Multimodal Learning Strategies for Post-Secondary Music Theory: An Action Research Project

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Abstract: This action research project investigated the efficacy of a multimodal Supplemental Instruction strategies resource site for Music Theory Supplemental Instruction (SI) Leaders at a University in California. An accessible website containing both curated and original content on using multimodal SI strategies in Music Theory SI sessions was developed and provided to Music Theory SI Leaders as an optional resource to assist in the creation of resource-rich, constructivist, deep-learning environments in SI sessions. Bi-weekly SI lesson plans created by leaders with access to the website were collected, analyzed, and compared to lesson plans developed without access to the resource site. SI leaders who used the website planned more auditory, kinesthetic, and group learning strategies. The types of auditory and kinesthetic strategies used changed from discussion-based practices to strategies known to facilitate the development of internal audiation. Use of non-group "paper-based" strategies dropped by sixty-six percent. This paper reviews traditional Music Theory pedagogies and classroom practices, and investigates alternative strategies currently being explored in music theory classrooms. It explores the viability of Supplemental Instruction programs for Music Theory and suggests models for best practices based on qualitative and quantitative data from SI leaders. Areas for suggested further research on short and long term student performance and improvement are indicated.

Introduction

A functional knowledge of the symbolic language of western musical notation can be difficult for music students at the postsecondary level to acquire. Students are expected to learn the sonic, temporal, and dynamic implications of notation, and immediately apply them in a variety of performance settings. Supplemental Instruction (SI) is an academic assistance program that utilizes peer-assisted study sessions to help students master course content through multimodal activity facilitation. Since music performance and music learning both require the use of the aforementioned multimodal strategies, provision of SI sessions for postsecondary music courses is indicated.

SI for postsecondary Music Theory courses was instituted at a university in California in September, 2014, where the investigator serves as the Tutoring and Supplemental Instruction Coordinator. Part of the investigator's duties include determining which courses should be complimented with SI, training SI Leaders, and revising program delivery to ensure positive outcomes in SI sessions. As of the Fall, 2017 semester, approximately half of the students enrolled in Music Theory courses attended SI sessions.

In a regular review of program efficacy conducted in Spring, 2017, comparisons of mean term grades from SI vs non-SI students showed a smaller difference for students enrolled in Music Theory than was seen in other subjects where SI is provided, indicating lesser academic benefit for students who attended Music Theory SI than students who attended SI for other disciplines such as Biology or Chemistry. A qualitative review of lesson plans from Music Theory SI sessions revealed extensive use of two-dimensional visual strategies combined with "re-lecturing"; strategies not aligned with SI pedagogy. A subsequent Appreciative Inquiry small group session held with Music Theory SI leaders revealed a lack of knowledge and access to multimodal strategies on behalf of Music Theory SI leaders for Music Theory SI sessions due to having never seen multimodal, group based, collectivist strategies used in Music Theory education. It was theorized that providing SI Leaders with an online resource of curated multimodal session strategies aligned with the specific learning outcomes (SLOs) of Music Theory courses may increase the use of multimodal session strategies in SI sessions. This change in strategy was hoped to increase engagement, participation, and on-task behavior in SI sessions, and increase retention of music theory concepts. Consequently, this action research project was designed to evaluate the efficacy use of an online resource of multimodal learning strategies to be used by SI Leaders for Music Theory at the university.

Literature Review

Music is a harmonic series of frequencies, uniquely shaped by the instruments producing those frequencies, regulated by time. It is represented visually through a series of symbols arranged in patterns designed to show both the temporal and harmonic spaces between the frequencies. According to music educator and researcher Edwin Gordon, music learning occurs when the brain develops what he called "internal audiation"; the ability to internally "hear" the pitches and rhythms in a piece of music by only seeing the written notation of the music. This internal audiation is developed through hours of

singing, rhythmic movement, tonal audiation practice, and exposure to written notation (Gordon, 2012). This type of whole-body music learning occurs frequently in Practical Musicianship or "Ear Training" courses, where students are required to practice sight-singing notated melodies and harmonies.

The traditional model of Music Theory instruction at the secondary and post-secondary levels occurs in a lecture-based classroom, where students maintain a posture of passive learning while their instructor serves as the "expert", delivering knowledge to students in the form of visual and auditory examples. Students are expected to engage in the constructivist learning of music theory exercises on their own time, playing music theory examples on the piano, and completing four-part music writing assignments (Nagy, 2017). While the lecture model allows for a great deal of knowledge to be transferred in a short period of time, it creates a condition where students do not participate in the deep constructivist learning needed to master music reading in the presence of a "knowledge-holder" or "expert" who could potentially offer support as students develop their skills. Many student musicians are also developing their instrument playing skills at the same time they are developing their music theory skills, and the increased cognitive load of playing an instrument accurately while trying to analyze a written musical example makes it difficult to use the sounds the instrument creates to effectivly analyze the notes on the page. Furthermore, the lecture-homework model does not include the multimodal strategies posited by Gordon as necessary for developing internal audiation (Gordon, 2012).

The attempt by many music learners to learn to read and write music without developed internal audiation has led to a phenomena of what Yeary describes as a "Fundamentals Gap". This disparity of knowledge has unfortunately left many music learners in need of remedial music instruction, which can delay their degree completion by a year or more. The need to educate students in remedial skills also places a burden on music theory professors already stretched for time and resources (Yeary, 2014).

