A Pseudo-Experimental Investigation of the Efficacy of Asynchronous Instruction for Novice Sight-Singers

by

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Abstract

The purpose of this study was to test the efficacy of teaching sight-singing to novice, vocal music readers using a structured instructional model through an asynchronous format. Sight-singing literature is inconclusive on definitively best systems, resulting in educators using a variety of methods in the classroom. Research has shown however that instructional procedures, curricular elements, and strategies might be potential contributions toward a sight-singing pedagogy which would ultimately help current and future teachers.

I used quantitative method and convenience sampling from area schools for this study. Participants, mostly high school students, completed a nine-day, asynchronous sight-singing curriculum which contained a pre-/post-survey, three pre-tests, and three post-tests. The following research questions guided the statistical procedures chosen:

1. Is an asynchronous format an effective means to teach sight-singing to novice sight-singers? Specifically, will post-test scores indicate improvement over pre-test scores in sight-singing skills after two weeks of asynchronous direct online instruction?
2. Are individuals of different age groups able to sight-sing equally after proceeding through an asynchronous instructional format? Specifically, will there be significant differences between participants' pre- and post-test scores based on age?
3. Will individuals who receive feedback about their sight-singing performance perform better than those who do not? Specifically, will there be significant differences in the

sight-singing post-test scores between participants who receive individual feedback versus participants who receive no individual feedback?

Due to a small sample size, data were analyzed using descriptive statistics and non-parametric procedures. Participants generally improved from pre-test to post-test, though not significantly as evidenced through a series of Wilcoxon signed rank tests. The results of a Mann-Whitney *U* however indicated though novices were significantly different from non-novices on pre-tests, the difference between the groups on post-tests were not significant. Directed feedback in this study did not seem to impact the results from pre-test to post-test.

Future research might investigate using the sight-singing curriculum presented in this study with in-person participants, either with or without use of the created videos. Replication with a larger sample could confirm the greater importance of a structured instructional process and curriculum, rather than specific methodologies, toward a recommended sight-singing pedagogy for current and future teachers.

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Although this journey is complete, another will undoubtedly arise. I look forward to the next alongside all of these wonderful people.

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CHAPTER 1

INTRODUCTION

Music educators are frequently torn between the fundamental skills of music literacy and the urgency and expectancy of quality performances. Many educators seek professional development, instructional materials, or methodologies to improve music literacy in their students and to utilize instructional time effectively, but there is no universal instructional practice for sight-singing (Kuehne, 2005; Nichols, 2012). Further, there is no unanimous agreement among music educators on the most appropriate means for teaching music literacy (Henry & Demorest, 1994; McClung, 2001). Discrepancies in significant correlational studies between achievement and methodology may indicate there is no singular best method for sight-singing and researchers should instead investigate pedagogy and strategies to improve students' metacognition while engaging in the sight-singing process (Henry, 2011; Mishra, 2014).

Many researchers examined instructional practice, effectiveness of traditional sight-singing systems, and systematic introduction of content. However, little research exists to investigate teachers' use of instructional strategies or students' metacognitive awareness of the sight-singing process (Boyle & Lucas, 1990; Henry, 2001; Henry 2011, Kuehne, 2007; Kuehne, 2005; McClung, 2008; Mishra, 2014; Nichols, 2012). Killian and Henry (2005) suggested low-accuracy singers seemed to not know what to do during 30-seconds of preparation time for a sight-singing assessment. Kuehne (2010) reviewed ten years of published sight-singing research and recommended instructors teach an approach for preparation prior to sight-singing. Daniels

(1986) found a specific sight-singing method was not a significant predictor of achievement, but rather concluded the teacher's attitude toward sight-singing is of greater importance. Perhaps it is not enough to simply be concerned with training in a pitch or rhythm system. Instructors should teach sight-singing alongside an explicit system of procedures, problem-solving, and metacognitive strategies.

Though little research exists that tests instruction in metacognition for music students, Bathgate, Sims-Knight, and Scunn (2012) found when instructors taught novice music students using a metacognitive structure, they significantly improved performance in areas of rhythm, error detection, and musicality. The researchers supported explicit instruction in reflection and evaluation of students' process and progress in musical skills. Pintrich (2002) suggested, "if the [strategic] knowledge is never shared through discussion, modeling, or explicit instruction, it is difficult for students to learn" (p. 224). Research applying metacognition to sight-singing instruction may be sparse due to a lack of a clear pedagogical model, but it would seem an important and missing component into sight-singing training.

The global pandemic, COVID-19, compounded the curricular and instructional challenges that music educators face when determining a path toward music literacy and challenged the educational norms (Centers for Disease Control and Prevention, 2020). Face-to-face education suddenly halted, and most instruction moved to a distance learning format as fears of contagion became a daily worry. Ultimately, music educators provided instruction to their students through either synchronous or asynchronous means with little guidance or resources. A survey by Price and Pan (2002) found among the topics taught in undergraduate music education technology courses, music notation software and MIDI were most frequently taught but require specific software or hardware for the teacher and student. Many studies found one-on-one synchronous instruction can be as effective as asynchronous instruction, however most cited technical problems with hardware or software and connectivity issues as prevailing hindrances in distance instruction (Comeau et al., 2019; Denis, 2016; Koutsoupidou, 2014). Few studies tested efficacy of synchronous, large-group instruction (Bovin, 2018; Denis, 2016) and fewer tested asynchronous music instruction (Seddon & Biasutti, 2009).

The purpose of this study was to test the efficacy of teaching sight-singing to novice, vocal music readers using a structured instructional model through an asynchronous format. Research questions for the present study are as follows:

1. Is an asynchronous format an effective means to teach sight-singing to novice sight-singers? Specifically, will post-test scores indicate improvement over pre-test scores in sight-singing skills after two weeks of asynchronous direct online instruction?
2. Are individuals of different age groups able to sight-sing equally after proceeding through an asynchronous instructional format? Specifically, will there be significant differences between participants' pre- and post-test scores based on age?
3. Will individuals who receive feedback about their sight-singing performance perform better than those who do not? Specifically, will there be significant differences in the sight-singing post-test scores between participants who receive individual feedback versus participants who receive no individual feedback?

CHAPTER 2

LITERATURE REVIEW

Sight-Singing Practices and Methods

Music educators have discussed music literacy, given its complexity, for at least as long as music instruction has occurred in schools (Mark, 2008). Sight-singing, a singular aspect within music literacy, can be a confusing and frustrating area of instruction for teachers due to a lack of a universal pedagogical model or materials. Best instructional practices are seemingly elusive, though pedagogues have developed methods and theories to facilitate sight-singing training in the classroom, and the literature is abundant with common practices. Additionally, due to the COVID-19 global pandemic, administrators mandated teachers to provide an equivalent, standard-rich learning experience for students through a distance learning format (Centers for Disease Control and Prevention, 2020). Rather than continuing to investigate the effectiveness of particular sight-singing methodologies, researchers could explore research-based instructional models that might provide different ways of thinking about sight-singing pedagogy. Further, it would be important to examine how and if teachers can instruct music through a distance learning medium. Therefore, the purpose of this study was to test the efficacy of teaching sight-singing to novice, vocal music readers using a structured instructional model through an asynchronous format.

Common Practices and Attitudes

Teachers agree sight-singing is an important skill, but it is equally apparent many struggle with how to teach it effectively. Survey results from educators in the field indicated respondents felt sight-singing instruction was important as a fundamental skill for reading music (Kuehne, 2007; Nichols, 2013). Seeking predictors of sight-singing ability, Daniels (1986) concluded a teacher's attitude about the importance of sight-singing was among the strongest predictors of a chorus' sight-singing ability. Teachers' allotment of rehearsal time for sight-singing instruction is further evidence of perceived importance. Demorest (2004) found respondents allowed for an average of 9.5 minutes per rehearsal. Kuehne (2007) and Nichols (2013) reported many respondents reserved between 5 – 10 minutes for sight-singing instruction.

Common practice among choral directors also emerged from survey results, however there is less agreement on instructional and assessment practices, methods, and materials (Daniels, 1986; Demorest, 2004; Kuehne, 2007; Nichols, 2013). Choral directors, for example, used a variety of pitch systems, with a frequent preference toward movable systems such as moveable-*do* or numbers over fixed systems (Demorest, 2004; Kuehne, 2007; Nichols, 2013). Frey-Clark (2007) suggested the preference for moveable systems could be geographically dependent. Less data were collected regarding rhythmic systems, although Demorest (2004) reported 47% of respondents used a variation on the counting system over text-based systems, such as *ta-ti*, Gordon's system, or a neutral syllable system.

Classroom teachers' use of sight-singing materials that vary as widely as the teachers themselves. Demorest (2004) and Kuehne (2007) found no consensus among respondents regarding a specific sight-singing published method used for instruction. Interestingly, the largest group of participants in both studies reported using self-created materials, including 72% in

Demorest's (2004) survey and 36.84% in Kuehne's (2007) study. Nichols (2013) did not gather data on specific methods, however reported 72.5% of his respondents believed their chosen method was more effective than other available methods. It should be noted, no known research supports any specific published method to be more effective than any other and few are known to have a theoretical framework supporting the curriculum. The teacher's chosen system seems to be an heirloom, passed from middle school, high school, or undergraduate aural skills teachers or the result of a professional development experience (Kuehne, 2007; Nichols, 2013). These findings could suggest teachers understand the importance of sight-singing instruction, but struggle to agree on a correct path or feel unprepared based on their undergraduate training (Floyd & Bradley, 2006).

Given results from a study of sight-singing pedagogy covered in undergraduate choral method textbooks, the variation in teachers' method selection is justified. Floyd and Haning reviewed ten choral methods textbooks for sight-singing pedagogy content and found the information to be "fragmented and incomplete" (2015, p. 18). Few textbooks discussed how to teach sight-singers to deal with changing tonalities or modulations. Further, curriculum planning and assessment were only present in two of the ten reviewed textbooks. They suggested a reason teachers feel unprepared to teach sight-singing is a lack of complete information in undergraduate course materials. Survey results supported this conclusion which indicated teachers neither feel prepared to teach sight-singing nor do their undergraduate methods courses generally influence their pedagogical decisions (Floyd & Bradley, 2006; Kuehne, 2007; Nichols, 2013). Researchers noted many of the choral music texts contained philosophical discussions on why instructors teach sight-singing, but few detailed the concept of internally organizing sound. They suggested textbook authors assume readers understand these basic skills and processes, which could explain the absence. Regardless of the reason for absence of content, a need exists for a comprehensive resource for sight-singing pedagogy, with research-based instructional models, strategies, and resources to support current and future classroom teachers.

Efficacy of Pitch Systems

Survey results indicated teachers had bias toward the efficacy of their selected pitch system, which often teachers selected based on their personal experiences (Kuehne, 2007; Nichols, 2013). Research, however, is inconclusive on a best singular system. In general, many reduce pitch systems to variations on two ideas, either the tonic syllable is moveable in relation to the tonal center or that syllables are fixed, regardless of the tonal center. Moveable systems include moveable-*do*, in which singers use solfeggio syllables and *do* indicates the tonal center, or a number system, which scale degree numbers replace solfeggio syllables. The primary non-moveable system is fixed-*do*, in which solfeggio syllables are always associated with a specific pitch. Despite personal biases, there are benefits and flaws with each system in practical application to reading music. Moveable systems, for example, allow a relationship between pitch and musical function, but are less useful in atonal music. Fixed systems by comparison allow for easier movement through modulatory phrases in music but accidentals complicate solfeggio syllables (Frey-Clark, 2007). These are only a few of the many arguments for and against specific systems, but there is little indication that one singular system is most effective in practice.

There is a lack of evidence a specific pitch system is most effective in sight-singing performance. Henry and Demorest (1994) found no significant difference in individual sight-singing achievement between high achieving participants who used moveable-*do* versus those who used fixed-*do*. Researchers also concluded group success did not equate to individual performance, despite the recognition for high sight-singing achievement of the two ensembles. Demorest and May (1995) investigated the effectiveness of moveable-*do* and fixed-*do* with participants from two different high schools. Though results were significantly higher for participants who used moveable-*do,* the researchers suggested frequent individual assessment as a mediating variable rather than the method used.

The body of literature on pitch systems is broad but lacks ample studies that unite toward a conclusion of effective practices. Frey-Clark (2017) stated, "the limited and inconclusive research on effectiveness may be disappointing to educators in search of 'the best system'", adding "in short, selection of the 'best system' may be contextual" (p. 61). Teacher attitudes regarding supremacy or efficacy of their chosen system could be a result of their comfort level with the instructional tool rather than an innate superiority. Sight-singing curriculum development therefore should allow for flexibility of teacher choice as it relates to pitch and rhythm systems.

Interventions and Predictors in Sight-Singing

Sight-singing research has not only considered methodology but includes various studies which test interventions on sight-singing or prediction models for sight-singing achievement. Given the wide variety of research that examined interventions, predictor variables, and relationships among variables, researchers use meta-analyses to find statistically significant trends among selected studies.

If there is a lack of agreement on a best methodological approach for sight-singing instruction, an investigation into other variables that impact achievement may yield considerations for curriculum design. Daniels' (1986) study of predictor variables of sight-singing achievement found the single best predictor was ethnic make-up of the school population, rather than other variables such as teacher methodology or attitude, size of the school, or student instrumental experience. This single variable accounted for 46% of the variance in sight-singing performance (R^2 = .461). Mishra (2014a) developed a list of seventeen variable constructs from a meta-analysis of correlational sight-singing studies. The researcher concluded, "music constructs that can be improved with practice correlated more strongly with sight-reading than did stable characteristics, such as music aptitude, IQ, and personality" (Mishra, 2014a, p. 460), further summarizing, "sight-reading is a teachable activity rather than a stable characteristic" (Mishra, 2014a, p. 461). Findings suggest while individual student characteristics may play a role in the understanding of sight-singing, the teacher's instructional decisions are more important factors in mastery of music literacy.

Though sight-singing is the performance of pitch and rhythm, either separately or collectively, it could be possible for teachers to develop instructional methods that go beyond these two processes to enhance overall ability. Mishra (2016) suggested not only were pitch and rhythm different cognitive processes, but they could also be multi-modal experiences. Therefore, even though a single intervention might not be effective for both processes, supporting learning through additional modalities could lead to greater achievement. Regardless of the intervention, Mishra (2016) concluded each skill must be explicitly taught, reinforced, or remediated based on student needs.

Additionally, teachers could improve sight-singing ability by more than developing instructional methods that support multi-modal learning. Mishra (2014b) found researchers used a total of ten categories of treatments across a range of experimental studies. Of the identified categories, four were found to have significant effect on sight-singing: aural training (such as melodic dictation and aural models to improve aural skills), controlled reading (generally studies which used a tachistoscope), creative activities (such as composition or improvisation training), and singing/solfege (those that assessed the effectiveness of solfege or the use of a melodic system). Further, Mishra (2014b) found age and experience level made no difference given the treatments. She noted treatments that taught musicians to evaluate music based on patterns and use prediction would most likely have the greatest effect on sight-singing achievement. The combination of the two meta-analyses indicated while direct instruction of sight-singing processes was important, perhaps equally important were the development of activities that support practical application of music literacy beyond repertoire.

A review of interventions and predictors of sight-singing suggested there must be a greater emphasis in future research into sight-singing instruction, not merely a continued discussion of systems or methods. The key to improving music literacy among all levels of education could be the development of a pedagogy, grounded in educational theory, instructional techniques, and a sequenced curriculum, including metacognitive strategies.

Literature Review for Pedagogical Framework

A series of musical examples will not provide the pedagogical foundation needed to support instruction if teachers feel unprepared to teach sight-singing. Further, sight-singing is not only a cognitive skill but includes metacognitive components that instructors must teach alongside musical understandings. Students need both cognitive and metacognitive processing, as well as a series of strategies, to move toward musical independence.

There are a variety of instructional approaches in any educational field, each with a purpose disseminating knowledge to students. During a child's educational journey, reading becomes a venture into the independent comprehension of text. Reading, at this point, is no longer about decoding letters, but rather synthesizing, contextualizing, and inferring from groups of words (Reutzel & Cooter, Jr, 2004). Switching to reading-to-learn is challenging for many and the teacher's job becomes to explicitly teach this process. Pearson and Gallagher (1983) investigated reading comprehension instructional practices. The researchers combined literature into three distinct categories: "removing roadblocks to comprehension, teaching explicit routines to help students perform comprehension tasks, and teaching monitoring strategies so that students will be able to evaluate whether or not they have applied a routine appropriately" (Pearson & Gallagher, 1983, p.325). The researchers found the greatest difference between a novice and expert reader was their repertoire and use of behavioral and monitoring strategies, suggesting training in these strategies is of importance. Pearson and Gallagher (1983) developed a teaching model for explicit instruction that provided a gradual release of responsibility of skills from teacher to student through three stages (see Figure 1).

