them and promotes deep learning" (Kolb & Kolb, 2013b, p. 35). Kolb and Kolb's imperative is perhaps even more crucial at the high school stage where students are still developing their learning preference in order to create more holistic, well-rounded learners capable of diverse responses to learning experiences.

Phase II Data: Understanding Student Responses to a Model

Kolb's (1984) ELT functions as a framework to better understand how learners process specific experiences and build upon their understanding and own responses within the context of these, and possibly other, experiences. The modeling activity during the current study provided opportunities for participants to react in a variety of ways; they were instructed that there was no wrong way to learn the modeled piece. Popular responses included concurrent performances with the model (AE/CE), listening (CE/RO), quiet reflection (RO/AC), and trial and error (AC/AE). Overall, the qualitative data suggested an incredible diversity of techniques among participants regarding their individual specific responses to the modeled lesson. Three salient points emerged from the qualitative data:

1. Participants prioritized individual learning needs over learning preferences;
2. The diversity of participants' responses as a result of a single modeling experience suggest that modeling gestures are often misinterpreted by students; and
3. The manner in which learners utilize a modeled performance varies a great deal from each other.

Participants Prioritize Individual Learning Needs Over Learning Preferences

Composite dimensional comparisons of KLSI data in the current study indicate that the majority of participants preferred the Reflecting dimension, and to a lesser extent, the RO/AC and CE/RO combinative dimensions. However, strategies used among all participants in the study indicated that participants utilized AE/CE strategies with the greatest frequency—a finding in keeping with Gumm's (2014) suggestion that music performers most often utilize the AE/CE quadrant of the ELT cycle. During the act of learning violin performance via a videotaped model, I saw many participants apply reflective or abstracting activities.

Despite several notable disparities regarding the representation of LSI profiles between Phase I and Phase II (as discussed in the limitations portion above), there is an obvious discrepancy between almost all applied strategies and participants' learning preferences in Phase II. Whereas no learner would apply their own preferred learning strategy 100% of the time (Kolb, 1984; Kolb & Kolb, 2013b), the differences in relative frequency suggest that the participants were frequently choosing and applying strategies outside their own learning preference. A modeled violin lesson might require specific AE/CE/RO, AE/CE, or CE/RO strategies more often than other strategies. For example, participants applied concurrent performances focused on pitch identification (AE/CE) far more frequently than singing (AC/AE/CE) or even trial and error (AC/AE) strategies. Again, the very nature of the lesson (where only eight seconds separated modeled performances) might have precluded the ability of participants to extend their internal understanding of the melody through trial and error.

Regardless of the nature of the modeled lesson—which might prioritize CE and the adjacent learning dimensions—participants frequently experimented with and applied strategies outside their preferred learning modality. When observing the composite qualitative data, few patterns emerged that allowed me to predict learner behavior based on individual learning preference. Kolb's ELT is clear on the specific non-predictive nature of the ELT and KLSI. Kolb and Kolb (2013b) stated that the LSI was designed mainly as a tool to validate the ELT as a theoretical framework. Additionally, the LSI was designed as a tool for self-analysis and as such "is not intended for use to predict behavior for purposes of selection, placement, job assignment, or selective treatment" (p. 40). On this final point, Kolb (1984) was particularly adamant, stating that LSI data should only be predictive as a means to align with the ELT framework. According to these researchers, learners should apply strategic modalities closely related to their learning preferences as much as possible. The results from the current study suggest, however, that other factors are at work. As such, the KLSI profile data from Phase I served as a valuable framework to contextualize participants' responses throughout Phase II data collection—at least as a starting point in order to consider both externally observed and tacitly implied internal responses.

Alternatively, Dorca et al. (2012) argued that specific, single modalities of learning are insufficient for all learners. Learning is highly contextual and requires learners to adapt to a variety of ways according to myriad factors—factors that differ even from moment to moment depending on the experience. On this, Kolb and Kolb (2013b agreed. Citing the non-deterministic nature of learning, Kolb and Kolb outlined several roles that teachers can and should adopt in order to facilitate student access to all four ELT cycles rather than focus on any specific pair. The participants in the current study demonstrated that their own shifting needs—as described in Chapter 4's examples of student responses—were far more salient than a learning preference when responding to the performance model. The static modeling experience, therefore, served only a single role and was sufficient as only a supplement to other educator's positions—facilitator, expert (modeling), evaluator, and coach.

The Diversity of Participants' Responses as a Result of a Single Modeling Experience Suggest that Modeling Gestures May Be Often Misinterpreted or Otherwise Ignored by Students

Viewed as a whole, the above depictions of participant responses provide a sample of the myriad ways in which learners might interpret and internalize a single teacher model. These qualitative examples aligned with Matthews's (2014) assertion that students and teachers often utilize models for fundamentally different reasons. During this study, many participants adhered closely to the teacher instructions and were capable enough as a learner and performer to keep up with the pacing of the lesson. Other participants made gains at a slower pace, chose strategies or approaches non-conducive to the lesson tasks, or simply attended to the model in ways that were unexpected yet personally important to their own learning process. For example, if Xavier were in a normal classroom, it would be safe to assume that his behaviors would be deemed off task. His choice to remain silent at the beginning and simply listen, reflect, and internalize could easily be viewed as passive inactivity by an instructor.

As seen in several examples above (see Theresa, Theta, and Anissa's responses surrounding their passive reflective or internalizing instances), inactivity should not be viewed as off-task behavior. Several of Kolb and Kolb's (2013b) learning preferences (i.e., Analyzing (RO/AC), Thinking (RO/AC/AE), and Deciding (AC/AE) tend to prioritize introspective consideration. Learners with an Analyzing preferences tend to be deliberate with their strategic process and carefully consider consequences in order to prevent mistakes and predict outcomes—both positive and negative. As a teacher—even a teacher who understood Xavier's learning preference—it would be difficult to rationalize his choice of responses.

The above challenges are further compounded by participants' drive to attend to their own learning needs. In addition to prioritizing their own individual learning needs above their learning preference, many participants attended to their own learning needs above the modeled task. This pattern was seen in participants' responses in two contexts: (a) when the material was challenging and participants needed to review it later, and (b) when the material was challenging and participants ignored it to attend to more immediately-attainable goals. These deviations from teacher-prescribed tasks indicated that students have the capability to be rather adept at self-determining their own immediate learning needs. According to the variety of codes gathered in the current study, those learning needs are a spectrum ranging from fundamental musical or technical components (such as rhythm, pitch, and tone) to advanced components (such as musicality).

Additionally, the strategic means that participants used were on a spectrum that ranged from elementary components of the ELT cycle to more advanced, combinative strategies. All participants demonstrated some form of post-elementary blend of strategies at some point in the lesson, most often seen during or immediately after the challenging fig. 3 instances. As the lesson became more challenging, blended strategies became more prevalent. There was a leveling off period, however, near the end of the lesson when most participants settled into a pattern of behaviors.