In the last five years, music theory educators have begun to investigate several alternative teaching methodologies to stimulate constructivist learning in the classroom and get students to think in music. Researchers investigating the "flipped" model of instruction in secondary and post-secondary music theory courses have seen increased levels of student engagement in the classroom, as well as higher scores on assessments. Ravenscroft and Chen (2016) attribute these successes to the individual responsibility for learning students have to assume when working in groups, as well as the opportunities group learning presents to reassess and refine one's own analysis of a piece of music. Ducker, et. al. (2015) advocate for the use of pre-lecture micro assessment and just in time teaching to identify gaps in their students' knowledge before lecture begins. They also support the use of criteron-referenced, standards-based grading for music theory assignments, where students receive several smaller grades on their assignments tht correlate to specific course learning objectives. Educator Anna Ferenc posits for the addition of collaborative projects where peers work together to analyze and create music, then metacognitively reflect on the experience (Ferenc, 2015). While each of these educators uses a variety of strategies to help alleviate the "fundamentals gap", all stress

the value of peer based, peer led learning.

Supplemental Instruction (SI) is a peer-based learning model originally developed by the University of Missouri at Kansas City to improve student success rates in traditionally difficult courses. The multimodal activities used in SI are designed to cause students to interact with each other, discuss course concepts, and strengthen each other's understanding of course content by teaching each other (Arendale, 1994). SI has proven to be effective in mathematics, the STEM subject closest to music theory, due to the subject-specific nature of adapted activities planned for mathematics SI sessions, students' active engagement with the course material, and with their peers (Cheng & Walters, 2009). Supplemental Instruction's focus on "on-task", collaborative learning in courses where students are required to master complex skills and are frequently assessed by their professors has also been shown to generate positive attendance outcomes in SI sessions for Arts and Humanities courses (Cheng & Johnston, 2015).

However, SI sessions are only successful when SI Leaders have access to tools and strategies that allow them to create "resource-rich" deep learning environments that cause students and their SI leaders to trust in their own ability to construct knowledge, rather than rely on the SI Leader to transfer knowledge in the same way a professor would (Westberry & Franken, 2013). While complimenting Music Theory courses with Supplemental Instruction was indicated, SI leaders lacked a repository of multimodal SI session strategies adapted or designed to work in Music Theory SI sessions. Since the majority of Music Theory SI leaders at the university never participated in courses where the use of SI was more established, they had never seen multimodal teaching strategies used in the way they were being asked to use them.

Peer tutors, including SI leaders, have a natural inclination to provide knowledge in the way it was provided to them by their professors rather than create conditions where students can construct their own knowledge (Roscoe & Michlene, 2007). This problem is compounded when the SI leaders do not fully understand the conditions and strategies they are being asked to create. To prevent tutors and SI leaders from becoming "knowledge-tellers", they must have training early in their tutoring careers on the creation of appropriate learning environments (Roscoe & Michlene, 2007), and must be provided with materials that establish the ethos and praxis of the peer-tutoring program to perpetuate positive outcomes (Kail 2003).

Creating resource rich environments for Supplemental Instruction is a different process than creating those same environments in a tutoring center or writing center. SI leaders conduct their SI sessions in classrooms throughout the University campus, and do not visit the learning center frequently. Their access to resources is limited to weekly interaction with a mentor, resources found in SI manuals, and resources they find online that fail to meet their specialized information needs (Akbar, et. al. 2011). The University's SI leaders have difficulty adapting general SI strategies and ideas for use in Music Theory courses. Considering the immense cognitive load and time demands placed on music students (including SI leaders), the investigator made the decision to create a mobile collection of specialized resources and strategies that allows SI leaders to

easily create collaborative, metacognitive learning environments for their attendees. It was thought that a carefully-curated resource of information and learning strategies adapted for use in Music Theory SI sessions, curated by an subject matter expert in Music Theory and in multimodal learning strategies, would create more favorable conditions for the creation of resource-rich learning environments for music theory students (Cole & Cunningham 2014).

Action research is a research strategy that allows for use of iterative cycles of action and reflection to create understanding and change (Dick & Swepson, 2013). Due to its flexible nature and focus on achieving positive outcomes through understanding and change, it is especially well-suited to research involving workplace learning and training (Taylor, 2002). The investigator of this research project chose to develop multiple iterations of the resource site, gaining input from other subject matter experts at multiple points along the path of development, to ensure the usability and appropriateness of the site for its intended audience.

Project Design

This Action Research project began with a review of the Suggested Learning Outcomes (SLOs) from all Music Theory I and II professors at the University. The initial conception of the resource site included more concrete connections between course SLOs and SI strategies. However, early SLO review revealed great differences in course SLOs between professors. Rather than continue with specific SLO alignment, the SLOs were compared, and learning goals were developed for the skills and concepts covered by all of the Music Theory professors. Paper prototypes of the site were then developed. Music Theory SI leaders were informally shown the paper prototypes as they were being developed, and gave valuable input into the content the website should contain, and how the navigation should work.