The instructor demonstrates how and when to use the given strategy in the first stage, *modeling*, maintaining all responsibility for the strategy. The teacher is expected to talk aloud about processing the problem and why they are applying a given strategy. Students observe the teacher using cognitive and metacognitive processing during this stage. The teacher and students share responsibility for strategy use in the second stage, *gradual release*, with a gradual release of responsibility over a period of time. The teacher provides continual feedback about strategy use and allows for remedial practice when needed. Additionally, the teacher monitors use of cognitive and metacognitive processes and strategies. Students take primary responsibility for the strategy in the final stage, *practice or application*, and use it independently. The authors noted feedback throughout the model is not corrective in nature but rather suggestive, acting as a guide for continual mastery. This model provides a structured system for explicitly teaching and modeling any content, however in the process of independent sight-singing students must be able to continually reflect and evaluate on their progress without an outside aide. Students must also be explicitly taught self-reflection and self-evaluation, or metacognition. While researchers developed this model for teaching reading comprehension, teachers can apply the stages to any content, including the skills embedded within sight-singing (Pearson & Gallagher, 1983).

Figure 1

A Model of Explicit Instruction

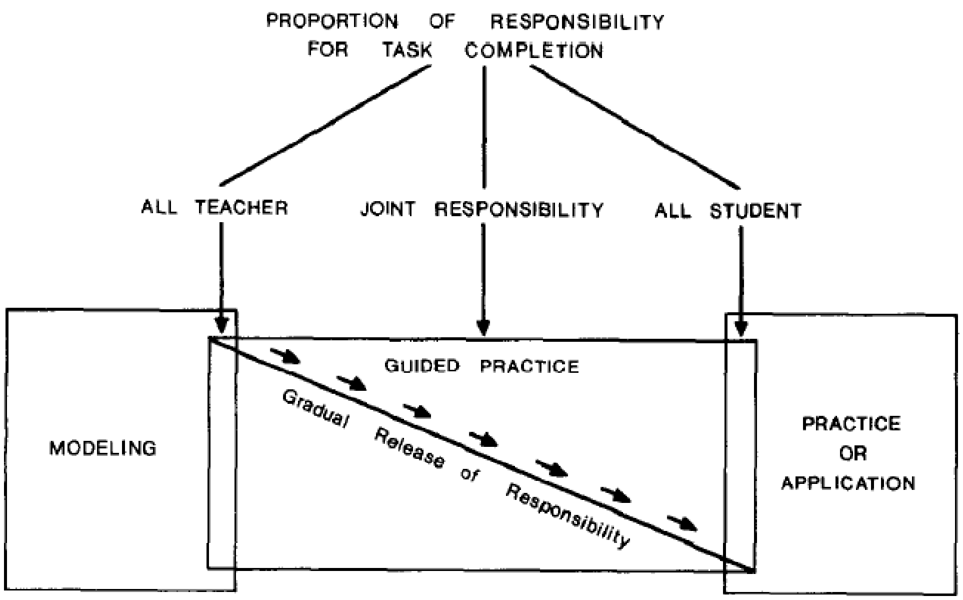

FIG. 1. A model of explicit instruction.

Note. Pearson & Gallagher, 1983, p. 337

Metacognition in Music

Music is a cognitive enterprise, but musicians often engage in metacognition during the music learning process or to evaluate progress toward a goal. Not every musician however develops the same level of expertise in metacognition. Flavell (1976) speculated why children, who had the requisite knowledge, were unable to solve problems. The author's solution was the children lacked, what he termed, metacognition. He defined metacognition as, "one's knowledge concerning one's own cognitive processes and products or anything related to them, e.g., the learning-relevant properties of information or data" (Flavell, 1976, p. 232). He described metacognition as an individuals' ability to self-monitor and, upon reflection, use known processes to move toward a goal.

Flavell (1979) expanded his theories of metacognition into four areas of cognitive monitoring, including metacognitive knowledge, metacognitive experiences, goals (or tasks), and actions (or strategies). Metacognitive knowledge includes knowledge of what an individual knows of people, tasks, and strategies as cognitive processes. An individual, for example, could understand they learn better if they see information rather than just hear it. Further, an individual might evaluate the complexity of a given task and choose to break it into smaller tasks, strategically accomplishing the most difficult first. He noted that individuals do not often understand these three areas, people, tasks, and strategies, singularly but rather they occur in tandem with one another.

Metacognitive experiences transpire when an individual considers their location in the process of completing a task or if they will be able to complete the task. These experiences can occur before the individual begins, while the task is in process, or once it is finished. Metacognitive experiences give an individual the opportunity to be reflective on their progress and if they need to determine a different path, goal, or strategy. In addition, metacognitive experiences add to the individual's metacognitive knowledge by broadening their understanding of processes and tasks. He continued by dividing goals and strategies into two categories, cognitive and metacognitive. Individuals use cognitive strategies to make progress toward a physical goal, such as re-reading a chapter to be better prepared to pass a test. Individuals use metacognitive strategies internally to monitor progress toward a metacognitive goal, such as reflecting that after reading an individual does not understand the material and choosing to ask themselves questions to evaluate where there are gaps in knowledge. In summary, an individual's goals and actions are the byproduct of their knowledge and experiences.

Contemporary research has expanded and detailed the role metacognition in the instructional process, including applications for classroom teachers. Pintrich (2002) discussed the role of metacognitive knowledge and its implications for the classroom by dissecting each of the three areas, strategy, task, and person, into more specific types of understandings. He divided cognitive strategic knowledge into three categories, rehearsal, elaboration, and organization. An individual can use rehearsal strategies when they need simple repetition of knowledge or skills. Elaboration strategies call for a deeper understanding of content as they require an individual to summarize, paraphrase, or reconfigure information. Organizational strategies require individuals to identify similarities and differences among various pieces of content and group them for better understanding. He also identified three categories of metacognitive strategic knowledge, planning, monitoring, and regulating. The author discussed how when an individual is working toward a goal, they will monitor their progress, evaluate their plans toward that goal, and then regulate their understanding through the process.

Task knowledge not only includes cognitive tasks, but also metacognitive tasks. Cognitive knowledge of a task is an individual's ability to consider task difficulty and what cognitive strategies can be used to complete a task. Metacognitive task knowledge would include the inner dialogue regarding task completion, if given strategies are effective, or the development of a new process and/or strategies to use toward completing the goal. Pintrich (2002) noted an important part of metacognitive knowledge is self-knowledge, understanding one's own motivations, strengths, weaknesses, and interests. The author called for explicit education in metacognitive knowledge, including instruction about students' strengths and weaknesses. Specifically, he suggested teachers and students should have a common vocabulary for labeling various areas of metacognitive knowledge so during instruction students can share their chosen processes and strategies. Pintrich recommended teachers model and explain strategies for students as an effective means of instruction, noting "if the knowledge is never shared through discussion, modeling, or explicit instruction, it is difficult for students to learn" (2002, p. 224). Finally, the author suggested that assessment of metacognitive knowledge should be informal rather than formal.

Metacognition application in music is sparse and rarely experimentally tested. Benton (2013) and Hart (2014) suggested self-assessment worksheets as strategies to improve metacognition in students. While this method is not incorrect, it restricted metacognition to solely after a cognitive process, such as a practice session. An individual's reflection of a process or product is only a singular area of the complete picture of metacognition. Rather than passive methods, Bathgate, Sims-Knight, and Scunn (2012) tested the effectiveness of the direct teaching of metacognitive practice strategies to beginning music students. The instructional practice included four stages: planning, playing, evaluating, and applying new strategies. Researchers found the amount of practice time by a participant in either condition of the study did not confound performance. Further, results indicated students significantly improved in performance, categorized by rhythm, error, and musicality, following metacognitive teaching regardless of condition group. The researchers noted the participants benefited from explicit teaching of metacognitive practices, including reflection and evaluation during practice and performance.

Metacognition can be a powerful tool for an individual as they embark on learning a new skill, however teachers must explain and model it explicitly to ensure transfer. As a part of metacognitive processing, it would be equally valuable to develop a repertoire of strategies to support the learning and sight-singing process.

Learning Strategies in Music Literacy

Individuals who are metacognitively considering a task not only evaluate their process toward a goal, but when achievement is hindered consider the use of a series of strategies. Kuehne (2010) suggested educators teach students how to prepare for sight-singing, implying students might not have a process by which to proceed. It is theoretically possible if students do not have a process to follow during sight-singing preparation, most likely they do not have or use a set of learning strategies. Killian and Henry (2005) found that high-accuracy sight-singers engage in strategy use, whether they were explicitly taught to the students or not. What remains unclear is how individuals develop these strategies. Ideally, teachers would provide a series of strategies within their sight-singing curriculum, however researchers cite few strategies, and fewer tested experimentally for efficacy.

Possibly the most frequently noted sight-singing strategy is Curwen hand signs, though researchers debated their effectiveness as part of a sight-singing instruction. Survey results of teacher practices indicated Curwen hand sign were an important part of the sight-singing curriculum (Floyd & Bradley, 2015; Kuehne, 2007; Nichols, 2013). Killian and Henry (2005) found the use of this strategy during performance had a positive effect in participants. McClung (2008) however found no significant difference in scores when participants used Curwen hand signs and when they did not. Frey-Clark (2017), after a review of literature, concluded Curwen hand signs were neither helpful nor harmful to students during sight-singing instruction. As

Curwen hand signs are the primary sight-singing strategy used by teachers, it would be valuable to not only test their effective use in the development of sight-singing skills but to investigate other, similar strategies that aid in music literacy instruction.

The field of sight-singing strategies seems to be a new area of research, as some are beginning to catalogue these various skills. Killian and Henry (2005) documented strategies used by low-, middle- and high-accuracy singers, during performance and practice. They found using hand signs, physically keeping the beat, and maintain the tempo were strategies associated with success. Additionally, they determined middle- and high-accuracy singers were much more likely to use strategies during practice and performance than low-accuracy singers. More recently, Fournier et al. (2019) catalogued 72 cognitive sight-singing strategies, including categories such as reading mechanisms, sight-singing, reading skills acquisition, and learning support. The researchers preparatory work provides a collection of strategies for future research into this burgeoning field.

Development of a sight-singing curriculum for novice musicians should contain more than a collection of musical examples with an accompanying system for decoding. Since reading music is a complicated, cognitive enterprise, it is equally important to provide strategies as supports for the bridge toward music literacy. Explicit and early strategy instruction are important elements for the full development of the musically literate individual.

Music Example Development

Though research is inconclusive regarding a best pitch reading system, developing a systematic series of sight-singing examples is foundational to best facilitate understanding of music reading. Henry (2001) sought to develop an individualized sight-singing assessment tool for use by secondary choral directors, with an emphasis on a pitch skill hierarchy. Henry (2001) noted the body of research supported tonal patterns in sight-singing instruction, which would improve the practical concerns of individualized assessment for teachers in the field. A focus on tonal patterns, in addition to the need for a strong tonal context, allowed the researcher to develop skill patterns that prior research, instructional materials, and theoretical conceptions supported. Henry identified a total of 18 tonal patterns, some divided into ascending or descending, and were grouped into seven categories: (a) conjunct, (b) tonic, (c) dominant, (d) sub-dominant, (e) cadential, (f) modulatory, and (g) chromatic (see Table 1 for tonal patterns, difficulty indexes, and discrimination indexes).

Table 1

Difficulty and Discrimination Indexes for Component Skills

	Component pitch skill	*Diff.*	*Disc.*		*Component pitch skill*	*Diff.*	*Disc.*
1	repeated	.82	.55	19	upper chromatic	.31	.69
2a	*drm* ascending	.81	.52	3b	*drmfs* descending	.28	.51
3a	*drmfs* ascending	.77	.63	9a	*fld* skip	.28	.52
4a	*drmfslt* ascending	.70	.63	11a	*ldm* skip	.27	.58
4b	*drmfslt* descending	.53	.64	10a	*rfl* skip	.26	.58
5a	*dms* (I) skip	.51	.61	7b	*str* leap	.25	.51
5b	*dms* (I) leap	.51	.59	8a	*strf* skip	.24	.67
12	end on *d*	.50	.69	8b	*strf* leap	.22	.61
2b	*drm* descending	.46	.52	16	V/V sec. dom.	.22	.68
6	*dd'* octave	.45	.70	17	bm parallel minor	.21	.61
13	*td'*	.44	.71	9b	*fld* leap	.20	.52
14	*sd'*	.38	.56	10b	*rfl* leap	.17	.58
7a	*str* skip	.32	.65	11b	*ldm* leap	.16	.46
15	*sltd'*	.32	.64	18	lower chromatic	.14	.57

Note. Henry, 2001, p. 30

After conducting a pilot study, she tested the sight-singing ability of 183 participants from five high schools. Henry used parallel forms and two scoring systems, the first only scored pitches that were part of one of the 18 tonal patterns and the second system simply scored note-by-note accuracy, which resulted in high reliability (r = .96). A t-test revealed no significant difference between participants completing form A versus form B. An inter-scorer reliability revealed a correlation of .97 using the tonal pattern scoring system. She concluded, “the identified skills are an adequate representation of the skills required to sight-read vocal music” (Henry, 2001, p.31).

Curriculum development is multi-faceted, and designers should consider each piece of a curriculum carefully, curating it to best facilitate learning. Henry’s (2001) work, as part of the development of the Vocal Sight-Reading Inventory, serves as the theoretical framework for the scaffolded progression through tonal patterns for the present study. Rhythmic patterns are based on a theoretical progression gained through practical experience (see Appendix A for sight-singing examples). The present curriculum used Moveable-do and Takadimi. A teacher would utilize the system that is most familiar or comfortable for instruction in practical application outside of the present study, rather than a particular rhythm or pitch reading method. The Gradual-Release Model is the foundation for the instructional design with a dual emphasis on both cognitive and metacognitive processes. The curriculum reinforced sight-singing strategies identified by Killian and Henry (2005). The following literature review describes the distance learning medium used for the present curriculum, specifically asynchronous instruction.

Music Education and Technology

Technology quality and quantity has improved in recent decades and its use in the education field has blossomed with possibility (Bowman, 2014). Music education technology specifically is a relatively new field, but one that shows promise despite innate challenges (Bowman, 2014; Koutsoupidou, 2014; Rees, 2002; Webster, 2011). Geographical location, for example, can hinder finding a quality private music instructor. However, with video conferencing applications, such as Skype or Zoom, an individual can have access to weekly lessons they would otherwise not have (Koutsoupidou, 2014; Rees, 2002; Stevens et al., 2019). Further, distance learning can also engage a wider and more diverse audience of participants than traditional face-to-face often solicits (Bowman, 2014; Koutsoupidou, 2014).

The rapid pace of technological progress may not be indicative of the preparation or transfer to the music education field. Though there is an ever-increasing pool of music related software, there may not be sufficient instruction for current or future music educators. Price and Pan (2002), in an undergraduate music education survey of technology courses, found while 90% of institutions believed the curriculum should include music education specific software, less than 40% included those topics in their classes. Further, the researchers asserted based on survey results there did not appear to be a difference in the technology curriculum for music education majors and other music majors, with the most common topics being music notation software (61%) and MIDI (56%) (Price & Pan, 2002).

The current body of music education technology literature has generally been either using technology as a supplement to traditional classroom instruction or video conferencing for one-on-one instruction, rather than a primary means of group instruction (Bovin, 2018; Comeau et al., 2019; Koutsoupidou, 2014; Pike & Shoemaker, 2013; Rees, 2002; Stevens et al., 2019). The present study investigates the effectiveness of asynchronous instruction, therefore a search for effective practices and potential challenges of this learning medium could yield impactful results for designing online content.

Instructional Delivery

As technology has developed so have the divisions among the umbrella term, *distance learning*. Bowman (2014) defined distance learning as "programs of study delivered entirely or partially away from regular face-to-face interactions between teachers and students in classrooms, tutorials, laboratories, and rehearsals associated with coursework, degrees, and programs on the campus" (p. 4). Two general categories of distance learning developed from this more overarching term: synchronous and asynchronous instruction. Rees (2002) described synchronous instruction as when "student and teacher, regardless of location, meet at the same time" and asynchronous instruction as when "there is no common meeting schedule of classes, and instruction is delivered in some archived form…" (p. 259).

Researchers suggested distance learning instructional methods are more important than the delivery medium chosen (Bowman, 2014; Sitzmann et al., 2006). In a meta-analysis of the comparative effectiveness of web-based and classroom instruction, Sitzmann et al. (2006) found web-based instruction and traditional classroom instruction were equally effective at teaching procedural knowledge. Further, data indicated web-based instruction was more effective at teaching declarative knowledge (Sitzmann et al., 2006). The researchers noted despite the suggested equality of effectiveness, different instructional media created different learning experiences and educators should be cautious in choosing one system without consideration for the participants.

Research provided evidence personality traits can impact the distance learning process or develop because of online instruction. Pike and Shoemaker (2013), for example, found participants who studied piano through synchronous distance learning exhibited a greater level of independence than those who studied in a face-to-face model. This result came as observations revealed students developed a required independence due to the lack of an in-person instructor. Comeau et al. (2019) noted though the synchronous student in their study was more advanced following treatment a possible cause could have been the participant's personality. The researchers continued the in-person participant was more social which led to additional verbal interactions, while the distance learning student was less verbal and more focused on playing and receiving directives (Comeau et al., 2019).