Overall, participant alignment to immediate teacher goals was mixed. This can be attributed to the tacit nature of these teacher goals as well as the instructions prior to the lesson performances; there was no wrong way to learn the piece. Participants, therefore, were left to both interpret the teacher performance and self-regulate their own pacing alongside the model. Though some participants adhered to the pacing of the lesson, others did not. It was also noteworthy that students who closely aligned with the model's pacing and instruction did not always find immediate success. Likewise, students that deviated from the model's tacit instructions often did so with a clear internal goal in mind: They had an immediate need that the model was not satisfying.

In the current study, how students attended to, interpreted, and internalized a teacher's model was a fluid and diverse spectrum of responses. Kolb and Kolb (2013b) summarized by stating that the ELT is indicative of how diverse individuals can be regarding their learning processes. The interaction between a learner and their individual contextual experiences yields a recursive cycle of continuously developing reality for that learner. This reality is subjective for individuals according to how they interpret their past experiences and apply them to the current learning space. "Teachers objectively create learning spaces by the information and activity they offer in their course; but this space is interpreted in the students' subjective experience through the lens of their learning style" (Kolb & Kolb, 2013b, p. 19). Individual learners' goals and experiences often seemed in direct conflict with the learning space established by the model in this study. Though a teacher in a typical classroom might be more capable of redirecting individual learners, the results of this study demonstrate that even a singular modeling experience provides a diverse array of starting points for observers.

The Manner in Which Learners Utilize a Modeled Performance Varies Notably from Each Other

Throughout the study, participants' variance in their individual responses could be divided into three categories: strategy, approach, and application. Based on the above understanding that students prioritize immediate individual learning needs over both teacher goals and learning preference, individual responses should be viewed as holistic and non-deterministic in nature. Participants in the current study often experimented with strategy, approach, or application as a means of overcoming specific contextual challenges. Though it is unclear if these responses had been utilized in past learning contexts or if they were improvised means of overcoming novel challenges, the remarkable diversity shown by participants throughout the study suggests that learners observing a model are capable of manifesting a variety of response modalities.

The observed diversity of study responses does not imply that all students are capable of selecting the learning response most appropriate to the task. This potential for ineffective responses to the model among participants aligns with similar conclusions made by Dewey (1938) who posited that "the belief that all genuine education comes about through experience does not mean that all experiences are genuinely educative" (p. 25). Indeed, the researchers that found mixed results regarding modeling's effectiveness (Cribari, 2014; Henley, 2001; Quindag, 1992) found similar results when observing student responses to a model. Kolb and Kolb's (2013b) suggested that an understanding—or at least an appreciation—of the fluid and diverse states of learners yielded the possibility that learners bring an incredible amount of variables to any experiential context. When Henley (2001) posited that a learner must identify incorrect performances prior to being able to apply corrections, it is a confirmation that modeling provides a different context for each learning. The assumption is that a student must, therefore, have an internal conceptualization of an accurate model as well as the physical and musical ability to make such a correction. Cribari (2014) agreed, stating that students who have faulty technique might be able to conceptualize their desired musical outcome, but their improper technique prevents them from creating that outcome.

Participants' diverse strategies, approaches, and applications in response to a teacher's model suggests that care must be taken when applying a model in a string classroom setting. Musical modeling portrays a great deal of information to students. Without careful preparation, consideration, and follow up, learners might lack the tools (as a result of a multitude of variables) to adequately interpret and internalize a string model. Building on the understanding of Zull (2002), who used neuroscience to posit that neural networks in learners are not significantly impacted by teacher explanation, Kolb and Kolb (2013b) concluded that an effective teacher—particularly a modeling performer—must understand that individual learners only build upon their previous experiences. "The effective teacher activates prior knowledge, building on exploration of what students already know and believe, on the sense they have made of their previous concrete experiences" (p. 21). Once a teacher can establish a common ground among past experiences, both teacher and learner might begin to construct a meaningful contextualization (or re-contextualization) of both past and current experiences. Together, they might extend that understanding towards novel concepts or skills. Beginning with these or related concrete experiences allows the learner to re-examine and modify their previous sense-making in the light of new ideas. (p. 21) The constructionist nature of learning—specifically learning via a model—plays a central role in determining the outcome of a learner's experience. A single context is only the starting point for observers' subsequently branching learning outcomes. There are multiple avenues for success or failure in every learning task.

Coda

Modeling is, and should remain, a central tenet of music education pedagogical practice. Combined with teacher-based initiatives such as directives, questions, and feedback, modeling is a very valuable tool to communicate complex learning goals. Researchers (Dickey, 1991; Hewitt, 2000; Rosenthal, 1984) have long aimed to suggest that modeling should be increasingly used in music education classrooms as a means of conveying the innumerable technical and artistic components of performance. Modeling is at least as effective as verbal directives in a music classroom and, at worst, causes no direct negative impact to student performances. Other researchers (Cribari, 2014; Haston, 2004; Quindag, 1992) presented mixed results regarding modeling's effectiveness on student performance. The qualitative results from the current study suggest that modeling's effectiveness is subject to variability related to how individual learners choose to respond. Based on the data from this study, learners' responses to a singular model range from tacit, internally focused conceptualizations of the task or performance, to rapid, high-intensity experimentation with the subject matter both past and present. Each participants' response within the study represents a branching path of possibilities that lead to varying degrees of success and effectiveness.