A digital version of the paper prototypes was developed using the web development tool Wix. The site can be viewed at mmercuriosantos.wixsite.com/musictheorySI. Wix was chosen over other web development tools for its ease of use and operational similarities with web development softwares that had been previously used by the developer (such as Dreamweaver). The use of Wix also allowed for the easy development of a mobile version of the site that users can access on any web-enabled phone or tablet. The immediate availability of mobile access to the site allowed SI Leaders to utilize the site in situations where a laptop or desktop computer was not available, or not feasible to use. The digital site was previewed informally by Music Theory SI Leaders before content was added to the site to ensure the site's navigation and design made sense to the SI Leaders. The SI Leaders liked the clean, simple look of the website, and that they could access it from all of their devices, whether they be laptop, desktop, or mobile.

The resource site was designed to be attractive, simple, and accessible, aligned with Universal Design for Learning principles. The interface is high contrast, featuring a white screen with black lettering and brightly-colored icons to make the site easier to read for those with visual impairments. All navigational icons on the website feature

descriptive pictures and ALT Text for easy identification, and all of the videos designed for the site are Closed Captioned using corrected captioning created by YouTube's auto-captioning generator (Appendix G).

A series of circular navigational icons, each with a descriptive picture, lines the bottom of each page. The "Home" page (Appendix A) provides users with an overview of the website. The "Presentations" page (movie camera icon) gives users access to original, captioned videos explaining multimodal strategies and how they can be incorporated into lesson plans. The videos on this page serve multiple functions; they recall and review information on best practices for SI sessions that is given to SI leaders in training at the beginning of each semester, serving as a digital manual that expresses the ethos and praxis of the program (Kail, 2003). They also expand on the knowledge bases the SI leaders already have, giving them explicit instruction on how and why to incorporate these new multimodal strategies into their existing framework of lesson plan ideas. The "Adapted SI Strategies" page (Appendix B) lists some of the SI strategies most commonly used in SI, suggests ways those strategies can be used in Music Theory SI sessions, and gives explicit instruction on how execute these modified strategies in SI sessions(Appendix D).

The six icons following the lightbulb represent the different landing pages users can visit to learn about multimodal strategies for use in Music Theory SI. The icons follow the order that musical concepts are usually taught in a music theory classroom; notes, keys, scales, intervals, chords, and rhythms. A Site Directory (Appendix E) lists each video and strategy on the site for easy access, and the Contact page (Appendix F) allows users to Email questions and comments to the developer. Links to exterior web pages, and links to all videos open in a new tab in the user's browser, so users never navigate away from the resource site.

Once the design was secured, thirty-two pages of original or adapted curated content was added to the site, including seven SI strategy adaptations, twelve pages of original content, and four videos developed specifically for the site. Content from other developers (twenty videos, four content pages, and four games) was also included in the resource site, having been curated over a series of months and chosen based on the following criteria:
  • Use of auditory, kinesthetic, or tactile strategies, or a combination thereof;
  • Ease of adaptation to large or small groups;
  • Use of a gaming strategy;
  • Clear communication of the strategy's application (some content was modified for clarity and brevity).
  • Videos that provided easy to understand explanations of difficult concepts such as the Circle of Fifths and the Overtone Series.

Methods

Given the multimodal nature of music, it is important that multimodal strategies be used to shape the emerging skills of student musicians. The purpose of this research was to

see if, given information on how and why to use multimodal session strategies and a resource of curated multimodal SI session strategies, SI leaders for Music Theory would use more, and more varied multimodal strategies in their SI sessions.

For the purposes of this study, an experimental group of seven Music Theory SI leaders was created. Each SI Leader was be provided with a Research Consent Form (Appendix I), and consented to participating in the research project by signing the Research Consent form. These SI leaders range in age from 18-23, and come from various socioeconomic and cultural backgrounds. Each of the seven SI leaders has completed four semesters of music theory covering diatonic and chromatic harmonization, as well as 16-40 hours of training on SI pedagogy, metacognition, learning theory, lesson planning, and multimodal SI strategies. Approximately 75% of the SI lesson plans analyzed in this study were written by SI leaders in their second semester of leadership, having completed only one full cycle of Supplemental Instruction for a given course. Development of the SI lesson plans needed for a full semester of SI is iterative. At the end of the first semester of SI, leaders tend to assess which activities were successful in their sessions, making big changes to the types of activities they use in the second and subsequent semesters. Since the resource site was provided to SI leaders at the very beginning of their second semester of leadership, it was likely that intervention into their pedagogical development at this stage in their careers could successfully interrupt development of "knowledge-telling" strategies among the leaders.

In early January, 2018, all Music Theory SI leaders were given access to the Music Theory SI resource site and encouraged, but not required, to review the information on the site and use it in their lesson plans.   It was made clear to each participant that their use of the resource site was completely voluntary, as was their choice to participate in the research project. Each SI leader spent approximately one hour per week developing lesson plans for their SI sessions as part of the requirements of their leadership position, using a form specifically developed for that purpose, that had been in use at the University for five years (Appendix H). SI lesson plans created by the participants in the experimental group from January 8, 2018 to February 21, 2018 were collected for analysis and entered into the Supplemental Instruction Lesson Plan Analysis Form developed using GoogleSites, and its corresponding database (see attached). Data identifying the research participants, the professors they worked with, and the level of Music Theory they provided SI for was not entered into the database.

The lesson plans collected in Winter 2018 were analyzed to evaluate the number, types, and varieties of modal strategies used in each session. This data was then compared with SI Lesson plan data collected in the 2017 Spring semester, looking specifically for changes in the modalities of strategies used, as well as strategies used directly from the resource site.