Researchers found many trends in distance learning curriculum design that positively impacted the learning process. Feedback about mastery of skill, regardless of delivery medium, provided individuals with the opportunity to clarify their understandings about content (Comeau et al., 2019; Sitzmann et al., 2006). Integrating opportunities to practice within the curricular design also appeared to be a beneficial instructional strategy for face-to-face and distance learning teachers (Bovin, 2018; Comeau et al., 2019; Sitzmann et al., 2006).

Research suggests distance learning is at least as effective as traditional face-to-face instruction, not because of the chosen medium but rather due to purposeful design and implementation of curriculum (Bowman, 2014; Sitzmann et al., 2006). Selection and pacing of content are important, but it would seem equally important for the instructor to carefully consider their students and select teaching strategies that best facilitate the learning process (Bovin, 2018; Comeau et al., 2019; Pike & Shoemaker, 2013; Sitzmann et al., 2006). Despite the apparent benefits to utilizing technology in education, it also adds a component of complexity as it requires the use of hardware and software, which at times can make instruction less effective or not possible.

Practical Issues of Technology in Music Education

Music education technology brings many other practical concerns for quality instructional delivery beyond particular hardware or software reliability. Music is a real-time artform and any delay among participants diminishes the quality of the product produced. As teachers implement technology into their teaching repertoire, it would be important to consider practical issues and make provisions prior to their realization.

Often a quality audio and video production require specific equipment that is beyond the budget of primary and secondary schools. Traditional built-in computer microphones, for example, are not capable of collecting the larger range of pitches produced by instruments or the voice (Comeau et al., 2019). Several researchers detailed the experience of one-on-one lessons and recommended the use of multiple large screen televisions, allowing the instructor to observe the student's posture and technique (Comeau et al., 2019; Koutsoupidou, 2014; Stevens et al., 2019). Though there are clear advantages to having these recommended pieces of hardware, finances or available lesson space might make them an impracticality or impossibility.

While quality hardware can be a financial deterrent, the reliability of the internet can create added barriers to online instruction. Many platforms now offer free, but limited, access to video conferencing software, such as Skype, Zoom, or Google Meet. Regardless of the platform, latency from slow connection speeds can make real-time communication delayed to a point of inefficiency or impossibility (Koutsoupidou, 2014; Pike & Shoemaker, 2013; Stevens et al., 2019). Latency also impacts the quality of both the audio and visual product produced by either the teacher or student, impacting instruction (Stevens et al., 2019).

Despite all the potential challenges faced by music educators who choose to incorporate technology into their instruction, the suggested benefits lead to a worthiness of consideration. It is notable that both teachers, students, and parents who participated in technology-centered studies generally reported positive experiences because of online instruction (Bowman, 2014; Comeau et al., 2019; Rees, 2002; Stevens et al., 2019). Music education technology literature however is somewhat limited regarding asynchronous instruction effectiveness, especially as it relates to music literacy instruction (Seddon & Biasutti, 2009).

In summary, sight-singing literature is inconclusive regarding the best systems for teaching. It is possible this lack of a universal pedagogy also has hindered the development of supplemental strategies because of the quantity of individual approaches and methodologies. Another obstacle could be the inclusive nature of music education as a similar but separate entity from general education practice. The focus in sight-singing literature has often been student variables. Perhaps the way to improve music literacy is to provide teachers research and resources to support the act of teaching, rather than simply providing materials. Since direct connections from educational theory do not always find their way into practical application for music education, it could be valuable to see how music education can practically apply these theories and models. Allowing teachers to select their preferred method and providing a framework for *how* the method is implemented seems a novel contribution and an area worth investigating.

CHAPTER 3

METHOD

The purpose of this study was to test the efficacy of teaching sight-singing to novice, vocal music readers using a structured instructional model through an asynchronous format.

Participants

I used a convenience sampling method for this study. I sought to recruit 45 - 60 potential participants, ages 12 through adult, with a goal of at least 40 total participants who were novice sight-singers. Potential participants took three pre-tests prior to the study to determine their existing sight-singing level. Novice sight-singers were those who scored less than 50% on two of the three pre-tests. The original research design stated only novices would be entered into the study, however due to a low sample size, all participants between the ages of 12 through adult who completed the consent and, if appropriate, assent forms were included.

I recruited participants by sending an email to middle and high school choral directors from Southwestern Virginia, who were also members of the Virginia Music Educators Association (VMEA). The email described the goals of the study, participant requirements, and requested the teacher send the invitations to their students. In addition, I sent a similar email to adult, community choral ensembles and collegiate choral programs in Southwestern Virginia inviting singers to participate. After two follow-up emails to choral directors, no participants were recruited. Recruitment procedures were modified and approved through the Auburn University Institutional Review Board. The modifications allowed teachers to enroll an entire class, rather than self-registration by individuals within the class. The teacher allowed class time for participants to complete modules.

I used the same email list to describe the alterations and requested participation following the approved modifications. After three follow-up emails, five choral directors agreed to register one of their choral classes yielding 68 registrants. Recruitment efforts yielded no participation from either community ensembles or collegiate ensembles. Teachers facilitated the collection of consent and assent forms and mailed all forms to the research assistant, resulting in 24 usable data sets (n = 24).

All interested choral directors communicated via email with a research assistant who anonymously coded participants using a random number generator. The research assistant entered the instructional delivery platform, Instructure Canvas (Instructure, n.d.). The research assistant randomly assigned participants into treatment groups or control groups and altered codes to reflect their assignment to the treatment group. Specifically, the number "one" was added to the beginning of the codes for treatment group members, and the number "zero" was added to the beginning of the control group codes. Once assigned, I provided individual feedback to the treatment group throughout the sight-singing modules (research question 3), while the control group did not receive individual feedback.

Organization and Materials

Canvas (Instructure, n.d.) served as the learning delivery platform for this study. I equally divided and labeled instructional units into daily modules. Instruction and activities each day ranged from five to ten minute in length. Module prerequisites in Canvas ensured participants completed the units based on the designed curricular sequence. Specifically, I locked modules and they were not accessible until participants completed the previous day's modules.

Participants were able to view videos more than once if desired, though this was not required. The instructions in each module ensured they are aware that they have this option.

I created instructional videos using Keynote presentation software, recorded, and then used iMovie to edit. I uploaded completed videos to a private Vimeo account, which is a video creating and housing platform, and then embedded them into Canvas modules. The musical content and instructional delivery were based on a review of sight-singing literature (see chapter 2), the Gradual-Release Model (Pearson & Gallagher, 1983), and the researcher's practical experience.

Participants needed access to a computer with high-speed internet. In addition, participants downloaded two smartphone/tablet applications to facilitate practice and recording assessments. These included (a) *Smart Metronome and Tuner* (Ihara, 2014), a simplified metronome and (b) *EasyVoiceRecorder* (Digipom, 2019), a voice recording app that can email or message recordings. Both applications were free and available for both Apple and Android platforms. Instructional videos for both applications were available to participants in the introductory module from the start of the study and on a Canvas forum/discussion page devoted to technical issue questions.

Procedure

The study included nine daily modules, each with a total of 5 to 10 minutes of asynchronous instruction (see Table 2). A welcome video encouraged students to log in daily, that is, to not skip days between lessons, so instruction was continuous from day-to-day for 9 days. Participants watched an instructional video and submitted an audio recording of a sight-singing practice example on specified days following instruction. Participants used recordings to independently demonstrate understanding and they were not graded for accuracy. For each recorded submission, I provided the treatment group individualized feedback about their accuracy of rhythm and/or melodic notation through the Canvas messaging system. In addition, they received reminders strategy use, such as maintaining a steady beat. Following the four days of rhythmic instruction, the participants took a rhythm-only post-test. Following the four days of melodic instruction, participants took a pitch-only post-test and a combined rhythm and pitch ("melody") post-test. Any participants who completed the study were entered into a drawing for one of ten, $15 Amazon gift cards.

Table 2

Instructional Units

Day	*Section*	*Content*	*Instructional method*
1	A	Welcome, basic instructions, & rhythm, pitch-only, and melodic pre-test	Not applicable
2	A	Quarter note & paired eighth notes	Modeling
2	B	Quarter note & paired eighth notes	Modeling
2	C	Quarter note & paired eighth notes	Guided practice (teacher-led)
3	A	Quarter note & paired eighth notes	Modeling
3	B	Quarter note & paired eighth notes	Guided practice (teacher-led)
3	C	Quarter note & paired eighth notes	Guided practice (student-led)
3	D	Practice submission	
4	A	Quarter note & paired eighth notes	Modeling
4	B	Quarter note & paired eighth notes	Guided practice (teacher-led)
4	C	Quarter note & paired eighth notes	Guided practice (student-led)
4	D	Practice submission	
5	A	Quarter note & paired eighth notes	Guided practice (student-led)
5	B	Quarter note & paired eighth notes	Guided practice (student-led)
5	C	Rhythm-only post-test	
6	A	*do – mi*, stepwise (using quarter notes only)	Modeling
6	B	*do – mi*, stepwise (using quarter notes and paired eighth notes)	Modeling
6	C	*do – mi*, stepwise (using quarter notes and paired eighth notes)	Guided practice (teacher-led)

Day	*Section*	*Content*	*Instructional method*
7	A	*do* – *mi* (using quarter notes and paired eighth notes)	Modeling
7	B	*do* – *mi* (using quarter notes and paired eighth notes)	Guided practice (teacher-led)
7	C	*do* – *mi* (using quarter notes and paired eighth notes)	Guided practice (student-led)
7	D	Practice submission	
8	A	*do* – *sol* (using quarter notes and paired eighth notes)	Modeling
8	B	*do* – *sol* (using quarter notes and paired eighth notes)	Guided practice (teacher-led)
8	C	*do* – *sol* (using quarter notes and paired eighth notes)	Guided practice (student-led)
8	D	Practice submission	
9	A	*do* – *sol* (using quarter notes and paired eighth notes)	Guided practice (student-led)
9	B	*do* – *sol* (using quarter notes and paired eighth notes)	Guided practice (student-led)
9	C	Pitch-only post-test and pitch and rhythm post-test	

Measurement Strategies

I used Qualtrics (2020) to create surveys to capture participant demographic data and 7-point Likert-type questions about their comfort levels regarding technology use and their own perceived sight-singing ability. Subject-matter experts were consulted for construct validity and adjustments were made according to feedback prior to use.

Each participant completed three pre-tests and three post-tests. The pre- and post-tests were researcher-created based on expected curricular outcomes from the designed curriculum. I developed a rubric to capture each rhythm and/or pitch as either correct or incorrect using Google Sheets (see Appendix B). An additional item was included on each test to note a participant's ability to maintain steady beat, an indirect curricular outcome. I consulted two subject-matter experts to determine construct validity. Each received training on how to use the rubric before assessing participants pre- and post-tests. Following training, the two independent experts and I graded ten, non-participant post-tests to establish inter-rater reliability. Following, the rubric pilot, I made adjustments according to feedback. I determined inter-rater reliability using Spearman Correlation Coefficient using scores from participant pre- and post-test scores because pilot scores were negatively skewed (Russell, 2018). Participants' pre- and post-tests were assessed by the same two subject-matter experts.

Design and Analysis

Research Question One

Research question one asked if an asynchronous format was an effective means to teach sight-singing to novice sight-singers? Specifically, will post-test scores indicate improvement over pre-test scores in sight-singing skills after two weeks of asynchronous direct online instruction? I used the Wilcoxon test using each sub-test to determine if there was a significant difference from pre-test to post-test for novices within the sample. I employed the non-parametric Wilcoxon test due to the small number of novices within the sample (Russell, 2018). I continued the investigation into the effectiveness of the asynchronous format by conducting the non-parametric Wilcoxon tests on each subtest for non-novice participants as well as the whole sample. Again, I used non-parametric procedures due to the small number of non-novices, as well as issues of normality, specifically the negative skew of the non-novice scores. I used Mann-Whitney *U* test to compare differences between the novice and non-novice group on all tests. Finally, I calculated change scores for all participants and conducted a Mann-Whitney *U* using the novice-level as the independent variable.

I tested participants at the start of the study, at the end of the rhythm unit, and finally at the end of the melodic unit separately, therefore results may yield changes based on sight-singing instruction for each skill. Pre- and post-tests produced continuous level data, with each rhythm and/or pitch counting as either correct or incorrect. The two subject-matter experts graded pre-test and post-test scores. Hypotheses were as follows:

H_0: $\mu_{\text{rhythm pretest}} = \mu_{\text{rhythm posttest}}$

H_0: $\mu_{\text{pitch only pretest}} = \mu_{\text{pitch only posttest}}$

H_0: $\mu_{\text{pitch and rhythm pretest}} = \mu_{\text{ pitch and rhythm pretest}}$

H_1: $\mu_{\text{rhythm pretest}} < \mu_{\text{rhythm posttest}}$

H_2: $\mu_{\text{pitch only pretest}} < \mu_{\text{pitch only posttest}}$

H_3: $\mu_{\text{pitch and rhythm pretest}} < \mu_{\text{ pitch and rhythm pretest}}$

Research Question Two

Research question two asked if individuals of different age groups were able to sight-sing equally after proceeding through an asynchronous instructional format? Specifically, will there be significant differences between participants' pre- and post-test scores based on age? Due to the small sample size, I used the Kruskal-Wallis *H* test to compare the means of two or more groups (Russell, 2018). First, I grouped participants by their chronological age. I then grouped participants into two groups based on age: 13 – 15 (freshmen and sophomores) and 16 – 18 (juniors and seniors) and conducted a Mann-Whitney *U* to compare differences between the two groups. Lastly, I calculated change scores for all participants and conducted a Mann-Whitney *U* using the age groups as the independent variable. Several studies in music education utilized groupings based on present educational level, for example Killian and Henry (2005) collected sight-singing strategies of high school students, while Kuehne (2007) surveyed instructional practice, attitudes, and methods of middle school choral directors. I designed sampling procedures to identify potential participants in all these categories, although recruitment efforts only yielded high school aged participants. The three post-tests served as the dependent variable and the age groups served as the independent variable. Results from the post-tests will provide continuous level data. Hypotheses were as follows:

H_0: $\mu_{\text{rhythm pretest}} = \mu_{\text{middle school rhythm posttest}} = \mu_{\text{high school rhythm posttest}} = \mu_{\text{college rhythm posttest}} = \mu_{\text{graduate rhythm posttest}} = \mu_{\text{adult rhythm posttest}}$

H_0: $\mu_{\text{pitch only pretest}} = \mu_{\text{middle school pitch only posttest}} = \mu_{\text{high school pitch only posttest}} = \mu_{\text{college pitch only posttest}} = \mu_{\text{graduate pitch only posttest}} = \mu_{\text{adult pitch only posttest}}$

H_0: $\mu_{\text{pitch and rhythm pretest}} = \mu_{\text{middle school pitch and rhythm posttest}} = \mu_{\text{high school pitch and rhythm posttest}} = \mu_{\text{college pitch and rhythm posttest}} = \mu_{\text{graduate pitch and rhythm posttest}} = \mu_{\text{adult pitch and rhythm posttest}}$

H_1: $\mu_{\text{rhythm pretest}} \neq \mu_{\text{middle school rhythm posttest}} \neq \mu_{\text{high school rhythm posttest}} \neq \mu_{\text{college rhythm posttest}} \neq \mu_{\text{graduate rhythm posttest}} \neq \mu_{\text{adult rhythm posttest}}$

H_2: $\mu_{\text{pitch only pretest}} \neq \mu_{\text{middle school pitch only posttest}} \neq \mu_{\text{high school pitch only posttest}} \neq \mu_{\text{college pitch only posttest}} \neq \mu_{\text{graduate pitch only posttest}} \neq \mu_{\text{adult pitch only posttest}}$

H_3: $\mu_{\text{pitch and rhythm pretest}} \neq \mu_{\text{middle school pitch and rhythm posttest}} \neq \mu_{\text{high school pitch and rhythm posttest}} \neq \mu_{\text{college pitch and rhythm posttest}} \neq \mu_{\text{graduate pitch and rhythm posttest}} \neq \mu_{\text{adult pitch and rhythm posttest}}$

Research Question Three

Research question three asked if individuals who receive feedback about their sight-singing performance perform better than those who do not? Specifically, will there be significant differences in the sight-singing post-test scores between participants who receive individual feedback versus participants who receive no individual feedback? I used the Wilcoxon test to assess the difference from pre-test to post-test for both the feedback (treatment) group and the non-feedback (control) group. I conducted a Mann-Whitney *U* to evaluate differences between groups for each subtest. Finally, I calculated change scores for all participants and conducted a Mann-Whitney *U* using the feedback grouping as the independent variable. As previously described, the research assistant randomly assigned participants to either a control group or a treatment group. Those in the control group received no feedback after sight-singing submissions and those in the treatment group received individualized feedback from the researcher through Canvas messages. Hypotheses were as follows:

H_0: $\mu_{\text{control rhythm posttest}} = \mu_{\text{treatment rhythm posttest}}$

H_0: $\mu_{\text{control pitch only posttest}} = \mu_{\text{treatment pitch only posttest}}$

H_0: $\mu_{\text{control pitch and rhythm posttest}} = \mu_{\text{treatment pitch and rhythm posttest}}$

H_1: $\mu_{\text{control rhythm posttest}} \neq \mu_{\text{treatment rhythm posttest}}$

H_2: $\mu_{\text{control pitch only posttest}} \neq \mu_{\text{treatment pitch only posttest}}$

H_3: $\mu_{\text{control pitch and rhythm posttest}} \neq \mu_{\text{treatment pitch and rhythm posttest}}$

Limitations

The global pandemic, COVID-19, created many limitations for this study. As previously noted, I altered both the recruitment and inclusion criteria to facilitate a larger sample size. The modification for recruitment and teacher-facilitation of the program could have altered the daily engagement or allowed for additional teacher instruction beyond the scope of the study. The need for an altered inclusion criteria impacted central tendency, specifically with a skew and kurtosis. Further, pandemic fatigue (World Health Organization, 2020) paired with the timing of the study could have reduced motivation to begin or complete the study.