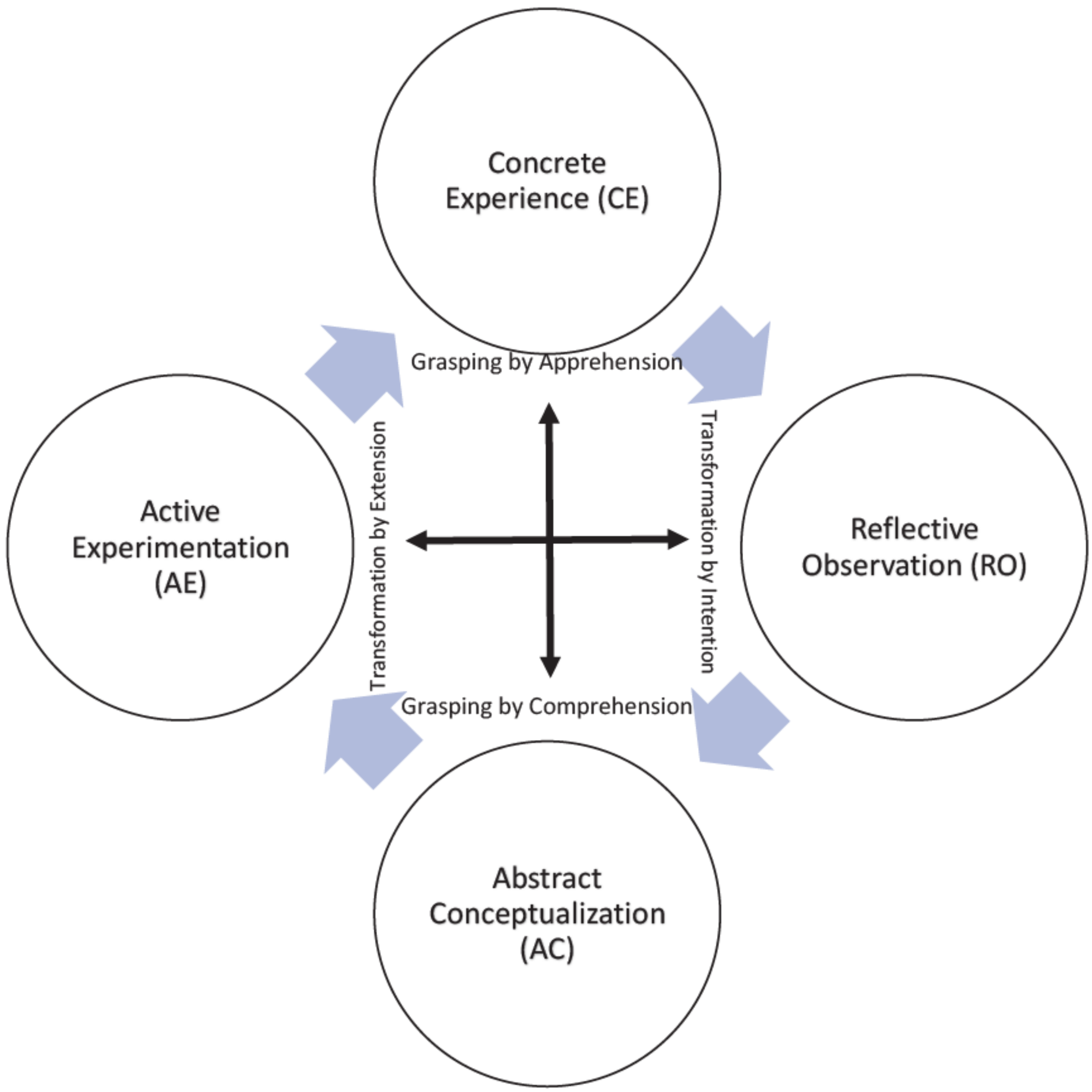
Modeling is not a one-way street. In any given music classroom on any given day, teachers present a model that might result in a multitude of interpretations and internalizations among learners. Those learners potentially, in turn, utilize that single concrete experience as a means to reflect upon the performer's technique, refine their internal concept of the musical nuance inherent to the performance, or attempt to directly mirror a specific component of the model itself. To assume that modeling (from a teacher-centric viewpoint) is a static representation of the optimal performance ignores the constructivist nature of music interpretation. Instead, teachers and researchers must attend to how learners vary in their response to a model in order to accommodate the incredible diversity inherent to the learning process.

Though Kolb's (1984) ELT provided a framework to understand and conceptualize the learning process via modeling, it is certainly not the only method. Using the above data, there was little evidence that learning preference impacted participants' responses to a model. Individual behaviors and responses, on the other hand, were sufficiently elucidated using phases of ELT cycle. Participants' learning preferences also provided a context against which to explain specific responses. As a predictive device, however, learning preferences provide little guidance for teachers aiming to plan or guide learner responses to a model. Instead, teachers and researchers might consider that the variety of learning behaviors within any classroom indicates the need to provide a range of learning opportunities. Rather than cater directly to particular learning preferences, educators might embrace activities utilizing multiple phases or modalities of the ELT cycle. Though it might be tempting to reinforce specific ELT modalities (and therefore, learning preferences), high-level processing activities such as metacognition are encouraged by ELT variety. Baker et al. (2012) posited that learners who are able to consistently access all four phases of the ELT cycle might better develop their ability to meta-cognate. The authors, though presenting a comprehensive agricultural education model, presented the salient point that the teacher must act in multiple roles: facilitator (CE-RO), exemplar (RO-AC), evaluator (AC-AE), and coach (AE-CE).

In the above examples of teacher roles—also presented by Kolb and Kolb (2013b)—modeling only services a specific subset of the ELT cycle. An overreliance on modeling ignores the three other roles that teachers must utilize to provide deep, meaningful teaching experience for students. In the opening example, the teacher provided a singular model while slowly refining and correcting student attention towards specific components of his playing. In order to better accommodate the variety of learners' needs within his ensemble, he might consider expanding modeling into more comprehensive learning contexts. As a facilitator, he might encourage collaboration among stand partners to overcome particular challenges or reflect upon his own model. As an exemplar, he might provide additional processing time or isolate specific technical components critical to the performance. As an evaluator, he could provide direct feedback to student performances comparing it to his own or prompt students to consider what they are listening for during his model. As a coach, he could work with the ensemble to create a hierarchy of musical components for student to attend to in response to the model. Modeling, as a means of overcoming a musical problem, is rarely a simple matter of presenting a performance and hoping that learners glean important information from the exemplar. After all, "hope is not much of an instructional strategy" (Duke, 2005, p. 31). By considering learner diversity, teachers might better utilize modeling as an overt, intentional, and directed teaching strategy with a better understanding of how students control their own learning outcomes.

APPENDIX A

KOLB S (1984) ELT CYCLE



APPENDIX B

KOLB AND KOLB'S (2013b) KLSI 4.0 PROFILES

Initiating AE/CE	Experiencing AE/CE/RO	Imagining CE/RO
Acting AC/AE/CE	Balancing CE/RO/AC/AE	Reflecting CE/RO/AC
Deciding AC/AE	Thinking RO/AC/AE	Analyzing RO/AC

APPENDIX C PART 1

DISTRICT RECRUITMENT LETTER

Dear Principal, Head of School, Music Director, or Supervisor,

My name is John Gordon and I am currently a doctoral candidate at Boston University in the process of working on my dissertation titled *An Investigation of Student Interpretations and Internalization of Modeling in a String Ensemble Classroom*. Specifically, I am attempting to investigate how music students—in this case, violinists—observe, incorporate, and learn from a teacher model. I would like to use orchestra students at your school as participants in my study and am requesting both administrative and teacher permission to do the following:

- Contact students and parents to gain consent for their participation in my study. I will deliver the Consent Form, Preliminary Information Form, and Recruitment Letter to all violinists at your school (see attached).
- Administer the Kolb Learning Style Inventory (KLSI) to those consenting students. The KLSI takes <u>less than five minutes</u> and can be completed at home or other non-class time. The participants have the option of receiving the results of their inventory along with an overview and explanation of their results.
- At a future date, based on the results of the KLSI, possibly contact students to observe, respond, and perform along with a videotaped violin lesson. I would videotape the student reacting to this lesson and interview them afterwards. This process would take <u>around 15 minutes</u> to complete and can be completed at the student's convenience.
- Use data collected from the KLSI and videotaped transcript to compile data.