Results

Usage

In early February, 2018, data from 36 SI lesson plans created in 2018 Spring by seven SI leaders (experimental group) was analyzed and compared to data from 44 SI lesson plans created in 2017 Spring by SI leaders with comparable educational backgrounds and experience facilitating SI sessions, but no access to the resource site (control group). A total of 171 activities was included on the 2018 Spring SI lesson plans, 77 of which (45.0%) were sourced directly from the resource site (Figure 1). Activities used in sessions but not sourced from the website frequently included session opening and closing activities, which are 30-50% shorter in duration than main session activities. These opening and closing activities frequently included content review from prior sessions, sample quizzes, and discussion-based activities, none of which required adaptation for use in Music Theory SI sessions. The frequent use of the session strategies from the resource site indicates that the resource site was valued by the SI leaders, and became a trusted source of educational strategies (Akbar, et.al. 2011).
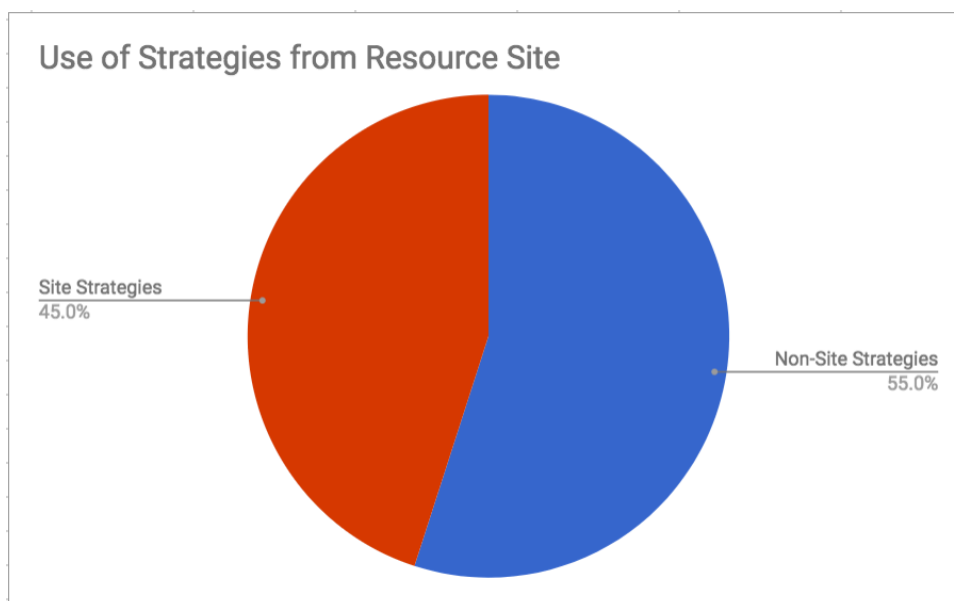

Figure 1. Use of Strategies from SI Resource Site.

Strategy Types
Overall, there were both quantitative and qualitative shifts in the types of strategies planned for use in SI sessions. The percentage of visual strategies used in session, such as notating scales and writing four-part harmonies on the whiteboard remained almost the same between the 2017 Spring and 2018 Spring semesters (41.5% and 41.53% respectively), there was a qualitative difference in the type of visual strategies used, described in the section below. There was a 7.42% decrease in the use of tactile strategies, which primarily consist of writing exercises done on paper or on a whiteboard. The decrease in tactile strategies was countered by a 4.95% increase in the use of auditory strategies and a 2.42% increase in the use of kinesthetic strategies. As with visual strategies, there was a more significant change in the types of auditory strategies used than in the number of auditory strategies used. Use of strategies that employed

visual, tactile, auditory, and kinesthetic strategies (referred to as the "Big Four"), increased by 2.8% (Table 1).

Table 1. Comparison of Strategy Types: 2017 Spring vs. 2018 Spring

	Visual	Tactile	Auditory	Kinesthetic	"Big Four"
2017 Spring	188 (41.5%)	169 (37.31%)	89 (19.65%)	7 (1.55%)	6 (3.09%)
2018 Spring	157 (41.53%)	113 (29.89%)	93 (24.60%)	15 (3.97%)	10 (5.89%)

Visual Strategies
Approximately 41% of all activities planned for both 2017 Spring and 2018 Spring incorporated visual strategies (Figure 2). While the percentage of visual strategies remained virtually the same, qualitative analysis of activities themselves revealed the aforementioned shift in the types of visual strategies being used. Visual strategies in the 2017 Spring semester primarily consisted of SI leaders demonstrating part writing and chord resolution strategies on a whiteboard while the students in the session sat in their seats and passively participated. The SI leaders used phrases like "SI leader will demonstrate", "SI leader will describe", and "SI leader will show students" to describe these activities. Use of passive learning activities in Supplemental Instruction sessions is not recommended, as it gives the impression of the SI leader as an authority figure and not a peer facilitator (Arendale, 1994), and pushes the SI leader toward a non-preferred model of "knowledge-telling" (Kail, 2003). It also deprives students of the opportunity to use their collective intelligence to critically engage with and analyze the material they are learning (Ravenscroft and Chen, 2016).