Hardware and software difficulties were a potential limitation of this study, which the distance learning literature reflected (Comeau et al., 2019; Denis, 2016; Koutsoupidou, 2014). While participants should have access to high-speed internet and had the ability to download applications to their phone/tablet, momentary or daily outages of internet service are not uncommon occurrences. This research presented an instructional curriculum that was solely provided through internet-based platforms and therefore, an internet outage could have impacted participants' access and the pacing of the instructional sequence. Further, technical challenges of transferring and uploading files from phones to the Canvas platform seemed to be a frequent issue.

I attempted to recruit at least 40 participants into the sample, with an equal distribution into the five age-based groups. It was possible that (a) the goal sample size would not be reached, (b) that a few participants would drop-out during the course of the study, or (c) that the sample would not be equally distributed into the age-based groups. Further, based on the approximately two-week commitment, participants could have chosen to halt their participation during the study due to personal difficulties. While recruitment yielded approximately 70 registrations, the sample contained less than 30.

Lastly, I directed participants through Canvas to record their pre-tests and post-tests once prior to submission. The procedures developed for participants to record and submit did not hinder their ability to record several times and submit the best recording. It was possible for an individual to have submitted their "best" recording rather than their initial recording.

Delimitations

I chose to limit the goal number of participants for feasibility of providing daily individualized feedback during the course of the study. This decision would have limited the statistical analysis power of the ANOVA used for research question two since the number of each group was approximately eight participants, requiring the use of the Kruskal-Wallis *H*. However, due to the small sample, I used the non-parametric equivalent for all statistical procedures.

I developed the curriculum and assessments chosen for this study to reflect findings in the literature regarding common practices and research findings. I chose approximately two weeks for the length of the study to test the theoretical effectiveness of the instructional and asynchronous format. I designed the length of each module, approximately ten minutes, to be reflective of common classroom practice found in survey data (Daniels, 2006; Demorest, 2004; Kuehne, 2007; Nichols, 2013).

CHAPTER 4

RESULTS

The purpose of this study was to test the efficacy of teaching sight-singing to novice, vocal music readers using a structured instructional model through an asynchronous format.

Participants

I used a convenience sampling method for this study. I sought to recruit 45 - 60 potential participants, ages 12 through adult, with a goal of at least 40 total participants who were novice sight-singers. The research assistant registered a total of 68 individuals into the Canvas module, 51 (75.0%) of whom engaged with the study content at least once, meaning 17 (25.0%) never logged in to Canvas. Eight (11.7%) individuals failed to enter their assigned identification number into the pre-survey and also did not complete any components beyond the pre-survey. The sample consisted of twenty-four (35.0%) of the final 43 (63.2%) individuals who completed and returned the consent and assent forms.

Participant Demographics

All participants (n = 24) were high school-aged, choral students (95.8%), a plurality of whom were ninth graders (37.5%), except for one participant who was in seventh grade (4.2%). Ages for the participants ranged from 13 to 18, with a mean age of 15.45 (SD = 1.41). See Table 3 for a summary of participants' demographic information.

Participants reported both sex assigned at birth and gender identification. Eighteen indicated assigned female a birth (75.0%), three indicated assigned male at birth (12.5%), one indicated they preferred not to respond (4.2%), and two did not respond (8.3%). Seventeen reported their gender identification as girl (70.8%), three identified as boy (12.5%), one identified as nonbinary/genderqueer (4.2%), one selected "another identity not listed here" (4.2%), and two did not respond to any questions on the pre-survey (8.3%).

Table 3

Participant Demographics

Characteristic	*n*	*%*
Age		
13	1	4.2
14	6	25.0
15	4	16.7
16	6	25.0
17	3	12.5
18	2	8.3
Did not respond	2	8.3
Grade		
7	1	4.2
9	9	37.5
10	4	16.7
11	7	29.2
12	1	4.2
Did not respond	2	8.3
Sex assigned at birth		
Female assigned at birth	18	75.0
Male assigned at birth	3	12.5
Prefer not to respond	1	4.2
Did not respond	2	8.3
Gender Identification		
Girl	17	70.8
Boy	3	12.5
Nonbinary/Genderqueer	1	4.2
Another identity not listed	1	4.2
Did not respond	2	8.3

Pre-/Post-Survey

I asked participants to rate their sight-singing confidence on a 7-point scale based on a provided musical example on both the pre- and post-survey (Appendix C). The pre-survey mean score for the sample was 5.09 (*SD* = 1.60) and the post-survey mean score was 4.91 (*SD* = 1.22). Novice's pre-survey sight-singing confidence was 3.76 (*SD* = 2.08) and post-survey was 4.33 (*SD* = 1.53). Non-novice pre-survey sight-singing confidence was 5.36 (*SD* = 1.55) and post-survey was 4.83 (*SD* = 4.67). I used Mann-Whitney *U* to investigate significant differences in sight-singing confidence on the pre- and post-surveys between the novice and non-novice groups. There was no significant difference between novice and non-novice participants on either the pre-survey ($U = 31.50$, $p = .197$) nor the post-survey ($U = 11.00$, $p = .714$). I used the Wilcoxon signed rank test to examine the change for novices and then for non-novices from pre-survey to post-survey. There were no significant differences for either the novice group ($Z = 1.41$, $p = .162$) nor for the non-novice group ($Z = .00$, $p < .999$). Although there were no significant differences from pre- to post-survey, the novice group self-reported a greater confidence in sight-singing ability, while the non-novices reported less confidence. The results could suggest the non-novices initially over-estimated their sight-singing abilities prior to the pre-tests, while the novices became more confident potentially as a result of the asynchronous curriculum. See Table 4 for a summary of sight-singing confidence descriptive statistics.

Table 4

Sight-Singing Confidence Descriptive Statistics

	All	*Novice*	*Non-Novice*
Pre-survey			
Mean	5.09	3.76	5.36
SD	1.60	2.08	1.55
n	22	3	14
Post-survey			
Mean	4.91	4.33	4.83
SD	1.22	1.53	4.67
n	11	3	6

Reliability and Validity

I evaluated reliability for pre- and post-test results for both evaluators using inter-rater reliability. The results for pre-tests were generally normally distributed, with exception of the rhythm subtest. The results for post-tests were generally negatively skewed and leptokurtic, with exception of the melody subtest. I chose to use the non-parametric Spearman Correlation Coefficient to test for reliability between Evaluator 1 (EV1) and Evaluator 2 (EV2) based on these normality results and the small sample size. See Table 5 for skew and kurtosis statistics for all pre- and post-tests. A strong, positive correlation was found for the pitch pre-test ($r_{16} = .94$, $p < .001$), pitch post-test ($r_{11} = .86$, $p < .001$), melody pre-test ($r_{16} = .97$, $p < .001$), and melody post-test ($r_{10} = .91$, $p < .001$) and a moderate correlation was found for the rhythm pre-test ($r_{16} = .73$, $p = .001$), indicating a significant relationship between the scores of the two evaluators. The reliability for the rhythm post-test could not be calculated due to a lack of variability of the scores by EV1 ([EV1] $\bar{x} = 22.00$, $SD = .00$; [EV2] $\bar{x} = 21.53$, $SD = 1.81$). Content validity was established and described in Chapter 3.

Table 5

Skew and Kurtosis for Pre- and Post-tests

EV1	*Rhythm Pre-test*	*Rhythm Post-test*	*Pitch Pre-test*	*Pitch Post-test*	*Melody Pre-test*	*Melody Post-test*
Skew	-1.95	*	-.97	-2.62	-.59	-.48
SE of Skew	.54	.58	.55	.62	.54	.64
Kurtosis	2.62	*	-1.07	7.31	-1.21	-1.07
SE of Kurtosis	1.04	1.12	1.06	1.19	1.04	1.23
EV2						
Skew	-1.61	-3.87	-.725	-2.35	-.97	-1.34
SE of Skew	.54	.58	.55	.62	.54	.64
Kurtosis	1.09	15.00	-1.33	5.24	-.70	.45
SE of Kurtosis	1.04	1.122	1.06	1.19	1.04	1.23

*Results for the rhythm post-tests were identical for all participants

Research Question 1

Research question one asked if an asynchronous format was an effective means to teach sight-singing to novice sight-singers. Specifically, will post-test scores indicate improvement over pre-test scores in sight-singing skills after two weeks of asynchronous direct online instruction? See Table 6 for a summary of descriptive statistics for novices and non-novices. I used a Wilcoxon signed rank test to determine if there was a significant difference for novice sight-singers from pre-test to post-test on each of the three subtests. There was no significant difference on the following:

- rhythm subtest ([EV1] $Z = 1.83$, $p = .068$; [EV2] $Z = 1.83$, $p = .068$),
- the pitch subtest ([EV1] $Z = 1.00$, $p = .317$; [EV2] $Z = 1.00$, $p = .317$), or
- the melody subtest ([EV1] $Z = 1.34$, $p = .180$; [EV2] $Z = .45$, $p = .655$).

Although the novices did not significantly improve, the novice group did improve from pre-test to post-test, more so than the non-novices. I therefore failed to reject the null hypothesis on each of the following:

H_0: $\mu_{\text{rhythm pretest}} = \mu_{\text{rhythm posttest}}$

H_0: $\mu_{\text{pitch only pretest}} = \mu_{\text{pitch only posttest}}$

H_0: $\mu_{\text{pitch and rhythm pretest}} = \mu_{\text{pitch and rhythm pretest}}$

Table 6

Novice and Non-Novice Descriptive Statistics

EV1	*Rhythm Pre-test*	*Rhythm Post-test*	*Pitch Pre-test*	*Pitch Post-test*	*Melody Pre-test*	*Melody Post-test*
Sample						
Mean	20.22	22.00	11.18	13.69	28.72	29.42
SD	3.74	.00	6.73	4.57	9.87	7.94
n	18	15	17	13	18	12
Novice						
Mean	16.50	22.00	.33	8.67	15.50	23.67
SD	4.44	.00	.58	7.77	4.51	11.59
n	4	4	3	3	4	3
Non-Novice						
Mean	21.29	22.00	13.50	15.20	33.69	31.33
SD	2.40	.00	4.77	1.87	6.03	6.04
n	14	11	14	10	13	9
EV2						
Sample						
Mean	19.83	21.53	10.59	13.69	26.89	27.67
SD	3.85	1.81	6.55	4.87	13.93	13.43
n	18	15	17	13	18	12
Novice						
Mean	13.25	22.00	.33	9.33	7.50	14.33
SD	2.63	.00	.58	8.33	8.19	20.65
n	4	4	3	3	4	3
Non-Novice						
Mean	21.71	21.36	12.79	15.00	34.54	32.11
SD	.83	2.11	4.82	2.83	5.43	7.25
n	14	11	14	10	13	9

Note. EV = Evaluator

I compared the novice results to those of the non-novices by first using a Wilcoxon signed rank test to examine if there was significant difference between pre-test and post-test for non-novices and then conducted a Mann-Whitney *U* to test for differences between novice groups on each pre- and post- subtest. No significant differences existed for non-novices on the following:

- the rhythm subtest ([EV1] $Z = 1.00$, $p = .317$; [EV2] $Z = -.45$, $p = .655$),

- the pitch subtest ([EV1] $Z = 1.63$, $p = .102$; [EV2] $Z =1.10$, $p = .273$), or
- the melody subtest ([EV1] $Z = -.81$, $p = .416$; [EV2] $Z = -.95$, $p = .343$).

The non-novices generally improved on the pitch subtest and only minimally worsened on the rhythm and pitch subtests. The Mann-Whitney *U* results indicated a significant difference on the following pre-tests:

- the rhythm pre-test ([EV1] $U = 52.50$, $Z = 3.01$, $p = .005$, $r = .68$; [EV2]$U = 56.00$, $Z = 3.54$, $p = .001$, $r = .83$),
- the pitch pre-test ([EV1]$U = 42.00$, $Z = 2.80$, $p = .003$, $r = .68$; [EV2] $U = 42.00$, $Z = 2.75$, $p = .003$, $r = .67$),
- the melody pre-test ([EV1]$U = 52.00$, $Z = 2.98$, $p = .001$, $r = .72$; [EV2] $U = 52.00$, $Z = 3.02$, $p = .001$, $r = .73$), and
- the pitch post-test of one evaluator ([EV1] $U = 27.00$, $Z = 2.22$, $p = .049$, $r = .61$).

There were no significant differences on the following post-tests:

- the rhythm post-test ([EV1] $U = 22.00$, $Z = .00$, $p < .999$; [EV2] $U = 20.00$, $Z = -.60$, $p = .851$),
- the pitch post-test of one evaluator ([EV2] $U = 23.00$, $Z = 1.65$, $p = .217$), and
- the melody post-test ([EV1] $U = 21.00$, $Z = 1.40$, $p = .209$; [EV2] $U = 19.50$, $Z = 1.13$, $p = .282$).

The results provided positive indication as the significant differences between novices and non-novices were eliminated from pre-test to post-test.

I further investigated the improvement by calculating change scores from pre-test to post-test for both the novice and non-novice group and then used Mann-Whitney *U* to determine if a difference existed between the groups. See Table 7 for change score descriptive statistics by novice-level. There was a significant difference in rhythm subtest change scores between the novice groups with a large effect size for both evaluators ([EV1] U = .50, Z = -3.22, p = .002, r = -.86; [EV2] U = .00, Z = -3.13, p = .002, r = .84), but not on either the pitch subtest ([EV1] U = 6.00, Z = -.74, p = .582; [EV2] U = 7.50, Z = -.39, p = .727) or the melody subtest ([EV1] U = 3.00, Z = -1.73, p = .117; [EV2] U = 7.00, Z = -.81, p = .517). Although the significant difference only occurred on the rhythm subtest, there was improvement on all subtests for novices and for non-novices on the pitch subtest.

Table 7

Summary of Change Descriptive Statistics by Novice-level

	Rhythm Change Score (EV1)	*Rhythm Change Score (EV2)*	*Pitch Change Score (EV1)*	*Pitch Change Score (EV2)*	*Melody Change Score (EV1)*	*Melody Change Score (EV2)*
Novice						
Mean	5.50	8.75	5.00	5.50	9.33	10.67
SD	4.43	2.63	7.07	7.78	10.69	20.23
n	4	4	2	2	3	3
Non-Novice						
Mean	.10	-.30	1.22	2.56	-1.29	-1.14
SD	.32	1.34	2.39	5.75	5.09	3.89
n	10	10	9	9	7	7

Note. EV = Evaluator

Research Question 2

Research question two asked if individuals of different age groups were able to sight-sing equally after proceeding through an asynchronous instructional format. Specifically, will there be significant differences between participants' pre- and post-test scores based on age? I used Kruskal-Wallis H to determine differences from pre-test to post-test among the ages represented in the sample for each of the subtests. There were no significant differences on the following:

- the rhythm pre-test ([EV1] H = 2.91, df = 4, p = .574; [EV2] H = 6.63, df = 4, p = .157),

- the rhythm post-test ([EV1] $H = .00$, $df = 4$, $p < .999$; [EV2] $H = 2.25$, $df = 4$, $p = .690$),
- the pitch pre-test ([EV1] $H = 5.41$, $df = 4$, $p = .248$; [EV2] $H = 6.72$, $df = 4$, $p = .152$),
- the pitch post-test ([EV1] $H = 6.03$, $df = 4$, $p = .197$; [EV2] $H = 7.39$, $df = 4$, $p = .117$),
- the melody pre-test ([EV1] $H = 4.90$, $df = 4$, $p = .298$; [EV2] $H = 3.34$, $df = 4$, $p = .502$), or
- the melody post-test ([EV1] $H = 7.24$, $df = 4$, $p = .124$; [EV2] $H = 9.11$, $df = 4$, $p = .058$).