There will be no individually identifiable information or recordings of your students used in any publication or presentation of this research. Remarks provided in the controlled interview or the performance component of the study may be published or presented but a pseudonym will be used to prevent to avoid identifying your students. Portions of the study will be presented as aggregate, summary data. and any identifying materials—such as the videos themselves—would be destroyed as soon as they are transcribed and coded. Immediate benefits include:

- Your students would benefit from their results of the KLSI—it clarifies how students prefer to respond to learning contexts and how to better utilize their learning style.
- I would be able to share generalized data regarding your students' learning styles (though I am unable to match names to this data for security reasons). This data would allow your teacher to address classroom learning styles in a more direct way.
- No other compensation is available.

Please contact me if you are willing to move forward and I will follow up with the next steps. If you have any questions, please contact me at jgordon2@bu.edu or if you would like to contact my doctoral dissertation supervisor, at [redacted]. I look forward to your reply.

Yours,

John Gordon
B.M., M.M., D.M.A. Candidate—Boston University

APPENDIX C PART 2

DISTRICT FOLLOW UP RECRUITMENT LETTER

Follow Up Recruitment

Hello, my name is John Gordon, a doctoral candidate at Boston University. I am writing to follow up on my email that I sent out earlier in September regarding conducting research on how violin students respond to teacher models at your school.

I am still interested in gathering data from orchestra students at your school but require both administrative and teacher permission to do so. Please let me know if there are other avenues (Superintendent, school board, etc.) that I need to pursue to gain permission to conduct this research in your building. As a reminder, the following are the steps that I would take during the course of this research:

- Contact students and parents to gain consent for their participation in my study. I will deliver the Consent Form, Preliminary Information Form, and Recruitment Letter to all violinists at your school (see attached).
- Administer the Kolb Learning Style Inventory (KLSI) to those consenting students. The KLSI takes <u>less than five minutes</u> and can be completed at home or other non-class time. The participants have the option of receiving the results of their inventory along with an overview and explanation of their results.
- At a future date, based on the results of the KLSI, possibly contact students to observe, respond, and perform along with a videotaped violin lesson. I would videotape the student reacting to this lesson and interview them afterwards. This process would take <u>around 15 minutes</u> to complete and can be completed at the student's convenience.
- Use data collected from the KLSI and videotaped transcript to compile data.

I have attempted to avoid putting additional stress on administration and teaching staff during this data collection process, but please let me know if you have further questions. Additionally, I will provide aggregated data regarding the learning preferences of your students to your orchestra director. Please contact me if you are willing to move forward and I will follow up with the next steps. If you have any questions, please contact me at jgordon2@bu.edu or if you would like to contact my doctoral dissertation supervisor, at [redacted]. I look forward to your reply.

Yours,
John Gordon
B.M., M.M., D.M.A. Candidate—Boston University

APPENDIX D

PARTICIPANT RECRUITMENT LETTER

Initial Recruitment

Hello, my name is John Gordon. I am a graduate student at Boston University in the Music Education department. I am conducting research on how violin students respond to teacher models and am inviting you to participate because you play the violin in high school.

Participation in this research is completely voluntary—your participation or non-participation will not impact your academic standing at your current high school. Participation in this research will occur in two parts. If you agree to participate, in the first phase I will gather basic data on your sex and grade level. Then you will complete a written test called the Learning Styles Inventory which will ask you to complete statements about yourself (ex. When I am in a new situation, I prefer to ____________). This first written test phase will take about 15 minutes to complete. Though the test will take me about a week or so to score, I will contact you with the results. The results of this test might provide you with insight into how you prefer to approach learning and suggestions for how to approach weaknesses and/or boost your learning habits.

Based on the results of your Learning Styles Inventory, I might ask you to participate in the second phase up to two weeks later at your convenience. In this phase, I will ask you to observe and respond to a videotaped violin lesson. In this lesson, you will listen to and perform in response to videotaped prompts. The responses will involve playing on your instrument and will closely resemble a private lesson. After this brief lesson, I will ask you seven interview questions about your experience observing the lesson and your thought process.

If you have any questions, please contact me at jgordon2@bu.edu. Thank you for your time and I hope you will consider participating in this study.

Phase One—LSI Testing

Hello and thank you for agreeing to participate in this study. My name is John Gordon and I am a graduate student at Boston University. I will be administering a written test to you today called the Learning Styles Inventory. This written test will take about 15 minutes to complete. I will read the instructions to you and answer any questions you have regarding how to complete the test or clarify any confusing terms or instructions. Has your parent or guardian signed and completed the consent form? *(Confirm yes or no. If yes, hand participant the LSI test and confirm their possession of a writing utensil)*

As a reminder, participation in this research is completely voluntary and your participation or non-participation in the study will not affect your academic standing. Based on the results of this written test, I may contact you regarding moving forward to a second phase at your convenience. The second phase will involve observing and responding to a videotaped violin lesson and responding to interview questions.

At this time, I will read you the instructions of the test in front of you and clarify any questions you might have. Are you ready to begin? *(Read instructions and clarify any questions asked)*

(Once the participant has completed the test): Thank you for your participation. I will contact you regarding your results. The results will include a detail of your learning preference profile, a description of how that learning preference compares to others, and how to better address the strengths and

weaknesses of that learning preference. If you have any questions or would like to withdraw from the study before that time, please contact me at jgordon2@bu.edu.

Phase Two—Video Lesson and Interview

Hello and thank you for agreeing to continue with the second phase of this study. My name is John Gordon and I am a graduate student at Boston University. Today, I will be showing you a videotaped violin lesson similar to a private lesson. The instructor will talk and demonstrate concepts on the violin. At times, the instructor will prompt you to perform on the violin. If you have a question or would like to pause the lesson, please raise your hand and I will pause the video. I will video record your responses to the videotaped lesson. The quality of your performances will not be assessed during this study.

Immediately after the lesson, I will ask you a series of seven interview questions regarding your thought process during the video. Your responses will also be video recorded. This process—both the lesson and interview—will take about 15 minutes. As a reminder, participation in this research is completely voluntary and your participation or non-participation in the study will not affect your academic standing. Do you understand the instructions and are you ready to begin? ***(Confirm and begin recording and videotaped lesson)***

(If student raises their hand during the video, pause the tape but keep the recording going)

(Once the video has ended)**: At this time, I will ask you some brief interview questions. Are you ready to begin?** ***(Confirm and begin interview questions).***

(Once the interview has ended)**: Thank you again for your participation in this study. If you have any further questions or concerns, please contact me at jgordon2@bu.edu.** ***(End recording)***

APPENDIX E

PARTICIPANT CONSENT FORM

Protocol Title: An Investigation of Student Interpretations and Internalizations of Modeling in a String Ensemble Classroom	
Principal Investigator: John A. Gordon	
Description of Subject Population: High School Violin Students	
Version Date: 5/21/2019	

Study Summary

The purpose of this research study is to determine how students of different ages, genders, and learning preferences differ in their response to a string model.