Descriptions of activities using visual strategies in 2018 Spring sessions described much more collaborative environments. Rather than sitting and being only passively engaged, students were required to work together to complete resolutions and other activities on the white board. Descriptions for 2018 Spring activities included phrases like "have students write (on board)", "students will create major and minor scales", and "students write notes and intervals for each other to solve". Surprisingly, the change from passive to collaborative learning using visual strategies occurred both in strategies that came from the resource site, and strategies that did not. The responsibility for this qualitative shift may lie more with the instructional videos at the beginning of the site than the adapted SI strategies. Each of the videos on the Presentations page of the website describe, recommend, and promote the use of collaborative, multimodal strategies. This unequivocal endorsement of collaborative strategies may have reinforced the linkage between collaborative strategies and program ethos for the SI leaders.
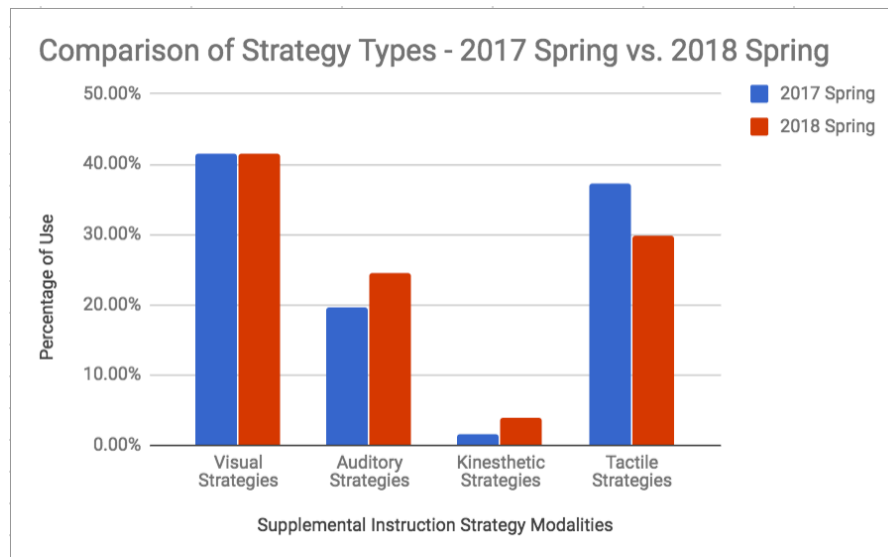
Figure 2. Comparison of Strategy Types 2017-2018 Spring

Auditory Strategies
Changes in the use of auditory strategies by SI leaders from 2017 Spring to 2018 Spring were slightly quantitative, but enormously qualitative (Figure 2). While auditory strategies in the 2017 Spring semester focused on group "discussion" of course concepts, lesson plans using auditory strategies in the 2018 Spring semester featured activities that included "singing" and "solfeging" scales and intervals, "voicing chords", and "harmonizing" melodies. These types of active verbal and auditory engagement are recommended by Long as ways to activate cerebellar learning pathways that allow for successively higher ordered learning (2006). Gordon describes these types of activities as a vital part of the "whole-part-whole" learning sequence required for musicians to develop internal audiation (2012).

Tactile Strategies
Use of tactile strategies in Music Theory sessions remained high in the 2018 Spring sessions, with only a slight reduction in the use of these strategies noted (Figure 2). Tactile strategies will always be essential components of Music Theory SI sessions, as the development of solid music writing skills is equally as important as the development of sight singing skills and internal audiation. The change in visual strategies from a passive experience to a collaborative experience was also reflected in the collective nature of part-writing strategies used in the 2018 Spring session strategies. Rather than individually writing their work on paper, students worked together to write musical parts, generating deep conversation and collective analysis of the work being done. To preserve the collective nature of the work and to save time, students were discouraged from individually writing notes in class and instead encouraged to take pictures of the work on the board with their smart phones so they could re-write the information into their notes at a later time. This additional processing of course concepts after the SI session positively reinforces acquisition of the material.
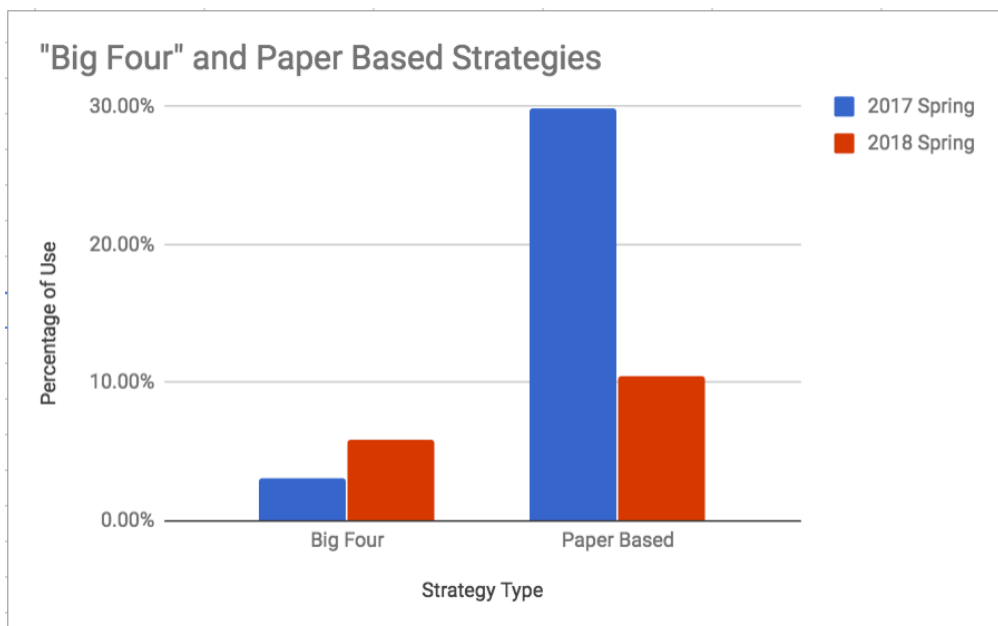
Figure 3. "Big Four" and Paper Based Strategies