I therefore failed to reject the null hypothesis on each of the following:

H_0: $\mu_{\text{rhythm pretest}} = \mu_{\text{middle school rhythm posttest}} = \mu_{\text{high school rhythm posttest}} = \mu_{\text{college rhythm posttest}} = \mu_{\text{graduate rhythm posttest}} = \mu_{\text{adult rhythm posttest}}$

H_0: $\mu_{\text{pitch only pretest}} = \mu_{\text{middle school pitch only posttest}} = \mu_{\text{high school pitch only posttest}} = \mu_{\text{college pitch only posttest}} = \mu_{\text{graduate pitch only posttest}} = \mu_{\text{adult pitch only posttest}}$

H_0: $\mu_{\text{pitch and rhythm pretest}} = \mu_{\text{middle school pitch and rhythm posttest}} = \mu_{\text{high school pitch and rhythm posttest}} = \mu_{\text{college pitch and rhythm posttest}} = \mu_{\text{graduate pitch and rhythm posttest}} = \mu_{\text{adult pitch and rhythm posttest}}$

I further investigated these results by grouping participants into two groups, 13 – 15 (early high school) and 16 – 18 (late high school) and conducted a Mann-Whitney *U*. There were no significant differences between the groups on the following:

- the rhythm pre-test ([EV1] $U = 18.50$, $Z = -.37$, $p = .758$; [EV2] $U = 35.00$, $Z = .45$, $p = .758$),
- the rhythm post-test ([EV1] $U = 21.00$, $Z = .00$, $p < .999$; [EV2] $U = 24.00$, $Z = .93$, $p = .731$),
- the pitch pre-test ([EV1] $U = 30.00$, $Z = .24$, $p = .867$; [EV2] $U = 32.00$, $Z = .48$, $p = .694$),

- the pitch post-test ([EV1] $U = 19.50$, $Z = .36$, $p = .755$; [EV2] $U = 22.00$, $Z = .87$, $p = .530$),
- the melody pre-test ([EV1] $U = 26.00$, $Z = -.44$, $p = .713$; [EV2] $U = 24.50$, $Z = -.61$, $p = .562$), or
- the melody post-test ([EV1] $U = 20.50$, $Z = .49$, $p = .639$; [EV2] $U = 21.00$, $Z = .58$, $p = .639$).

Finally, I calculated change scores and conducted a Mann-Whitney *U* to investigate differences from pre-test to post-test between the two age groups. See Table 8 for change score descriptive statistics by age group. There were no significant differences between the age groups, based on change scores, on the following:

- the rhythm subtest ([EV1] $U = 18.50$, $Z = .10$, $p < .999$; [EV2] $U = 22.00$, $Z = .71$, $p = .589$),
- the pitch subtest ([EV1] $U = 13.50$, $Z = .34$, $p = .762$; [EV2] $U = 16.00$, $Z = .91$, $p = .476$), or
- the melody subtest ([EV1] $U = 19.00$, $Z = 1.38$, $p = .222$, [EV2] $U = 16.00$, $Z = .74$, $p = .548$).

While no specific age or age group significantly improved from pre-test to post-test, generally those in the 16 – 18 group saw larger gains than those in the 13 – 15 group. It is important to note novices were equally distributed between the two age groups.

Table 8

Summary of Change Score Descriptive Statistics by Age Group

	Rhythm Change Score (EV1)	*Rhythm Change Score (EV2)*	*Pitch Change Score (EV1)*	*Pitch Change Score (EV2)*	*Melody Change Score (EV1)*	*Melody Change Score (EV2)*
13 - 15						
Mean	1.33	1.00	1.67	1.67	-1.80	-2.00
SD	2.80	4.29	2.73	5.24	5.76	3.39
n	6	6	6	6	5	5
16 - 18						
Mean	4.43	5.43	4.76	6.98	9.37	15.51
SD	3.55	4.85	3.49	6.04	8.31	11.56
n	12	12	10	10	10	10

Note. EV = Evaluator

Research Question 3

Research question three asked if individuals who receive feedback about their sight-singing performance perform better than those who do not. Specifically, will there be significant differences in the sight-singing post-test scores between participants who receive individual feedback versus participants who receive no individual feedback? See Table 9 for Feedback groups descriptive statistics. I used the Wilcoxon signed rank test to determine if there was a significant difference for the treatment group (those who received feedback) and the control group (those who did not receive feedback) from pre-test to post-test on each of the three subtests. There were no significant differences for the treatment group from:

- the rhythm pre-test to post-test ([EV1] $Z = 1.00$, $p = .317$; [EV2] $Z = -.45$, $p = .655$),
- the pitch pre-test to post-test ([EV1] $Z = 1.63$, $p = .102$; [EV2] $Z = 1.07$, $p = .285$), or
- the melody pre-test to post-test ([EV1] $Z = -.18$, $p = .854$; [EV2] $Z = -.37$, $p = .713$).

Similarly, there were no significant differences for the control group from:

- the rhythm pre-test to post-test ([EV1] $Z = 1.60$, $p = .109$; [EV2] $Z = 1.60$, $p = .109$),
- the pitch pre-test to post-test ([EV1] $Z = 1.34$, $p = .180$; [EV2] $Z = 1.34$, $p = .180$), or
- the melody pre-test to post-test ([EV1] $Z = .82$, $p = .414$; [EV2] $Z = .00$, $p < .999$).

I therefore failed to reject the null hypothesis on the following:

H_0: $\mu_{\text{control rhythm posttest}} = \mu_{\text{treatment rhythm posttest}}$

H_0: $\mu_{\text{control pitch only posttest}} = \mu_{\text{treatment pitch only posttest}}$

H_0: $\mu_{\text{control pitch and rhythm posttest}} = \mu_{\text{treatment pitch and rhythm posttest}}$

Table 9

Feedback Group Descriptive Statistics

EV1	*Rhythm Pre-test*	*Rhythm Post-test*	*Pitch Pre-test*	*Pitch Post-test*	*Melody Pre-test*	*Melody Post-test*
Feedback						
Mean	21.00	22.00	14.00	15.00	32.30	30.57
SD	2.83	.00	4.03	2.24	7.45	6.35
n	10	7	10	7	10	7
No Feedback						
Mean	18.83	22.00	6.80	11.60	25.67	27.80
SD	4.71	.00	7.98	6.80	12.79	10.35
n	6	6	5	5	6	5
EV2						
Feedback						
Mean	21.60	21.00	12.40	14.57	32.20	31.57
SD	.97	2.65	5.30	3.36	10.19	8.00
n	10	7	10	7	10	7
No Feedback						
Mean	17.00	22.00	8.00	12.00	20.50	22.20
SD	5.51	.00	7.52	6.93	18.59	18.36
n	6	6	5	5	6	5

Note. EV = Evaluator

I used a Mann-Whitney *U* test to compare the results for pre-test and post-test for each subtest. There were no significant differences for either evaluator on the following:

- the rhythm pre-test ([EV1] $U = 39.50$, $Z = 1.25$, $p = .313$; [EV2] $U = 42.00$, $Z = 1.58$, $p = .220$),
- rhythm post-test ([EV1] $U = 21.00$, $Z = .00$, $p < .999$; [EV2] $U = 18.00$, $Z = -.93$, $p = .731$),
- pitch pre-test ([EV1] $U = 39.00$, $Z = 1.81$, $p = .099$; [EV2] $U = 35.50$, $Z = 1.33$, $p = .206$),
- pitch post-test ([EV1] $U = 23.50$, $Z = 1.09$, $p = .343$; [EV2] $U = 20.50$, $Z = .58$, $p = .639$),
- melody pre-test ([EV1] $U = 39.50$, $Z = 1.05$, $p = .313$; [EV2] $U = 38.00$, $Z = .89$, $p = .428$), or
- the melody post-test ([EV1] $U = 20.50$, $Z = .49$, $p = .639$; [EV2] $U = 21.00$, $Z = .58$, $p = .639$).

I further investigated the results by calculating change scores for the pre-test and post-test for each subtest and then used a Mann-Whitney *U* to find any significant differences between the treatment group and the control group. See Table 10 for change score descriptive statistics by feedback group. There were no significant differences for either evaluator between the groups on the following:

- the rhythm subtest ([EV1] $U = 8.50$, $Z = -1.74$, $p = .149$; [EV2] $U = 7.00$, $Z = -1.90$, $p = .106$),
- the pitch subtest ([EV1] $U = 8.00$, $Z = -.61$, $p = .667$; [EV2] $U = 8.00$, $Z = -.61$, $p = .667$), or
- the melody subtest ([EV1] $U = 8.00$, $Z = -.86$, $p = .476$; [EV2] $U = 13.00$, $Z = .22$, $p < .999$).

These results suggest directed feedback might not have played a part in the gains found from pre-test to post-test. It is important to note, based on random assignment, no novices were in the feedback group.

Table 10

Summary of Change Score Descriptive Statistics by Feedback Group

	Rhythm Change Score (EV1)	*Rhythm Change Score (EV2)*	*Pitch Change Score (EV1)*	*Pitch Change Score (EV2)*	*Melody Change Score (EV1)*	*Melody Change Score (EV2)*
Feedback						
Mean	.14	-.43	1.57	3.14	-.33	.00
SD	.38	1.62	2.57	6.49	4.84	2.68
n	7	7	7	7	6	6
No Feedback						
Mean	3.80	6.00	3.67	4.00	5.25	6.00
SD	4.97	5.52	5.51	6.08	11.95	18.97
n	5	5	3	3	4	4

Note. EV = Evaluator

Summary

Results generally yielded no significant differences from pre-test to post-test, despite if participants were grouped by ability, age, or treatment group. It is imaginable the small sample size, most of whom were non-novices, created a ceiling effect, masking possible significant gains of the participants. However, the participants did show improvement as evidenced by change scores, with the novice group seeing the greatest increase, potentially as a result of the asynchronous curriculum. The elimination of the significant differences between novices and non-novices from pre-tests to post-tests was the most telling result from the study. The novice group additionally reported a growth in the confidence of their sight-singing ability while non-novices reported a decline. Interestingly, the use of targeted feedback seemed to have little impact on the growth seen in participants' sight-singing accuracy, as measured by the three subtests. These results suggested the theoretical benefit of an asynchronous sight-singing curriculum for participants in this study, especially novices.

CHAPTER 5

DISCUSSION

COVID-19: A Contextual Frame

Prior to describing the results of the study, it is important to provide some detail about how COVID-19 impacted the design, implementation, and results. Originally this study was designed in January of 2020, and I intended to conduct it in-person with secondary-level (MS/HS) choral students. However, as COVID-19 became a reality in March, during the time when most schools were going into Spring Break, it was apparent the long-term precautions of social distancing, masking, and the control of aerosols made the initial design impossible.

The shift of the instructional component from in-person to asynchronous was timely and could yield potentially valuable data and also provide resources for teachers who may be struggling with providing content virtually. The revised goal was to complete the study before mid-November to report results in a dissertation, but more importantly to the music education community before they moved into the Spring 2021 semester. To that end, I submitted the IRB protocols in early September, but the approval process was understandably slowed due to the needed caution during a global pandemic. I received final approval in November, just before most schools began their Thanksgiving break. I chose to wait until the start of the Spring semester to avoid the short time between end-of-year breaks and to hopefully recruit as many participants as possible.

I began recruitment in early January 2021. Initially, my research plan was to have participants self-enrolled in the study after receiving information from their classroom teacher or music director. However, after two weeks using my initial recruitment protocol, no participants enrolled. As a result, I submitted a modification to the IRB protocols requesting a change in recruitment process. I received approval within a month and was able to begin participant recruitment again in late-February 2021. Six teachers registered, each with one class. One class dropped out of the study in early-March as the state Department of Education announced students would be taking state-mandated testing in the latter part of the Spring semester. Additionally, several participants halted progress in the study during March, most likely due to spring breaks.

Although the Research Assistant registered 67 potential participants in the course management system, only 51 engaged with the curriculum, and even less moved beyond the pre-tests phase. I believe pandemic fatigue was a probable cause for the lack of a robust sample size and general participation, as participants at the point of engaging with this study had been absorbed with distance learning for approximately a year.

The World Health Organization (2020) defined pandemic fatigue as “a natural and expected reaction to sustained and unresolved adversity in people’s lives” (p. 7) and cited demotivation as a potential result. In addition, younger individuals are more likely to feel pandemic fatigue and have fewer strategies for resilience in the face of these struggles (MacIntyre et al., 202; Masten & Motti-Stefanidi, 2020). Masten and Motti-Stefanidi (2020) cited several complicating factors that impacted children’s cognitive and emotional development during a disaster, which could contribute to this fatigue. Further, while videoconferencing software enabled education to continue, it is possible “Zoom fatigue” was also contributing to this same demotivation (Bailenson, 2021). If the study began in the fall of 2020, prior to an onset of fatigue, perhaps more participants would have self-enrolled or completed the curriculum.

The small sample size necessitated a modification of the inclusion criteria to include non-novices in statistical procedures. This modification most likely caused a ceiling effect in many results as non-novices had high scores on all pre-tests. Despite the many issues that occurred in the course of this study, I believe this study and its findings contribute to the music education literature.

Asynchronous Approach to Sight-Singing

Research questions one and two asked if an asynchronous approach to sight-singing instruction was effective for novice groups and for age groups, respectively. Mishra (2014b) found age and experience level yield no differences regarding various treatments provided to improve sight-singing ability. Although this study had a small sample size and cannot be generalized to a larger population, these results provide some important insight into the answers to questions one and two.

Differences existed between novice and non-novice sight-singers beyond music reading ability. Killian and Henry (2005) found beginning sight-singers were less accurate and had fewer strategies for practice and performance. In this study, initially, there were significant differences in the sight-singing ability between the novice group and the non-novice group in the present study. While there were no significant differences for either group from pre-test to post-test, the novice group saw more gains than the non-novice group. Further, the novice group improved on all three sub-tests, while the non-novice group improved only on the pitch sub-test. Moreover, these improvements were made more impactful because there were no significant differences between the groups in post-test comparison. That is, the sight-singing ability difference between the novice groups was (statistically) removed after the group completed the nine-day curriculum. These findings support Mishra's (2014a) results, which suggested that sight-singing is a teachable activity rather than a stable characteristic.

The pattern of results was similar for the age groups, except that no significant differences existed from pre-test to post-test, nor in comparisons between groups on sub-tests. The lack of significant difference most likely was caused by the previously mentioned ceiling effect created from the number of non-novices and their high pre-test and post-test scores. While novices were equally distributed between the age groups, their larger improvement was not enough to dramatically change the age group means. However, returning to the question of efficacy, both age groupings' scores improved, though the changes were not statistically significant. Interestingly, even though the novices were equally distributed, those in the 16-18-year-old group saw greater changes than those in the 13–15-year-old group. Perhaps older participants saw more value in the program, had more motivation to complete the program, or were able to maintain focus. Future research could investigate a correlation between age and engagement with online curricula over various periods of time.

If the resulting improvements from pre-test to post-test were caused by engagement with the asynchronous curriculum, many elements could have played a part. The curriculum's foundation was a purposeful selection of components. The instructional process was based on the Gradual-Release Model (Pearson & Gallagher, 1983), the rhythmic and pitch scaffolding was drawn from findings of Mishra (2016), the musical examples were created based on the melodic pattern hierarchy work of Henry (2001), and the inclusion of metacognitive strategies was based on the research of Killian and Henry (2005). While it is impossible to select one as the greatest contributing element, it might be more appropriate to consider all of them collectively as part of the answer.

The theoretical framework for this study suggested any modality of delivery would result in improvements if instructional and curricular decisions were grounded in research-based principles. Distance learning literature supports this supposition (Bowman, 2014; Sitzmann et al., 2006) as well as Mishra's meta-analyses (2014a, 2014b, 2016). Bowman (2014) reported other curricular and instructional elements that impacted learning, rather than the delivery medium. Sitzmann et al., (2006) echoed this conclusion by stating "…instructional methods are more important than delivery media for ensuring effective learning" (p. 648). Mishra (2014a) suggested directed instruction and practice would be more effective in sight-singing skill improvement than characteristics such as age or music aptitude. Results from this study support previous findings that instructional choices are more important than a particular delivery medium.

The Gradual-Release model (Pearson & Gallagher, 1983) provided a systematic way to move participants from direct instruction toward independent application of skills, specifically through various and tiered opportunities to practice a given skill. Bovin (2018) suggested the more exposure individuals have to sight-reading, the better their abilities will become. Sitzmann et al., (2006) found practicing (sight-reading) benefitted individuals, regardless of the delivery medium. Participants in this study received between two and four opportunities to specifically practice sight-singing per day, mirroring the approximate amount of classroom time used for sight-singing instruction (Kuehne, 2007; Nichols, 2013). Further, based on Mishra's (2016) findings, rhythmic and pitch elements were introduced separately, before combining the two. This skill-separated practice, as well as using graduated musical examples, could have given participants an appropriate quantity of challenges without becoming redundant from day-to-day. However, when it comes to selecting materials, it is equally important to select both appropriate and varied musical examples and to choose an appropriate amount of time for practice so that it does not become tedious for students.