Subjects who take part in this research study will be in this research study for approximately two weeks. During this time, the investigator will make two study visits to you or your child's school.

Subjects taking part in this study will complete Kolb's Experiential Learning Styles Inventory v3.1. This test determines how learners prefer to respond to daily experiences—do they prefer to reflect, generalize, experiment, or observe? Based on the results of the Inventory, some participants will be asked to return in order to observe and respond to a brief videotaped violin lesson and interview questions. Student responses to the lesson and interview will be video recorded for later analysis.

The risks of taking part in this research study are minimal. Participants will be removed from their classroom music rehearsal for approximately 10-15 minutes on two occasions—I will attempt to reduce interruptions to your child's education as much as possible. All data collection will occur in you or your child's orchestra classroom, at his/her school. Should you or your child become upset with the activity, I will stop the activity to allow you or your child a moment to recover and recollect themselves before restarting the activity. Should you or your child become upset again, I will terminate the activity and not require you or your child to participate again.

If you are interested in learning more about this study, please read the rest of this form.

Introduction

Please read this form carefully. The purpose of this form is to provide you and your child with important information about taking part in a research study. If any of the statements or words in this form are unclear, please let us know. We would be happy to answer any questions.

If you or your child have any questions about the research or any portion of this form, please ask us. Taking part in this research study is up to you. We will give you and your child a copy of the form.

The person in charge of this study is John Gordon, a student and doctoral candidate at Boston University. The faculty advisor is [redacted] John Gordon can be reached at jgordon2@bu.edu or [redacted] can be contacted at [redacted] We will refer to John Gordon as the "researcher" throughout this form.

Why is this study being done?

The purpose of this study is to determine how students of different ages, genders, and learning preferences differ in their response to a string model. To do this, I will determine students' learning preferences and then record their responses to a videotaped lesson.

We are asking you or your child to take part in this study because you are a high school violin student.

About 150 of subjects will take part in this research study at Boston University and high schools in Delaware, New Jersey, Maryland, and Pennsylvania.

There is no sponsor is paying for this research to be done.

How long will I take part in this research study?

We expect that you or your child will be in this research study two sessions of 10-15 minutes each. During this time, we will ask you to make two study visits to your high school orchestra room. It is possible that you or your child may only be required to participate in the first study visit.

What will happen if I take part in this research study?

- We will visit your or your child's classroom twice for 10-15 minutes each visit.
- The first visit will last 10-15 minutes and will gather data regarding your or your child's gender, grade level, and learning preferences via a brief questionnaire and survey in your or your child's orchestra classroom.
- Based on these results, you or your child may be invited to participate in the second phase of research and asked to observe and respond to a 10-15 minute videotaped violin lesson and interview during a second visit within two weeks of the initial visit in your or your child's orchestra classroom. If you are asked to participate in this second phase of research, you will be contacted by your preferred method (see below).
- The study is only focused on violin students. The results of the initial visit will identify students as one of nine different learning preferences. If selected as a result of the data from the first visit, the second visit will observe participants that represent one of those nine learning preferences.
- For the first visit, there are no special requirements.
- For the second visit, participants will be asked to perform on their violin.

- Participation in this study is completely voluntary. Your or your child may stop participating in the study at any time without penalty. If you or your child decide to to participate in this study and then change your mind, you or your child can withdraw your child from the research without penalty.
- Data collected from both visits will be securely stored on encrypted hard drives and lock boxes.

Study Visits

Visit 1 will take about 10-15 minutes to complete. At this visit, we will ask you or your child to do the following procedures in your or your child's orchestra classroom:

- Give you or your child a questionnaire to fill out about your gender and grade level.
- Give you or your child a questionnaire entitled Kolb's Experiential Learning Inventory v3.1. This questionnaire will ask you or your child to respond to hypothetical prompts in an introspective fashion.

Visit 2 will also take about 10-15 minutes to complete. At this visit, we will ask you or your child to do the following procedures in your or your child's orchestra classroom:

- Verify your or your child's gender and grade level.
- Ask you or your child to watch and respond to a videotaped violin lesson. This video will ask you or your child to perform in response to verbal and musical prompts.
- Respond to brief interview questions inquiring about your or your child's thought processes and approaches to the video.

Audio/Videotaping

If selected for the second visit, we would like to videotape you or your child during this study. If you or your child are videotaped it may be possible to identify you or your child in the video. We will store these tapes in a locked cabinet and only approved study staff will be able to see the tapes. We will label these tapes with a code instead of your or your child's name. The key to the code connects your or your child's name to your videotape. The researcher will keep the key to the code in a password-protected computer/locked file. These tapes will be stored until transcribed—less than two weeks.

Use of Your Study Information

We will not send use any of your or your child's study information for future research studies or send any of your study information to research collaborators outside of this study even if we remove identifiers from your study information.

How Will You Keep My Study Records Confidential?

We will keep the records of this study confidential by several means. If you or your child participates in this study, I will record the results of the Learning and Adaptive Styles Index into my password-protected computer. Consent forms will be kept separate from the research data.

Data from this study may be used in publications or presentations. However, the information will not include any personal information that will allow you or your child to be identified. All videotaped recordings will be destroyed once transcriptions are made. Pseudonyms will also be used when citing interview responses.

We will make every effort to keep your or your child's records confidential. However, there are times when federal or state law requires the disclosure of your or your child's records.

The following people or groups may review your or your child's study records for purposes such as quality control or safety:

- The Researcher and any member of his/her research team
- The Institutional Review Board at Boston University. The Institutional Review Board is a group of people who review human research studies for safety and protection of people who take part in the studies.
- Federal and state agencies that oversee or review research

The study data will be stored in a password protected encryption software and lockbox until transcribed and destroyed. All transcribed and written data will be stored for seven years per Boston University record retention policy.

The results of this research study may be published or used for teaching. We will not put identifiable information on data that are used for these purposes.

All participants' private information—names, contact information, status within the study, results of surveys, etc.—will not be used or distributed for future research studies even if personal identifiers are removed.

Study Participation and Early Withdrawal

Taking part in this study is your or your child's choice. You or your child are free not to take part or to withdraw at any time for any reason. No matter what you or your child decide, there will be no penalty or loss of benefit to which you or your child are entitled. If you or your child decide to withdraw from this study, the information that you or your child have already provided will be kept confidential.

Also, the researcher may take you or your child out of this study without your or your child's permission. This may happen because:

- The researcher thinks it is in your or your child's best interest
- You or your child can't make the required study visits

- Other administrative reasons

Future Contact

We may like to contact you or your child in the future either to follow-up to this study or to see if you are interested in other studies taking place at Boston University.