"Big Four" Strategies

"Big Four" strategies that incorporate all four relevant sensory domains in one activity are the most difficult strategies to create, plan, and use, but are also some of the most beneficial strategies, as they are most likely to develop synaptic connections across several regions of the brain, allowing for deeper retention of the concepts being learned. They are also the most likely activities to put music theory exercises in the context of a simulated performance environment, which has a secondary benefit of supporting the performance work students are doing in their practical musicianship and ensemble classes. The number of strategies utilizing the "Big Four" in 2018 Spring nearly doubled, from 3.09% in 2017 Spring to 5.89% in 2018 Spring (Figure 3). This increase reflects the use of strategies directly from the resource site, and use of these types of strategies required additional support for the SI leaders from the investigator in their structuring and use.

Paper-based Strategies

The largest and most beneficial reduction in strategy use seen in 2018 Spring lesson plans was the reduction in paper-based strategies. The number of paper-based strategies used in 2018 Spring semester sessions was 19.37% lower than in 2017 Spring. This reduction in individual, paper-based work merely reflects the increase in collaborative strategy use described in previous sections.

Discussion

Participant Comments

Informal discussion with participants in the experimental group yielded valuable qualitative information about their perception and use of the resource site. Participants

appreciated the way the videos on the Presentations page reviewed important components of their SI training they may have forgotten about. They also liked the way the videos explained the rationale behind using multimodal strategies in SI sessions.

Participants liked the layout of the website, noting the uniformity of the use of icons in the site made it easier to find the information they were looking for. A few participants recommended adding labels for the icons directly underneath the icons in the toolbar at the bottom of each screen. One participant particularly appreciated the Site Directory, noting they had relied on the Site Directory as their sole source of navigation on the site.

Many participants expressed their appreciation and gratitude for the adapted Supplemental Instruction strategies on the site. They noted the adaptations made the strategies much easier to use, and that ease of use and made them much more willing to incorporate the strategies into their lesson plans. Participants also stated they had experienced difficulty in the past incorporating gaming strategies into their sessions because they were unsure of how to work on music theory concepts without "drilling" them. The examples of adaptation for gaming on the site inspired them to look at the content being covered in SI sessions from a different perspective, and try new ways of working through the material.

One of the greatest surprises uncovered through discussion with research participants was their choice to use the mobile version of the resource site for nearly all of their interactions. Many participants reported that they do not carry their laptops around campus or to SI sessions, and that the easy accessibility of the mobile site allowed them to view the material during transit times across campus, when it was convenient for them. Participants also reported having a "just-in-time" mindset about using the resource site. Most leaders did not read through the entire resource site at the beginning of the semester; instead choosing to look up strategies that might work for their sessions as they were doing their lesson planning, usually on the day of their SI sessions.

SI Leaders of Music Theory III and IV reported a different way of using the strategies on the website in their sessions. They felt the SI session strategies were more suitable for use in lower levels of Music Theory, so they used the strategies for concept review before moving on to more traditional part writing activities. They also gave SI students access to the resource site so they would have strategies for reviewing lower level concepts on their own or with study groups.

When asked what could be done to improve the site, participants asked that more strategies be added to the site; particularly rhythmic strategies and strategies for higher level learning of concepts covered in Music Theory III or IV. SI Leaders also expressed a desire to provide strategies to be uploaded to the site, which was fully welcomed by the investigator.

Research participants, all of whom were subject matter experts in Music Theory, also pointed out 3 errors on the site having to do with labeling of intervals, and an error in

pitches sung in a minor third interval on a video. The investigator expressed her gratitude to the participants, and fixed the errors reported.

"Big Four" Strategies
The continued low incidence of "Big Four" strategy use in SI sessions stimulated additional conversation between the Investigator and participants after lesson plan analysis was completed. Many participants expressed a feeling that execution of Big Four strategies in their SI sessions was almost beyond their abilities as relatively new SI leaders. It is likely this perspective is more due to the SI leaders' limited exposure to these strategies than it is to any lack of ability on the part of the SI leaders. Big Four strategies are difficult to describe in writing, and harder to understand when they are not being experienced, indicating a different training approach may be needed for these unique strategies.

Influence Concerns and Documentation Changes
Study integrity remained a primary concern of the investigator, and adjustments needed to be made to both the research project and the way the SI leaders were led during the course of the study to mitigate any influence the investigator may have had as the participants' direct supervisor. During regular weekly review of SI lesson plans, the investigator experienced difficulty understanding which activities had included use of auditory strategies, and which activities SI leaders had sourced directly from the resource site. The investigator requested that all SI leaders include a legend on their lesson plans that included writing an "A" next to each activity that incorporated an auditory strategy, and a "W" next to each activity that leaders sourced from the resource site. The investigator was concerned that requesting these additions would indicate the investigator's preference for activities from the website that incorporated auditory strategies, and as a result, stopped directing SI leaders who were participating as well as not participating in research to include particular strategy modalities in their SI sessions. The relatively low increase in auditory strategies provided some relief to the investigator that her concerns of undue influence had not become a reality. It is still possible the SI leaders only used the resource site because they were part of the research project. More analysis of lesson plans turned in after the end of the research project is needed to ascertain the degree to which participants continued to use the site after active research ended.