Strategy selection and embedding may also have played a part in the improvements seen by participants. Killian and Henry (2005) found advanced sight-singers had both practice and performance strategies to aid them, while beginning sight-singers did not. Further, Kuehne (2010) concluded educators needed to teach students how to prepare for sight-singing by providing process and strategies. Within the curriculum of the study, I embedded practice and performance strategies, including chunking, maintaining steady beat, and pattern recognition. Though it is unlikely participants mastered any one of these strategies within this relatively short nine-day study, they could have improved due to receiving (a) processes to help them consider musical examples or (b) strategies to support them in their practice or performance.

It is possible the asynchronous approach was effective (though not statistically significant in this study) because of the thoughtful selection and implementation of the instructional components as a whole, rather than the content delivery medium. This study's purpose did not focus on content delivery medium (i.e., course management system). So, it is not possible to know that impact. However, it is important to note that teachers are expected to select appropriate content for students and to thoughtfully choose instructional techniques which best support their students' learning. This study lends support for the development of systematic sight-singing pedagogy, with a foundation of instructional practice rather than a particular methodology.

Efficacy of Directed Feedback

Research question three asked if providing feedback to participants throughout the asynchronous course would be effective. The Gradual-Release Model (Pearson & Gallagher, 1983) provided opportunities for feedback throughout guided practice. Sitzmann et al., (2006) found individuals learned more when they were provided feedback about their progress, among other factors. Countering previous research, results from this study suggest directed feedback might *not* have contributed to improvements seen from pre-test to post-test for participants in this study. The treatment group showed smaller gains than the control group. Based on random assignment and those eligible for inclusion by returning consent and assent forms, no novices were included in the treatment (feedback) group. Therefore, similar to the previous research questions, the ceiling effect most likely impacted the potential results. Interestingly, the control group saw larger gains than those in the treatment group. However, there are several variables which could have caused this result. More research must be conducted to see the effects of individual feedback in this type of learning situation.

There were two potential impacts on this study's results. First, I could not control for the impact the classroom teacher would or could have had on the implementation of the study. While the teachers were asked to allow only for classroom time for participants to complete the daily modules, teachers could have provided additional instruction or feedback beyond what was contained in the curriculum. Second, I assumed participants read provided feedback. Feedback was provided to participants through the Canvas email system following each practice submission. While written feedback was provided for the treatment group after each practice recording in the form of comments on their submissions, participants may have not read the feedback. The management system did not allow for tracking whether participants opened or viewed my feedback comments.

The results for this research question suggest feedback did not impact novices' improvement from pre-test to post-test. However, this is a small group of participants and we cannot conclude that feedback is unimportant or unneeded in the educational process. A component of the learning experience is demonstrating knowledge or skills. Learning should not stop after this demonstration. Metacognition research suggests reflection on learning is a crucial component for developing metacognitive knowledge (Bathgate, Sims-Knight, and Scunn, 2012; Benton, 2013; Hart, 2014, Pintrich, 2002). Educators cannot expect learners to correct what they cannot personally perceive as incorrect. Therefore, the role of the teacher is twofold, the purveyor of knowledge and skills, and a guide when students lose their way.

Technology Issues which Confounded Results

Music education technology literature detailed the myriad of technology-related issues in connection with distance learning research (Koutsoupidou, 2014; Pike & Shoemaker, 2013; Stevens et al., 2019). Although I anticipated some technology issues as part of this study, I believe these issues may have impacted the reported findings. The predominant issue was recording and transferring. I found a noticeable anecdotal trend that participants had difficulty with either recording or uploading audio files, starting with the pre-test phase of the study, and/or with continuing throughout the curriculum. Often, participants completed two of the three pre-tests, but would upload nothing for the final part. In other cases, participants uploaded files which would have no sound. As a result, only four (16.67%) of the 24 participants completed all of the pre- and post-surveys, and pre- and post-tests.

Although some of the difficulties could be due to the previously mentioned pandemic or "zoom fatigue," I believe these anecdotal instances pose a practical concern for researchers who are interested in distance learning. While using technology may hold potential academic value, integrating it may never be without technical challenges. Educators should carefully consider if the addition of technology, either hardware or software, truly enhances the educational experience or simply creates a supplementary and potentially problematic step.

Conclusions and Recommendations

There is no singular solution for improving music literacy in students. Educators may argue for their chosen method, a product from their own personal music education, or a pre-packaged methodology, but efficacy most likely resides in how the method is used. Academic success begins in the hands of the teacher. While there may be benefits to moveable-*do*, fixed-*do*, and number-based systems, it is possible all can be equally effective when taught using a research-based instructional procedure. More importantly, various pitch and rhythm systems are only the tools from which music literacy is built. Educators must be able to effectively transfer how to use their selected approach or materials to their students. Kuehne (2010) recommended providing teachers procedures and strategies for teaching sight-singing. The instructional framework for this study could serve as the beginnings of a sight-singing pedagogy for teachers unsure of how to begin teaching the content or improve their current practice.

Selecting a curriculum which progresses logically and incrementally is equally important. While teaching one element of music at a time might be a tenet of music education, understanding the hierarchical complexities of music literacy is not as pervasive among educators (Mark, 2008). Henry's (2001) and Mishra's (2016) work helped form the foundation for the progression of musical examples in this study. Given the variety of music collections in existence used for sight-singing, providing teachers criteria to use to help judge existing collections seems important as these may determine students' mastery success or failure simply by the presence of an appropriate or inappropriate progression (Demorest, 2004; Kuehne, 2007). This study's content organization provides support for teachers to critically assess current in chosen methodologies, specifically in terms of their musical content. A series of musical samples which all have the same components might not necessarily educationally progress in a way which supports learning, or it may not have a sufficient quantity of examples to provide adequate practice. Moreover, selecting a preferred tool or resource might not be enough if the resource in question is of lesser quality in terms of content and organization.

Although not ideal, asynchronous delivery of content is a viable solution for sight-singing instruction. This conclusion must be tempered as pandemic or zoom fatigue could be a concern for the long-term efficacy of an online instructional medium. While distance learning might be a necessary and often practical choice for education at times, we should take care to avoid negative impacts on students' growth and development.

Future Research Implications

This study investigated the potential benefits of a structured, asynchronous sight-singing curriculum. Future research can explore sight-singing instruction in ways that parallel this study. First, the practicality of replicating this study, at least in the near-term, will most likely be limited as many school systems are returning to face-to-face ("normal") instruction. Music educators may want to move away from virtual instruction, at least for a time. However, replicating this study to include a larger group of only novice-level participants could provide better insights into how these particular learner types could benefit through online instruction, feedback, and/or remediation while they are developing their music literacy skills.

There are several potential applications of this study for in-person research. Future research could investigate the same research questions using the content and instructional procedures from this study, but using an in-person model rather than an asynchronous delivery. Further, it would be interesting to see how teachers might implement the asynchronous curriculum with entire classes and if gains would mirror the potential positive gains found in this study. As researchers focus on the components of quality sight-singing instruction, the music education field hopefully will move closer to the development of a much-needed pedagogy specifically for music literacy.

Finally, as anecdotal evidence suggests, “zoom fatigue” might affect distance learning curriculum design in the future (Bailenson, 2021). Although this study showed gains from its nine-day curriculum, researchers should investigate how much time students can spend in asynchronous learning settings before fatigue starts to negatively impact online learning’s potential benefits.

Closing

The purpose of this study was to investigate whether an asynchronous sight-singing curriculum would be an effective learning medium for novice sight-singers. The curriculum and instruction practices were carefully curated to provide participants with a theoretically strong formula for success. I hope music educators will acknowledge learning begins with teacher choices and they will critically reflect on their own practices to improve their own instruction. Music literacy is a foundation on which music education is built and can ultimately determine life-long musicianship. If this is true, researchers must continue to explore sight-singing pedagogy and support music educators as they revise and expand their teaching repertoire in this area.

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Appendix A

Sight-Singing Curriculum Examples

Figure A1

Day 2 Sight-Singing Examples

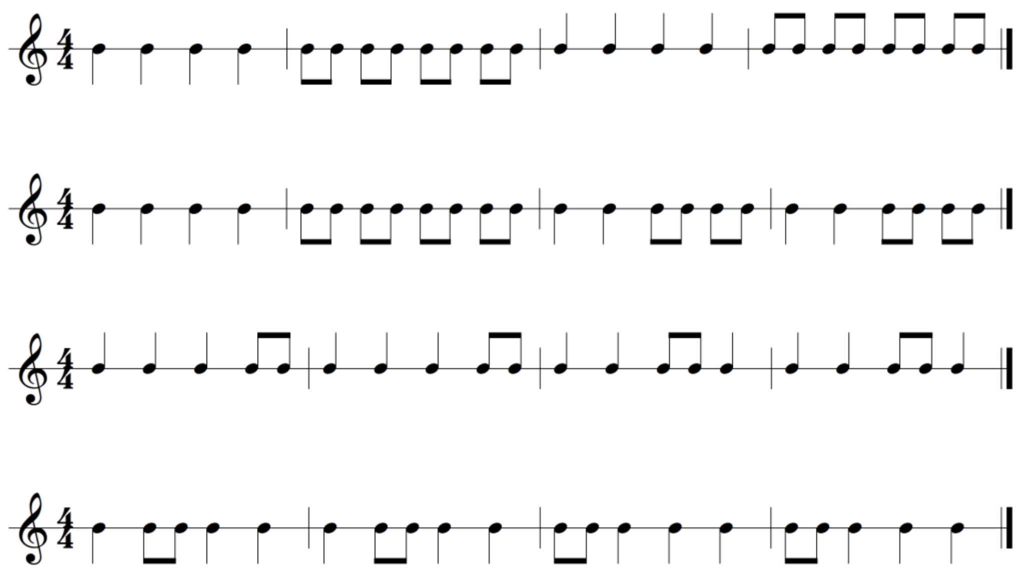


Figure A2

Day 3 Sight-Singing Examples

Figure A4

Day 5 Sight-Singing Examples

Figure A5

Day 6 Sight-Singing Examples

Figure A6

Day 7 Sight-Singing Examples

Figure A7

Day 8 Sight-Singing Examples

Figure A8

Day 9 Sight-Singing Examples

Appendix B

Pre-tests and Post-tests with Rubrics

Figure B1

Rhythm Pre-Test and Post-Test

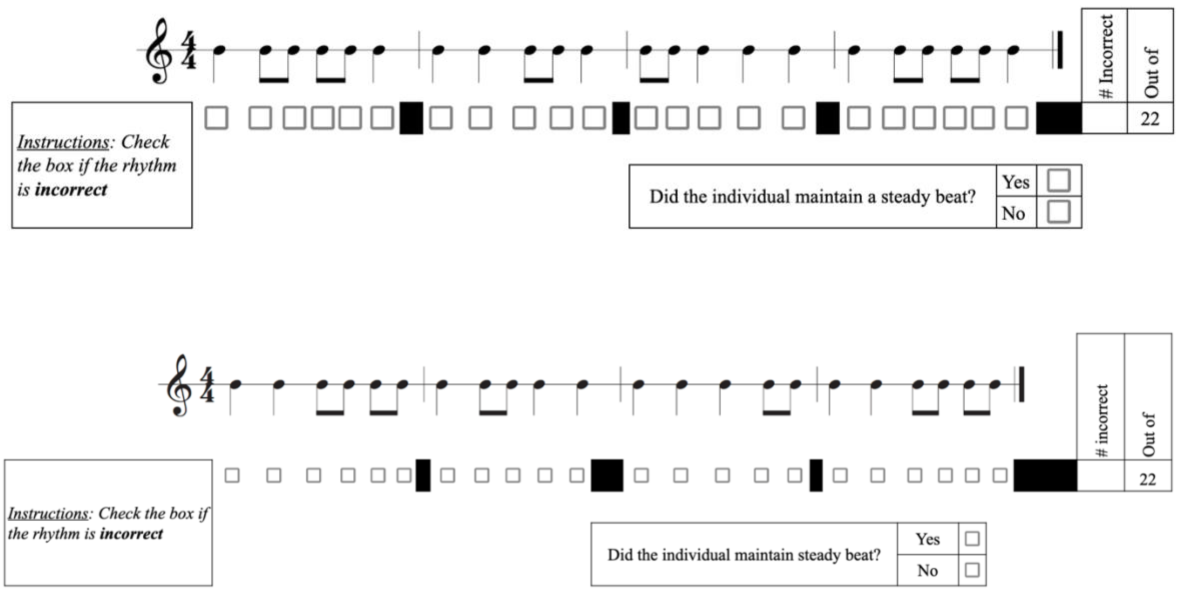
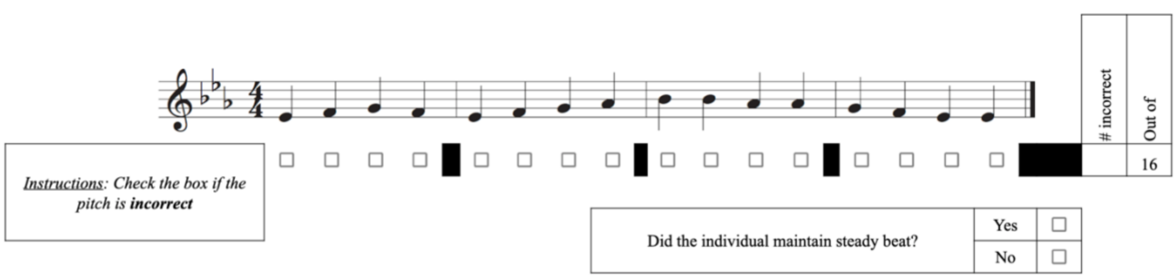


Figure B2

Pitch-only Pre-Test and Post-Test



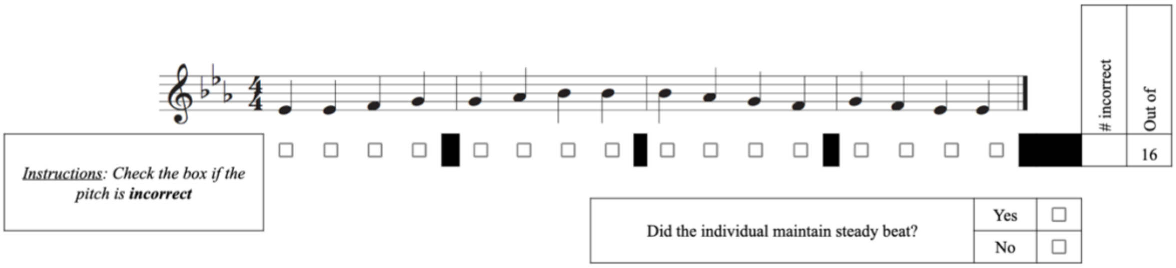
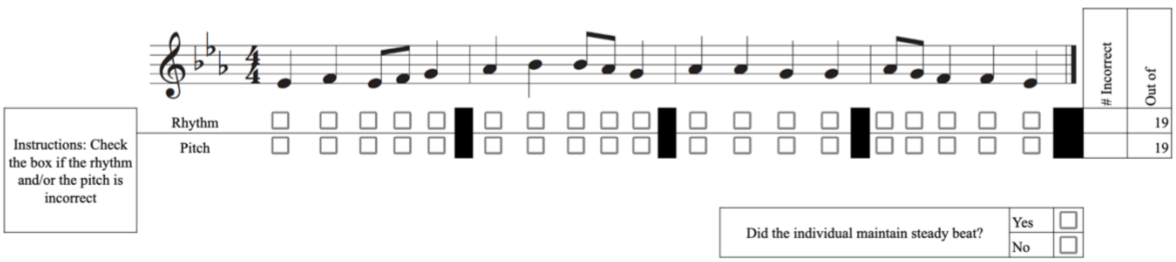
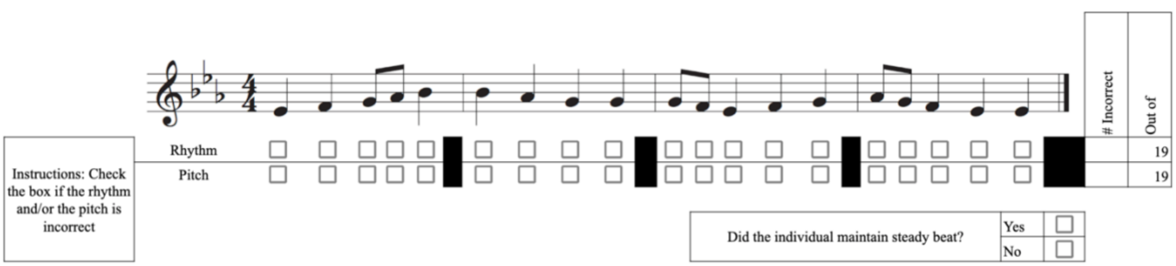