What are the risks of taking part in this research study?

There is no foreseeable risk of harm to participants. Participants will be removed from their classroom music rehearsal for approximately 10-15 minutes on two occasions—I will attempt to reduce interruptions to your or your child's education as much as possible. Should you or your child become upset with the activity, I will stop the activity to allow you or your child a moment to recover and recollect themselves before restarting the activity. Should you or your child become upset again, I will terminate the activity and not require you or your child to participate again.

Questionnaire/Survey Risks

You or your child may feel emotional or upset when answering some of the questions. Tell the interviewer at any time if you or your child want to take a break or stop the interview.

You or your child may be uncomfortable with some of the questions and topics we will ask about. You or your child do not have to answer any questions that make you feel uncomfortable.

Loss of Confidentiality

The main risk of allowing us to use and store your or your child information for research is a potential loss of privacy. We will protect your or your child's privacy by labeling your information with a code and keeping the key to the code in a password-protected computer.

Are there any benefits from being in this research study?

You or your child may or may not benefit from taking part in this study. Possible benefits include may include the results of Kolb's Learning and Adaptive Styles Index for you or your student. This test will indicate how you or your child prefers to respond to experiences. Additionally, you or your child will receive a 5-10 minute violin lesson. Results of this study may benefit society by helping teachers and researchers understand how students differ in their thought processes when observing a teacher model an activity.

Do you or your child agree to receive the results of your Kolb Learning Styles Inventory?

______YES ______NO _______INITIALS

What alternatives are available?

You or your child may choose not to take part in this research study.

Will I get paid for taking part in this research study?

We will not pay you or your child for taking part in this study.

What will it cost me to take part in this research study?

There are no costs to you or your child for taking part in this research study.

If I have any questions or concerns about this research study, who can I talk to?

You or your child can call us with any concerns or questions. If you or your child have questions regarding this study, please contact John Gordon at [redacted] JGordon2@bu.edu. For concerns regarding the principal researcher, please contact the faculty supervisor, [redacted]

If you or your child have questions about your rights as a research subject or want to speak with someone independent of the research team, you may contact the Boston University IRB directly at 617-358-6115.

Statement of Consent

I have read the information in this consent form including risks and possible benefits. I have been given the chance to ask questions. My questions have been answered to my satisfaction, and I agree to participate in the study.

APPENDIX F

ELT OVERVIEW AND EXPLANATION DOCUMENT

Experiential Learning Theory: An Overview and Explanation of Your Learning Preference Profile

Thank you for recently completing the Kolb Learning Styles Inventory. In the document, you'll find a brief overview of David Kolb's Experiential Learning Theory and a breakdown of your results. Please note that your results of the recent inventory are not designed to predict any future vocation, behaviors, or patterns. Instead, consider using the results to guide the way you respond to situations in order to broaden your perspectives and refine your thinking about your own self.

Overview: Experiential Learning Theory, as described by David and Alice Kolb (2013), is a way to conceptualize the different ways that people approach a situation. For example, consider how you might learn to shoot a basketball. Some people might prefer to watch the action performed multiple times before attempting it. Others might watch the shooting motion a few times and internally dissect it. Still others might compare that motion to similar motions they've performed in the past to see if previously learned skills apply. Others still might prefer to try the action multiple times in order to refine the skill. While young learners might prefer to approach every situation the same way, more experienced learners are more flexible in their approaches.

With his Experiential Learning Theory and resulting Inventory, Kolb aimed to describe how learners might combine the four different phases of how learners might approach any situation. He suggested that learners internalize experiences (CE) by observing (RO). Learners then transform those interpretations of the experience to abstract concepts (AC) before applying those concepts through active experimentation (AE). Learners begin to combine two of the phases in adolescence (CE-RO, RO-AC, etc.). Eventually, a third phase might be incorporated (CE-RO-AC, AC-AE-CE, etc.) The inventory you recently completed was designed to determine how and to what extent you incorporate these phases into your daily learning and contexts.

The Nine Learning Styles:

Initiating (AE-CE)—prefers to instigate experiences and refine learning based on the immediate results. Initiating learners might prefer to learn when a task is frequently repeated without much time between tasks.

Experiencing (AE-CE-RO)—prefers to immerse themselves in an experience to extract information. Experiencing learners might prefer to learn when a task is repeated frequently but with time between tasks to reflect on the outcome.

Imagining (CE-RO)—prefers to reflect on previously observed experiences. Imagining learners might prefer to learn when a task is demonstrated a few times and given time to deconstruct the task.

Reflecting (RO-CE-AC)—prefers to reflect on observed experiences in order to connect to past concepts and ideas. Reflecting learners might prefer to learn when a task is demonstrated once or twice and they are given time to think about how that task compares to previous or similar tasks.

Analyzing (RO-AC)—prefers to incorporate internal reflection into past concepts. Analyzing learners might prefer to learn when presented with a description of the task and given time to apply previously learned concepts or models to that task.

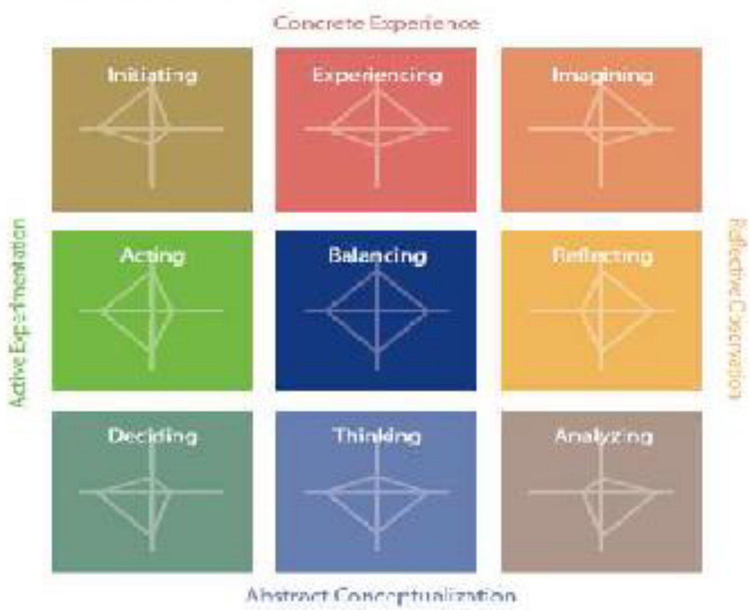
Thinking (RO-AC-AE)—prefers to connect observations to practical outcomes. Thinking learners might prefer to learn when they are given time to connect their observations to how they might perform they task in a logical and stepwise manner.

Deciding (AC-AE)—prefers to apply previously developed theoretical concepts to practical outcomes. Deciding learners might prefer to learn when they are able to develop and apply their own concept of a task.

Acting (CE-AE-AC)—prefers to create action plans and see them to completion before applying a new concept of a task. Acting learners might prefer to apply a concept of a task multiple times and ways before deciding on the best course of action.