Conclusion
The high percentage of strategies sourced from the resource site, combined with the dramatic qualitative change in visual, auditory, and tactile strategies indicates a successful adoption of the Music Theory SI resource site as a training and lesson planning tool for Music Theory SI leaders. Since publication of the resource site in January 2018, Music Theory SI leaders at one other University in the Mainland United States, and one University in South Africa have adopted it as a resource.

The first major revision to the site will occur in 2018 Summer, and will focus on adding resources requested by the research participants. To further encourage the use of "Big Four" strategies, SI Masterclasses will be added to the training offerings scheduled for

the 2018-2019 academic year. At these Masterclasses, a highly experienced SI leader (possibly the investigator) will run Supplemental Instruction sessions for both staff and students using underutilized strategies to enhance both strategy and musical concept reinforcement.

The conclusion of this study opens several avenues of research and publication on Supplemental Instruction for Music Theory. SI for Music Theory is an emerging discipline with no current published methodologies or resources for programs to utilize. The breadth of music theory concepts covered in SI at the University, combined with the length of time SI has been used and the extensive research done to provide a research-based rationale for the program has caused the Investigator to draft formalized best practices and standards for Supplemental Instruction for Music Theory. The publication of these best practices marks the first research ever published on the topic. Given the drastic qualitative change in Music Theory SI session strategies in the study, mean term grades for both SI and non-SI session participants will be analyzed as another indicator of program efficacy, or cause for review and revision. A longitudinal study assessing the long-term impact of SI attendance on course grades is also being planned.

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Appendix A
Home Page
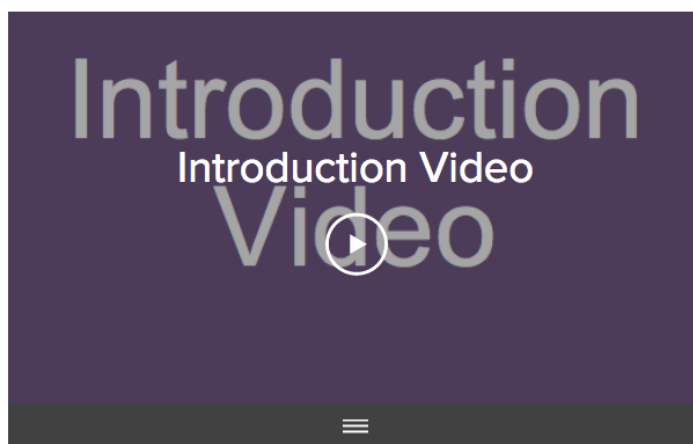
Appendix B
Adapted SI Strategies for Music Theory – Landing Page

Adapted SI Strategies for Music Theory

Team and Scribe

Send a Problem

The Matrix

Musical Timelines/Flowcharts

Concept Mapping

Speed Vocabulary

Musical Jeopardy

Appendix C
Intervals Landing Page

Intervals

Learning how to read and sing intervals can give students major headaches, minor panic, diminish their sight-singing confidence, and augment their stress levels. Click on the strategies below to learn ways to help them get unstuck.

Music Theory Pro - Intervals, Part I (video)

Music Theory Pro - Intervals, Part II (video)

Two Minute Music Theory - How to Remember the Interval (video)

Step Counting Strategies

Be the Interval

What Note Comes Next?

Name that Interval

Interval Recognition Game (timtopham.com)

Appendiz D
Adapted SI Strategies for Music Theory
Concept Mapping Strategy Page

Concept Mapping

A concept map is a type of diagramming that allows students to organize information according to relationships. The central idea is placed in a bubble in the middle of the map. Related ideas and pieces of information are placed in smaller bubbles around the central bubble. Lines are used to connect the bubbles together.

Concept mapping is commonly used to connect information from many types of subjects, so the students in your SI sessions are most likely familiar with the strategy. It is, therefore, helpful to adapt the strategy for use in Music Theory SI sessions, as it allows students to use information they already know (a familiar strategy) to organize information they don't know yet.

Here's what a concept map could look like for the different types of 7th chords. It's been left uncompleted, so students can finish it on their own, using the information given.

To use this strategy:
- Put students in small groups or pairs.
- Have them identify the central word, concept, or question around which to build the map.
- List the concepts, items, or questions associated with the central word or concept.
- Work from the general to the specific.
- Write in the linking words on the lines connecting the bubbles.
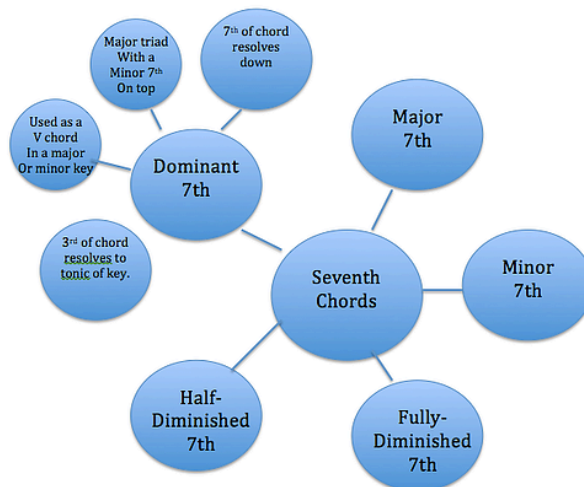
Appendix E
Site Directory

Site Directory

All of the strategies in this website are listed here in alphabetical order for quick and easy access. Just click on a link below to access the strategy you desire.