Figure B3

Melody Pre-Test and Post-Test



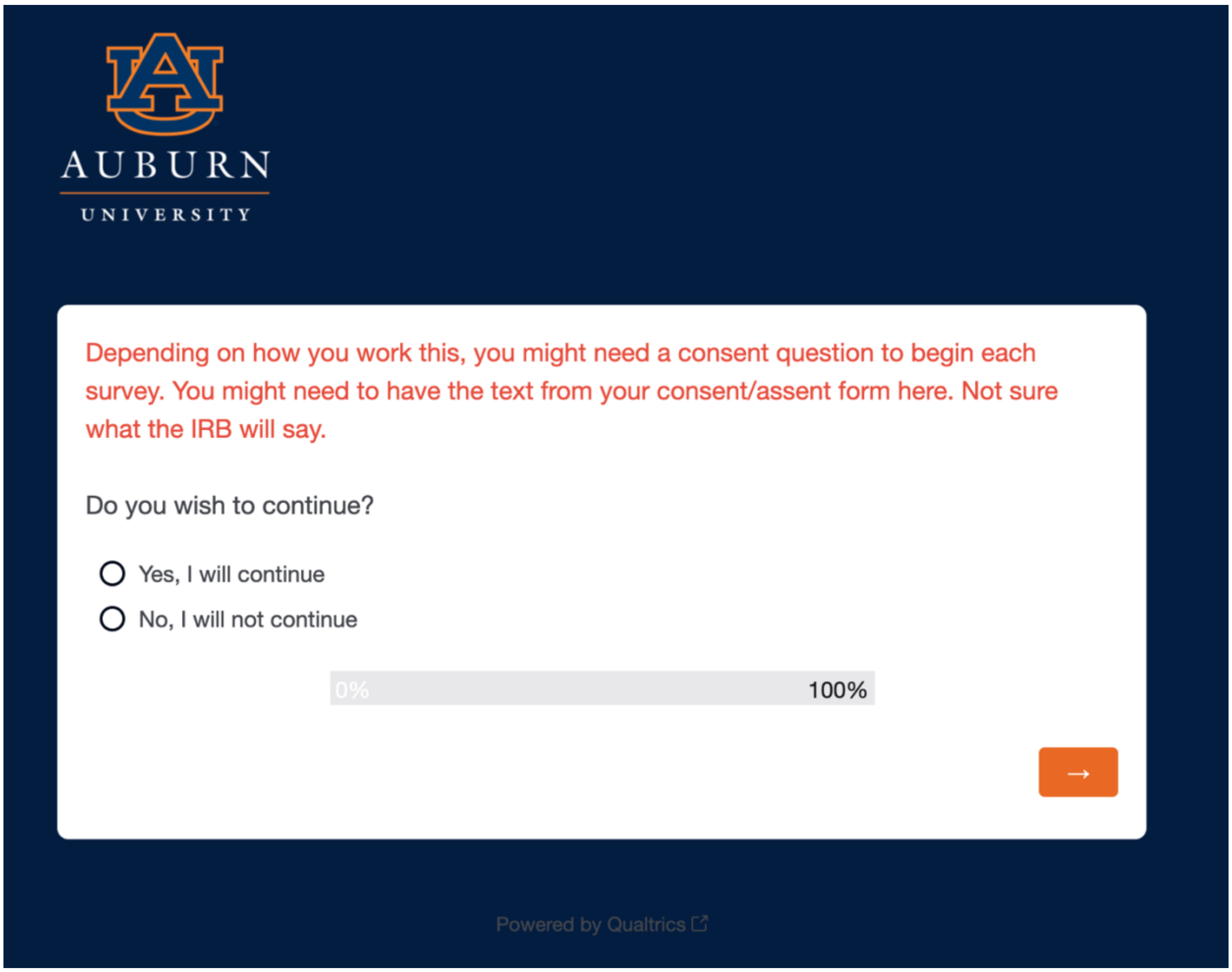


Appendix C

Pre-Survey and Post-Survey

Figure C1

Pre-Survey, Screen One


AUBURN
UNIVERSITY

Depending on how you work this, you might need a consent question to begin each survey. You might need to have the text from your consent/assent form here. Not sure what the IRB will say.

Do you wish to continue?

- Yes, I will continue
- No, I will not continue

0% 100%

→

Powered by Qualtrics

Figure C2

Pre-Survey, Screen Two

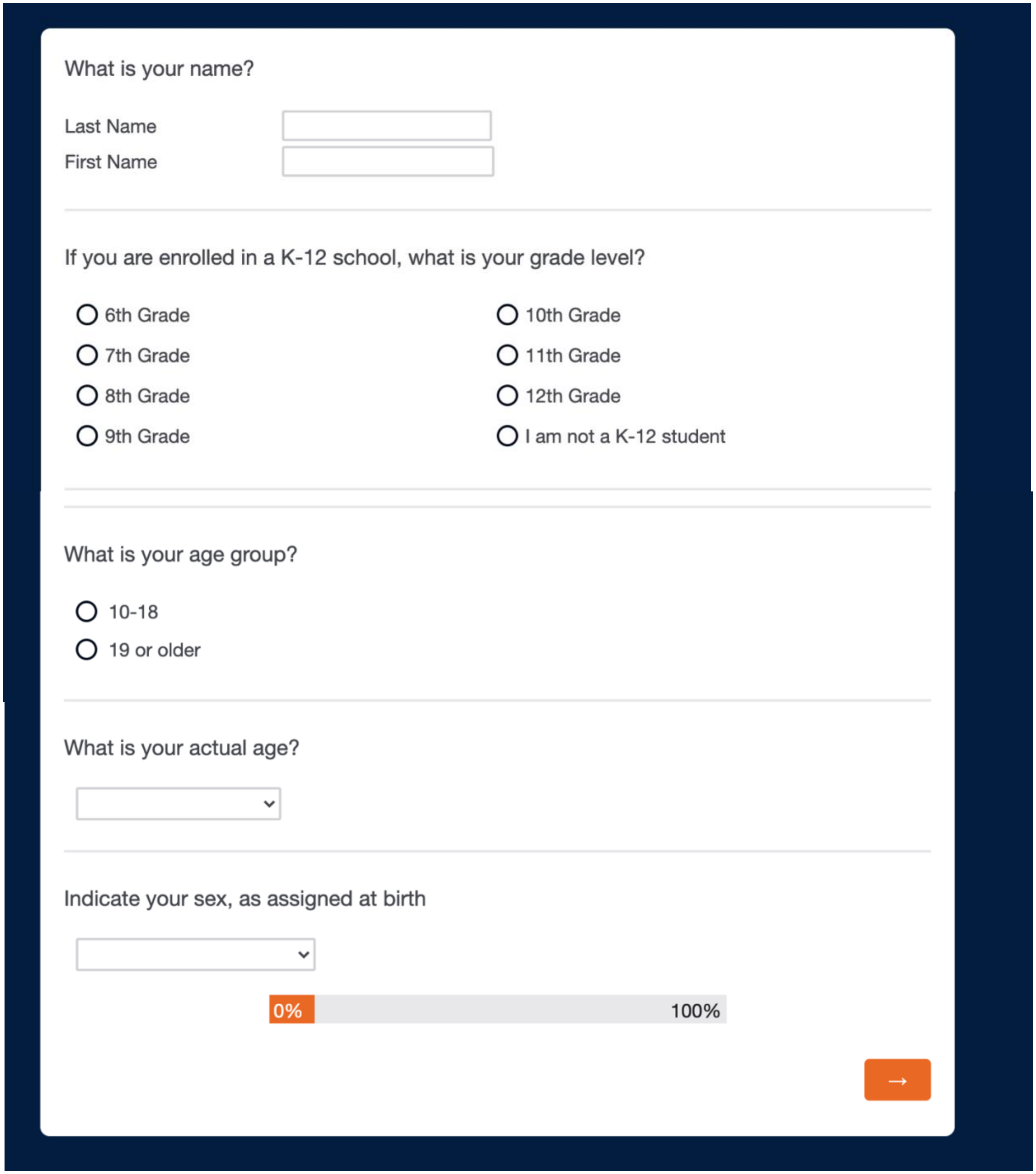
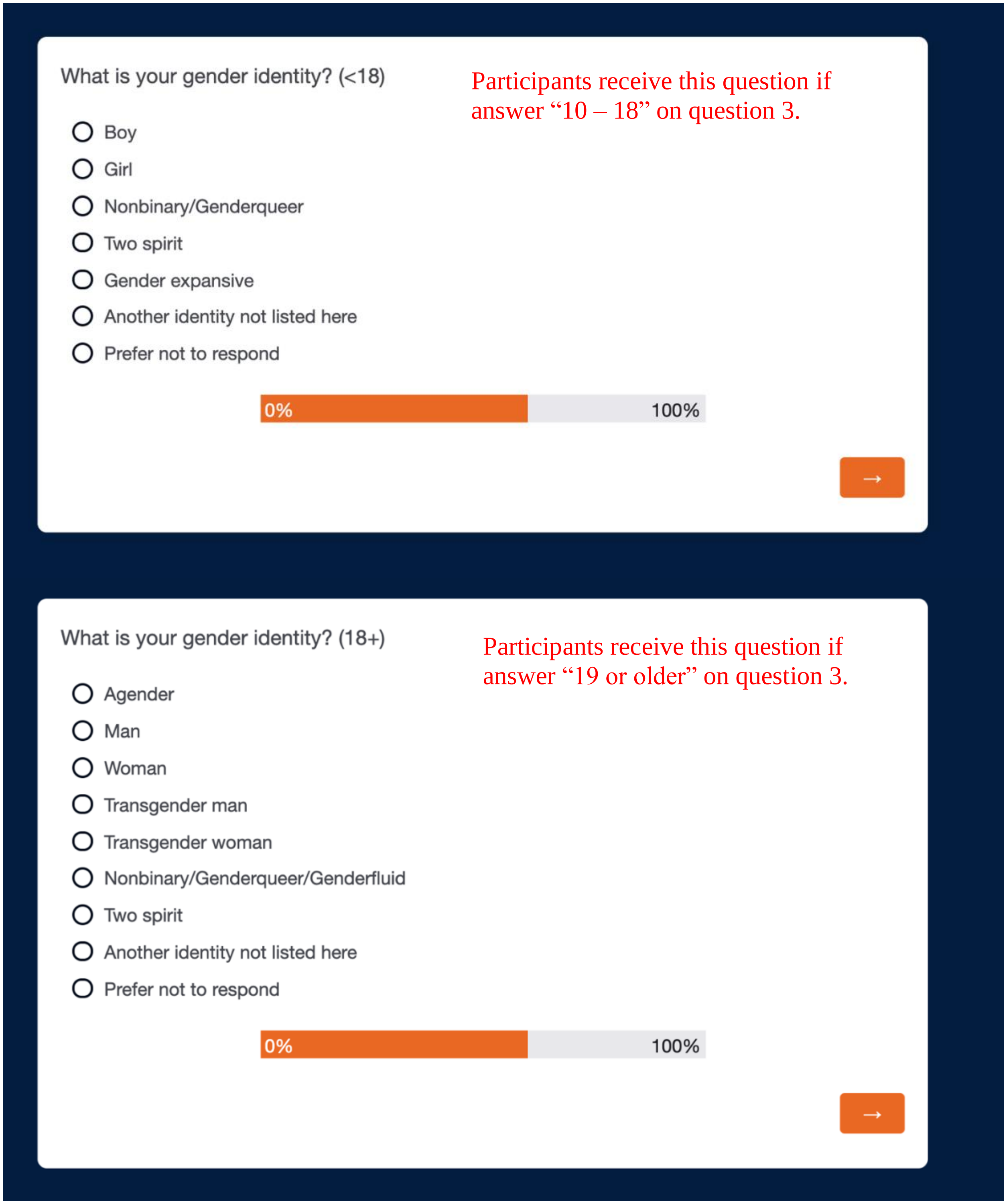


Figure C3

Pre-Survey, Screen Three



What is your gender identity? (<18)

Participants receive this question if answer “10 – 18” on question 3.

- Boy
- Girl
- Nonbinary/Genderqueer
- Two spirit
- Gender expansive
- Another identity not listed here
- Prefer not to respond

0% 100%

→

What is your gender identity? (18+)

Participants receive this question if answer “19 or older” on question 3.

- Agender
- Man
- Woman
- Transgender man
- Transgender woman
- Nonbinary/Genderqueer/Genderfluid
- Two spirit
- Another identity not listed here
- Prefer not to respond