Balancing (CE-RO-AC-AE)—prefer to consider the best course of action depending on the context of a specific task. Balancing learners might prefer to change their approach towards a specific task or even take a moment to consider the best course of action based on the requirements of the task at hand.

The results of this inventory are not a hard and fast rule. They are simply a reflection of how you would prefer to approach a learning scenario. If you have any questions or concerns, please contact me at JGordon2@bu.edu.



Kolb, D. A., & Kolb, A. Y. (2013). *The Kolb learning style inventory 4.0: Guide to theory, psychometrics, research and applications.* Retrieved from https://www.researchgate.net/publication/303446688_The_Kolb_Learning_Style_Inventory_40_Guide_to_Theory_Psychometrics_Research_Applications

APPENDIX G

VIOLIN LESSON TRANSCRIPT AND MUSIC

Hello, my name is ________________________ and today I will be demonstrating a short piece for you. Your task is to learn this piece entirely by ear—that is, without music in front of you. In this lesson, I will perform the piece in its entirety and then perform it in smaller fragments. At four times during this lesson, I will ask that you perform a “check-up” where you play along with me.

After each performance, I will pause for eight seconds. You are free to play along with my performance, after each performance, or only during the required check-ups. The quality of your performance during this lesson is not being assessed or adjudicated in any way. There is no wrong way to learn the following piece. The piece we’re looking at today is made up of four brief figures. Let’s begin:

[Perform the whole piece]

[Pause 8 seconds]

I will now play the first figure. [Perform the first two measures]

[Pause 8 seconds]

The first figure again. [Perform the first two measures]

[Pause 8 seconds]

One more time. [Perform the first two measures]

[Pause 8 seconds]

Now the first figure along with the second. [Perform the first four measures, stopping after the first note in the fourth measure]

[Pause 8 seconds]

I will now play the second figure. [Perform the third measure and the first note of the fourth measure]

[Pause 8 seconds]

The second figure again. [Perform the third measure and the first note of the fourth measure]

[Pause 8 seconds]

And one more time. [Perform the third measure and the first note of the fourth measure]

[Pause 8 seconds]

Now put the first two figures together. [Perform the first four measures, stopping after the first note in the fourth measure]

[Pause 8 seconds]

It's time for our first check-up. I will start the piece from the beginning. Please play along with me. [Perform the whole piece]

[Pause 8 seconds]

Now let's take a look at the third figure. [Perform the three eighth notes at the end of measure four and stop after performing beat three of measure six—before the piano]

[Pause 8 seconds]

I'll play the third figure again. [Perform the three eighth notes at the end of measure four and stop after performing beat three of measure six—before the piano]

[Pause 8 seconds]

And again. [Perform the three eighth notes at the end of measure four and stop after performing beat three of measure six—before the piano]

[Pause 8 seconds]

It's time for our second check-up. I will start the piece from the beginning. Please play along with me. [Perform the whole piece]

[Pause 8 seconds]

The last figure is up next. [Perform the last two eighth notes of measure 6 to the end of the piece]

[Pause 8 seconds]

I'll play it again. [Perform the last two eighth notes of measure 6 to the end of the piece]

[Pause 8 seconds]

And again. [Perform the last two eighth notes of measure 6 to the end of the piece]

[Pause 8 seconds]

I'll now play the third and fourth figures together. [Perform the three eighth notes at the end of measure four to the end of the piece]

[Pause 8 seconds]

And again. [Perform the three eighth notes at the end of measure four to the end of the piece]

[Pause 8 seconds]

One more time. [Perform the three eighth notes at the end of measure four to the end of the piece]

[Pause 8 seconds]

It's time for our third check-up. I will start the piece from the beginning. Please play along with me. [Perform the whole piece]

[Pause 8 seconds]

I'll now perform the first two figures again. [Perform the first four measures, stopping after the first note in the fourth measure]

[Pause 8 seconds]

And the last two figures. [Perform the three eighth notes at the end of measure four to the end of the piece]

[Pause 8 seconds]

Now the entire piece. [Perform the whole piece]

[Pause 8 seconds]

And again. [Perform the whole piece]

[Pause 8 seconds]

One more time. [Perform the whole piece]

[Pause 8 seconds]

It's time for our fourth and final check-up. I will start the piece from the beginning. Please play along with me. [Perform the whole piece]

[Pause 8 seconds]

Thank you for joining me today.

[End video]

APPENDIX H

NTERVIEW QUESTIONS

List of Questions

1. I'd like to ask you about the beginning of the modeling video. What was the first thing you noticed on the modeling video?
2. What details did you see before the teacher even started playing?
3. Now I'd like to focus on how you started to learn the song from the video. When the teacher did start playing, what was the first thing you focused on so you could learn the song?
4. How did you incorporate that into your playing?
5. Now I'd like to ask you about some of the things you learned from the video. Describe how your performance became more refined throughout this video.
6. How did you apply that to your own playing?
7. I'd like to ask you to think about a situation when your teacher modeled something for you during class. What kinds of things do you feel you learn from those models?

APPENDIX I

CODE CONSOLIDATION

Sub-Categories	Strategies	Instances
AE/CE	Pitch ID	213
	First Pitch	3
	Melodic Contour	30
	Intervals	1
CE/RO/AC	Error Detection	24
	Verbalization	24
	Visual	36
CE/RO	Listening	212
RO/AC/AE	Retention	63
	Task ID	30
	Theory Testing	1
RO/AC	Null-RO/AC	93
AC/AE/CE	Damage Mitigation	12
	Counting Pulse	6
	Singing	7
	Humming	4
	Audiation	1
	Advanced Figure	1
	Alternative Figure	1
	Previous Figure	15
AC/AE	Movement	9
	Guessing Notes	1
	Trial/Error	20
	Tone Matching	1
AE/CE/RO	Non-Sequential	13
	Delayed Sync	24
	Tempo Modification	24
	Rhythmic Contour	2
	Anchor Points	1
	Reference Pitch	10
	Drone	5
	Gesture Isolation	71
Balanced	Blended Strategy	44
	Overlapping Instances	8
Musical	Slurs	1
	Emotion	2
	Intonation	15
	Rhythm	78

	Style	6
	Tempo	2
	Articulation	14
	Musicality	2
	Dynamics	7
	Tone	2
Left Hand	Vibrato	15
	Fundamental Skills	1
	Posture	3
	Positioning	4
	Technique	8
	Visual (LH)	11
Lesson Execution	Instructions	2
	Pacing	1
	Model	7
	Repetition	8
Right Hand/Bow	Bowing Tech	2
	Bow Hold	1
	Bow Location	1
	Bow Speed	4
	Bow Length	5
	Bow Distribution	3
	Bow Direction	10
	Bow Placement	3
	Bowing	5
	Bow	2
General	Overall (Holistic)	2
	No Details	1
External	Task Difficulty	1
	Respect/Decorum	2
	Background/Environment	5
	Interrupted	38
	Unconventional Solution	2
	Chunking	17
Internal	Strategy	1
	Flexibility	1
	Struggle	2
	Confidence/Efficacy	5
	Stress	4
Intensity	0 Reps	3