Be the Chord

Be the Interval

Caveman Key Signatures

Concept Mapping

Chord Bungees

Circle of Thirds (Open Theory.net)

Circle of Fifths Made Clear - Mobile Studio - (video)

Everything Adds Up to Seven

How to Lesson Plan Using Multimodal Strategies

Key Signature Memory

Matrix, The

Appendix F
Contact Page

Contact Us

Thank you for visiting the Music Theory SI Resource Site. We hope you find these strategies to be helpful and informative. Please use the contact form below to share you comments, concerns, or suggestions!
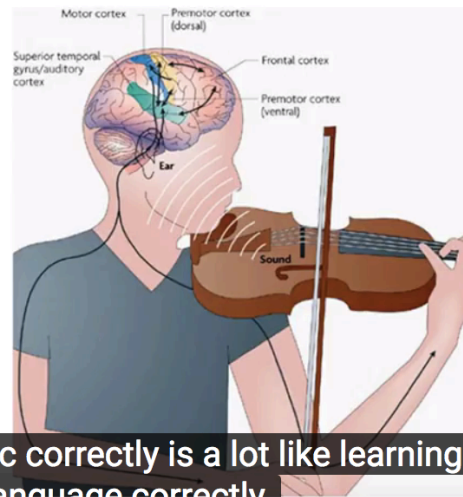
Email *

Name *

Subject

Message

Send

Appendix G
Multimodal Learning for Music Theory
Video with Closed Captioning

Appendix H
Supplemental Instruction Lesson Plan

AZUSA PACIFIC U N I V E R S I T Y

Supplemental Instruction
Lesson Plan

SI Leader: _____   Session Date: _____

Reminders: **Possible Activities to use:**   **Closing Reminders:**
1) Pass Around Sign-In Sheet   Informal quiz, 1-minute paper, think-pair-share,   1) Use closure technique
2) Introduce yourself   Matrix, Sequencing, Incomplete Outline, Definitions   2) Remind students of next session
3) Set a flexible agenda   Vocabulary Activities, Mnemonic Devices, Concept Map   3) Thank students for coming!

Min.	Noun/Level/Verb	Goal	Process (Activity):	How (individually, pairs, groups)?	Materials
	Noun: Level: Verb:				
	Noun: Level: Verb:				
	Noun: Level: Verb:				
	Noun: Level: Verb:				
	Noun: Level: Verb:				

Appendix I
Research Consent Form

University of Hawai'i
Consent to Participate in a Research Project
Curtis Ho, Ph.D., Principal Investigator
Mary Mercurio Santos, Investigator
Project title: Multimodal Learning Strategies for Post-Secondary Music Theory:
An Action Research Project

Aloha! My name is Mary Mercurio Santos and you are invited to take part in a research study. I am a graduate student at the University of Hawai'i at Mānoa in the College of Education. As part of the requirements for earning my graduate degree, I am doing a research project. The purpose of my project is to evaluate the to evaluate the effectiveness of the use of an online resource of multimodal learning strategies for Supplemental Instruction Leaders for Music Theory at Azusa Pacific University. I am asking you to participate because you are currently a Supplemental Instruction Leader for Music Theory at Azusa Pacific University.

Project Description – Activities and Time Commitment: If you decide to take part in this project, you will be trained how to complete Supplemental Instruction lesson plans for your SI sessions using an online resource site of SI strategies for music. Your lesson plans from February, 2018 will be reviewed. Data will then be collected from your completed Supplemental Instruction lesson plans and analyzed.   I expect around 5 people will take part in this project.

Benefits and Risks: Your participation in this research is completely voluntary. The findings from this project may help create a better understanding of the best ways to support Supplemental Instruction leaders for music theory in the development of their lesson plans. There is little risk to you for participating in this project.

Confidentiality, Anonymity, and Privacy: Only I will know the identities of the participants of this study. Your name, and the name of the professor you provide Supplemental Instruction for will be removed from your SI lesson plans before before data is collected on them.

Voluntary Participation: You can freely choose to take part or to not take part in this survey. There will be no penalty or loss of benefits for either decision. If you do agree to participate, you can stop at any time.

Questions: If you have any questions about this study, please call me at (909) 496-8960, or email me at mmercuri@hawaii.edu. You may also contact my advisor, Dr. Curtis Ho, at curtis@hawaii.edu, or (808) 956-7771. You may contact the UH Human Studies Program at 808.956.5007 or uhirb@hawaii.edu. to discuss problems, concerns and questions; obtain information; or offer input with an informed individual who is unaffiliated with the specific research protocol. Please visit https://www,hawaii.edu/researchcompliance/information-research-participants for more information on your rights as a research participant.

If you agree to participate in this project, please sign and date the following signature page and return it to:

Keep this copy of the informed consent for your records and reference.