	3 Reps	10
	~~Low Reps~~	~~1~~
	1 Rep	128
	High Reps	28
	2 Reps	~~35~~
	4 Reps	8
	Medium Reps	72
CE Concurrency	W/ Model	226
	W/O Model	10
AE Generation	Shadowbow	30
	Mod. Shadowbow	7
	Arco	380
	Pizz	108
	Null	93
	Rest Position	23
Instrument Location	Guitar Position	10
	Playing Position	35
	No Position	1
	Mod. Rest Position	3
Individual	AC	8
	AE	1
	CE	4
Dual	RO/AC	281
	AE/CE	218
	AE/AC	306
	RO/CE	6
Complex	CE/RO-AE	1
	RO vs. AE	1
	AE/AC+RO	1
	RO+AE/CE	1
	AC/AE/CE	2

APPENDIX J

KLSI 4.0 NORMATIVE VALUES: AGE*

Age		CE	RO	AC	AE	AE-RO	AC-CE
Under 19	Mean	21.69	26.03	25.74	34.62	8.59	4.05
	N	133	133	133	133	133	133
	SD	6.55	6.47	6.25	4.86	9.19	10.89
19–24	Mean	19.67	26.87	28.23	32.75	5.87	8.56
	N	2057	2057	2057	2057	2057	2057
	SD	6.21	6.84	6.86	5.55	10.43	10.88
25–34	Mean	19.83	26.14	28.66	32.20	6.06	8.83
	N	2979	2979	2979	2979	2979	2979
	SD	6.24	6.79	7.36	6.77	11.72	11.58
35–44	Mean	19.83	26.14	29.45	31.40	5.26	9.62
	N	2656	2656	2656	2656	2656	2656
	SD	6.52	7.19	6.54	6.11	11.40	10.83
45–54	Mean	19.64	25.80	29.74	31.19	5.39	10.10
	N	1839	1839	1839	1839	1839	1839
	SD	6.40	6.82	6.50	5.94	10.78	10.72
55–64	Mean	20.27	26.18	29.67	30.68	4.50	9.40
	N	542	542	542	542	542	542
	SD	6.86	7.13	6.71	6.00	10.98	11.12
65–Over	Mean	22.04	23.70	30.00	30.82	7.12	7.96
	N	50	50	50	50	50	50
	SD	6.98	6.06	7.00	6.12	9.84	11.80
Total	Mean	19.84	26.22	29.00	31.85	5.62	9.16
	N	10423	10423	10423	10423	10423	10423
	SD	6.47	7.02	6.66	5.93	10.92	10.87

*As reported by Kolb and Kolb (2013b)

APPENDIX K

KLSI 4.0 NORMATIVE VALUES: GENDER*

Gender		CE	RO	AC	AE	AC-CE	AE-RO
Female	Mean	20.54	26.36	27.57	32.18	7.02	5.82
	N	5361	5361	5361	5361	5361	5361
	SD	6.64	7.21	6.43	5.90	10.76	11.08
Male	Mean	19.01	26.07	30.57	31.52	11.56	5.45
	N	4809	4809	4809	4809	4809	4809
	SD	6.15	6.84	6.56	5.93	10.47	10.79
Total	Mean	19.84	26.22	29.00	31.85	5.62	9.16
	N	10423	10423	10423	10423	10423	10423
	SD	6.47	7.02	6.66	5.93	10.92	10.87

*As reported by Kolb and Kolb (2013b)

APPENDIX L

AVERAGE KLSI 3.1 SCORES IN COMPARISON TO OTHER EDUCATIONAL SPECIALIZATIONS*

Educational Specialization		CE	RO	AC	AE	AC-CE	AE-RO
Current Study	Mean	24.32	31.81	30.28	33.51	1.7	5.96
	N	100	100	100	100	100	100
	SD	6.43	6.77	6.64	6.03	10.90	11.19
Accounting	Mean	18.22	25.94	30.84	31.81	12.62	5.88
	N	305	305	305	305	305	305
	SD	5.55	6.55	5.76	5.75	9.10	10.45
Architecture	Mean	21.25	25.94	31.13	30.25	9.88	4.31
	N	32	32	32	32	32	32
	SD	6.61	7.08	6.43	4.65	10.51	9.57
Business	Mean	20.03	25.63	29.01	31.76	8.98	6.13
	N	1708	1708	1708	1708	1708	1708
	SD	6.22	6.77	6.42	6.00	10.47	10.97
Computer & Information Science	Mean	17.24	27.76	30.83	31.76	13.59	4.00
	N	58	58	58	58	58	58
	SD	5.83	6.25	7.08	6.36	10.96	10.88
Education	Mean	22.02	25.63	27.37	31.97	5.35	6.34
	N	422	422	422	422	422	422
	SD	7.14	7.26	6.92	6.21	11.72	11.19
Engineering	Mean	17.78	25.29	31.32	32.21	13.54	6.92
	N	798	798	798	798	798	798
	SD	5.55	6.59	6.27	5.59	9.43	10.10
Fine & Applied Arts	Mean	22.28	27.20	26.66	31.56	4.39	4.36
	N	140	140	140	140	140	140
	SD	7.36	7.70	7.57	5.75	12.79	11.31
Health	Mean	19.28	26.90	27.81	32.60	8.54	5.71
	N	268	268	268	268	268	268
	SD	5.97	7.72	5.96	5.89	9.52	11.58
Humanities	Mean	21.37	25.56	29.25	30.78	7.88	5.22
	N	184	184	184	184	184	184
	SD	7.21	7.54	7.67	6.18	13.02	11.69
Languages	Mean	21.24	28.07	28.35	30.87	7.10	2.80
	N	98	98	98	98	98	98
	SD	6.90	7.412	6.81	6.43	10.72	11.79

Medicine	Mean	18.93	26.13	29.62	32.29	10.69	6.16
	N	914	914	914	914	914	914
	SD	6.45	7.10	6.67	6.06	10.76	11.19
Nursing	Mean	19.69	26.84	27.16	32.32	7.46	5.48
	N	244	244	244	244	244	244
	SD	5.93	7.38	6.27	5.64	10.92	10.75
Physical Education	Mean	20.71	27.66	26.11	33.39	5.39	5.74
	N	38	38	38	38	38	38
	SD	6.24	6.93	5.44	4.48	9.52	9.93
Total	Mean	19.84	26.22	29.00	31.84	9.16	5.62
	N	10423	10423	10423	10423	10423	10423
	SD	6.47	7.02	6.66	5.93	10.87	10.92

*As reported by Kolb and Kolb (2013b)

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