0% 100%

→

Figure C4

Pre-Survey, Screen Four

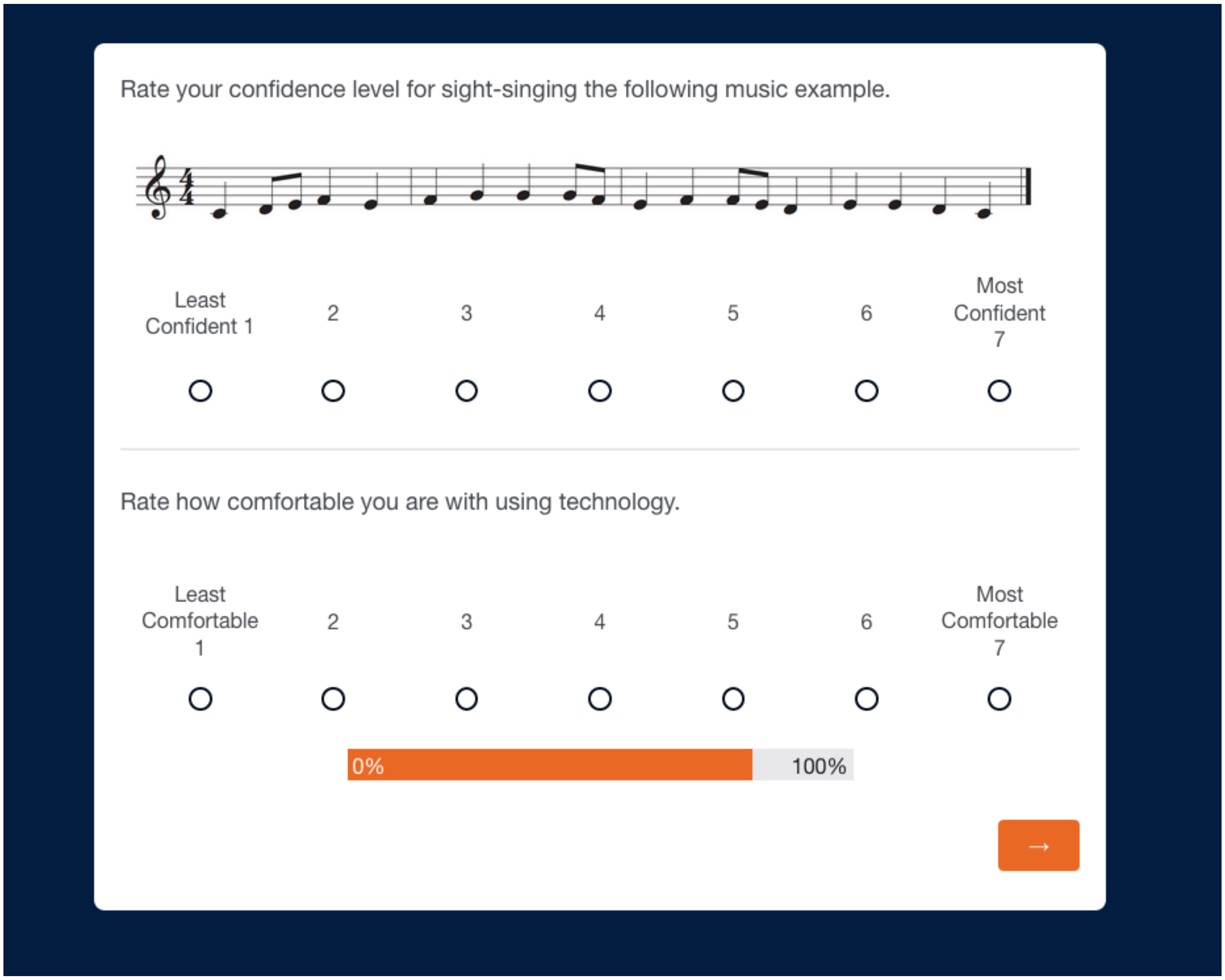


Figure C5

Pre-Survey, Screen Five

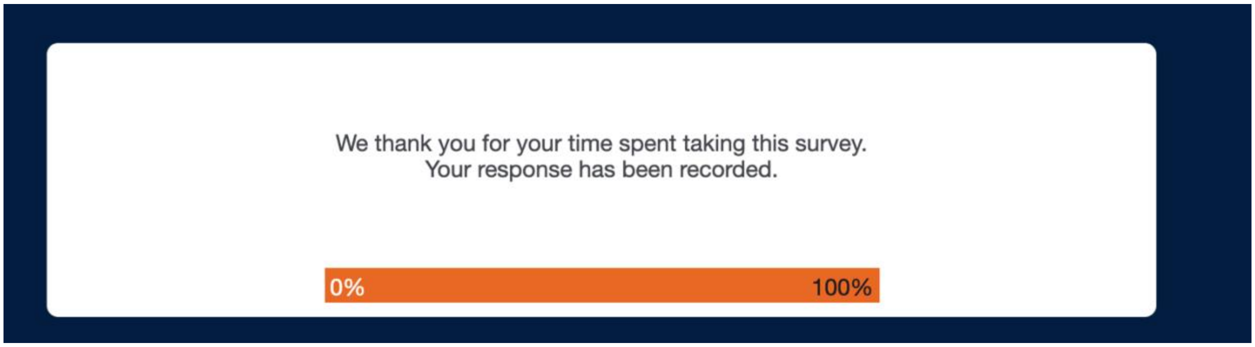


Figure C6

Post-Survey, Screen One

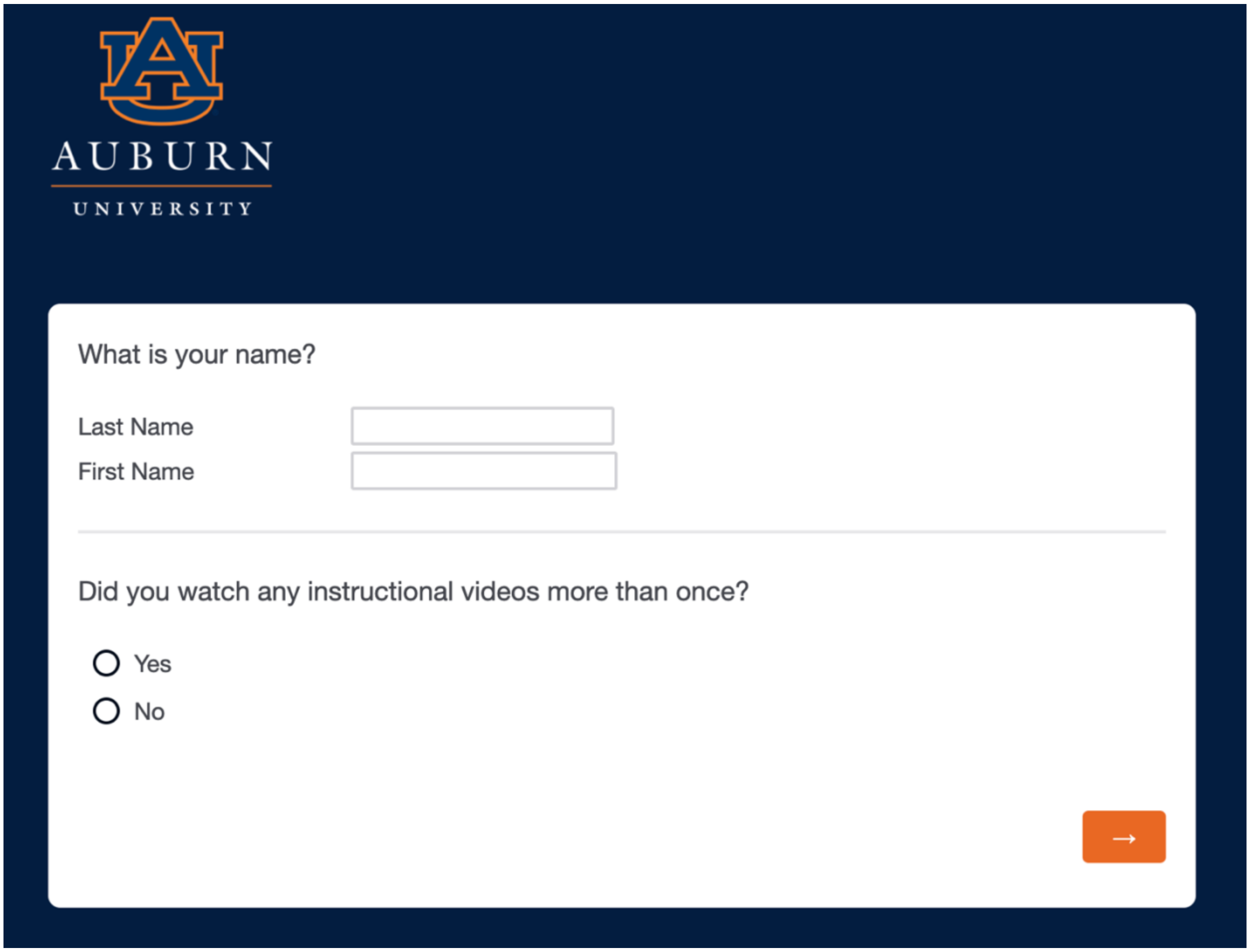
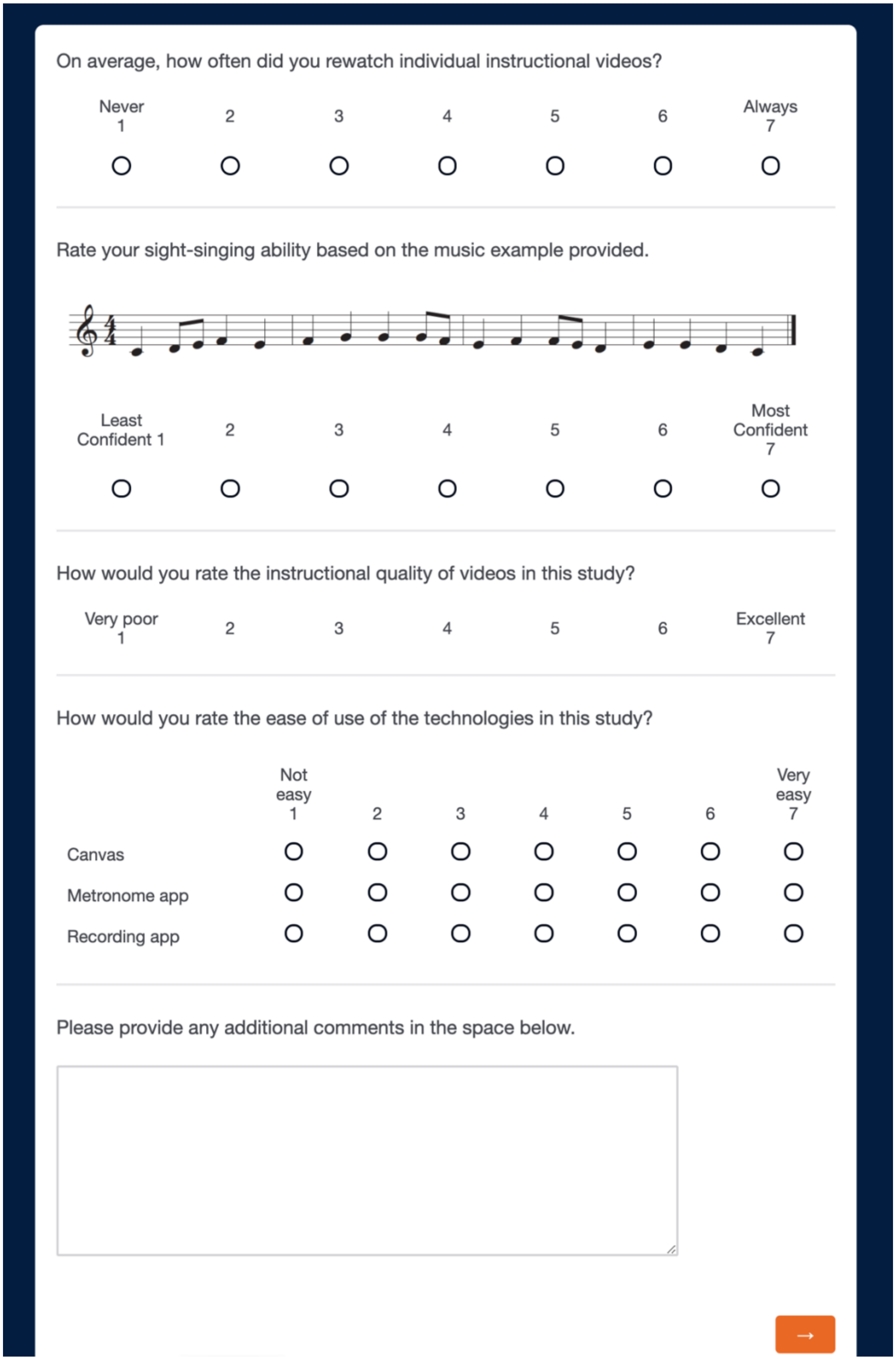


Figure C7

Post-Survey, Screen Two



On average, how often did you rewatch individual instructional videos?

Never 1	2	3	4	5	6	Always 7
○	○	○	○	○	○	○

Rate your sight-singing ability based on the music example provided.

Least Confident 1	2	3	4	5	6	Most Confident 7
○	○	○	○	○	○	○

How would you rate the instructional quality of videos in this study?

Very poor 1	2	3	4	5	6	Excellent 7

How would you rate the ease of use of the technologies in this study?

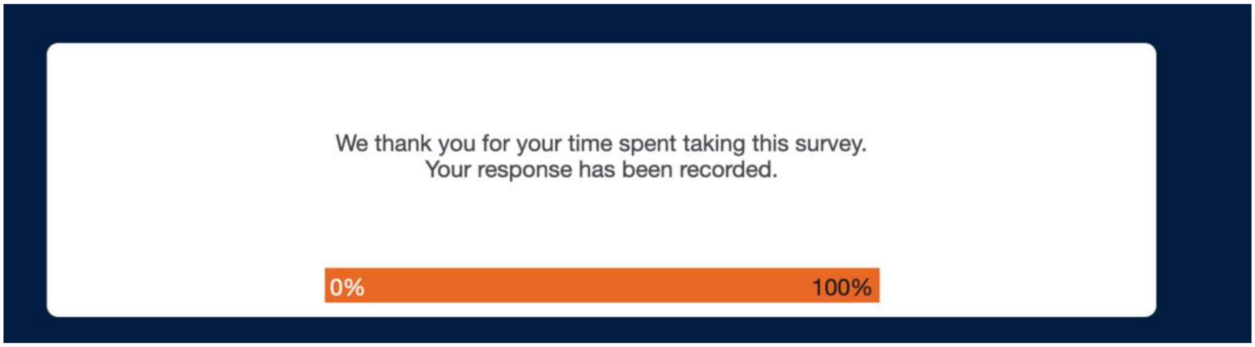
	Not easy 1	2	3	4	5	6	Very easy 7
Canvas	○	○	○	○	○	○	○
Metronome app	○	○	○	○	○	○	○
Recording app	○	○	○	○	○	○	○

Please provide any additional comments in the space below.

→

Figure C8

Post-Survey, Screen Three



Appendix D

Institutional Review Board Approval

AUBURN UNIVERSITY INSTITUTIONAL REVIEW BOARD for RESEARCH INVOLVING HUMAN SUBJECTS
RESEARCH PROTOCOL REVIEW FORM
FULL BOARD or EXPEDITED

For Information or help contact **THE OFFICE OF RESEARCH COMPLIANCE (ORC)**, 115 Ramsay Hall, Auburn University
Phone: 334-844-5966 **e-mail:** IRBAdmin@auburn.edu **Web Address:** http://www.auburn.edu/research/vpr/ohs/index.htm

Revised 5.19.2020 **Submit completed form to IRBsubmit@auburn.edu or 115 Ramsay Hall, Auburn University 36849.**

***Complete this form using Adobe Acrobat** Writer **(versions 5.0 and greater).** Hand written copies not accepted.*

1. PROPOSED START DATE of STUDY: 10/15/2020 **Today's Date:** 9/3/2020

PROPOSED REVIEW CATEGORY (Check one): ■ **FULL BOARD** ☐ **EXPEDITED**

SUBMISSION STATUS (Check one): ☐ **NEW** ■ **REVISIONS (to address IRB Review Comments)**

2. PROJECT TITLE: "The Efficacy of Asynchronous Instruction for Novice Sight-Singers"

3.

PRINCIPAL INVESTIGATOR	TITLE	DEPT	AU E-MAIL
Jeremy M Craft	Ph.D. Candidate	Curriculum & Teaching	jmc0177@auburn.edu

MAILING ADDRESS	PHONE	ALTERNATE E-MAIL
40 Easton Ave Lynchburg VA 24503	540-915-1231	mr.jeremycraft@gmail.com

4. FUNDING SUPPORT: ■ N/A ☐ Internal ☐ External Agency: ______ ☐ Pending ☐ Received

For federal funding, list agency and grant number (if available). ______

5a. List any contractors, sub-contractors, other entities associated with this project:

______

b. List any other IRBs associated with this project (including Reviewed, Deferred, Determination, etc.):

______

PROTOCOL PACKET CHECKLIST

All protocols must include the following items:

- ■ **Research Protocol Review Form** (All signatures included and all sections completed)
  (Examples of appended documents are found on the OHSR website: http://www.auburn.edu/research/vpr/ohs/sample.htm)
- ■ **CITI Training Certificates** for all Key Personnel.
- ■ **Consent Form or Information Letter** and any Releases (audio, video or photo) that the participant will sign.
- ■ **Appendix A**, "Reference List"
- ■ **Appendix B** if e-mails, flyers, advertisements, generalized announcements or scripts, etc., are used to recruit participants.
- ■ **Appendix C** if data collection sheets, surveys, tests, other recording instruments, interview scripts, etc. will be used for data collection. Be sure to attach them in the order in which they are listed in # 13c.
- ☐ **Appendix D** if you will be using a debriefing form or include emergency plans/procedures and medical referral lists (A referral list may be attached to the consent document).
- ☐ **Appendix E** if research is being conducted at sites other than Auburn University or in cooperation with other entities. A **permission letter** from the site / program director must be included indicating their cooperation or involvement in the project. NOTE: If the proposed research is a multi-site project, involving investigators or participants at other academic institutions, hospitals or private research organizations, a letter of **IRB approval** from each entity is required prior to initiating the project.
- ☐ **Appendix F** - Written evidence of acceptance by the host country if research is conducted outside the United States.

The Auburn University Institutional Review Board has approved this Document for use from 11/18/2020 to ----------------
Protocol # 20-433 EP 2011

Version Date (date document created): 10/11/2020

page 1 of 1

6. **GENERAL RESEARCH PROJECT CHARACTERISTICS**

6A. Research Methodology

Please check all descriptors that best apply to the research methodology.

Data Source(s): ☒ New Data ☐ Existing Data

Will recorded data directly or indirectly identify participants?
☒ Yes ☐ No

Data collection will involve the use of:

- ☐ Educational Tests (cognitive diagnostic, aptitude, etc.)
- ☐ Interview
- ☐ Observation
- ☐ Location or Tracking Measures
- ☐ Physical / Physiological Measures or Specimens (see Section 6E.)
- ☑ Surveys / Questionnaires
- ☑ Internet / Electronic
- ☑ Audio
- ☐ Video
- ☐ Photos
- ☐ Digital images
- ☐ Private records or files
- ☐ Other: ______________________________

6B. Participant Information

Please check all descriptors that apply to the target population.
☒ Males ☒ Females ☐ AU students

Vulnerable Populations
☐ Pregnant Women/Fetuses ☐ Prisoners ☐ Institutionalized
☒ Children and/or Adolescents (under age 18 in AL)

Persons with:

☐ Economic Disadvantages ☐ Physical Disabilities
☐ Educational Disadvantages ☐ Intellectual Disabilities

Do you plan to compensate your participants? ☒ Yes ☐ No

6C. Risks to Participants

Please identify all risks that participants might encounter in this research.

- ☒ Breach of Confidentiality*
- ☐ Coercion
- ☐ Deception
- ☐ Physical
- ☐ Psychological
- ☐ Social
- ☐ None
- ☐ Other:

*Note that if the investigator is using or accessing confidential or identifiable data, breach of confidentiality is always a risk.

6D. Corresponding Approval/Oversight

- **Do you need IBC Approval for this study?**
  ☐ Yes ☑ No

  If yes, BUA #____________________ **Expiration date** ____________________

- **Do you need IACUC Approval for this study?**
  ☐ Yes ☑ No

  If yes, PRN #____________________ **Expiration date** ____________________

- **Does this study involve the Auburn University MRI Center?**
  ☐ Yes ☑ No

  Which MRI(s) will be used for this project? (Check all that apply)
  ☐ 3T ☑ 7T

  Does any portion of this project require review by the MRI Safety Advisory Council?
  ☐ Yes ☑ No

  Signature of MRI Center Representative: ______________________________
  Required for all projects involving the AU MRI Center

  Appropriate MRI Center Representatives:
  Dr. Thomas S. Denney, Director AU MRI Center
  Dr. Ron Beyers, MR Safety Officer

Version Date (date document created): 10/11/2020

7. PROJECT ASSURANCES

A. PRINCIPAL INVESTIGATOR'S ASSSURANCES

1. I certify that all information provided in this application is complete and correct.
2. I understand that, as Principal Investigator, I have ultimate responsibility for the conduct of this study, the ethical performance this project, the protection of the rights and welfare of human subjects, and strict adherence to any stipulations imposed by the Auburn University IRB.
3. I certify that all individuals involved with the conduct of this project are qualified to carry out their specified roles and responsibilities and are in compliance with Auburn University policies regarding the collection and analysis of the research data.
4. I agree to comply with all Auburn policies and procedures, as well as with all applicable federal, state, and local laws regarding the protection of human subjects, including, but not limited to the following:
    a. Conducting the project by qualified personnel according to the approved protocol
    b. Implementing no changes in the approved protocol or consent form without prior approval from the Office of Research Compliance
    c. Obtaining the legally effective informed consent from each participant or their legally responsible representative prior to their participation in this project using only the currently approved, stamped consent form
    d. Promptly reporting significant adverse events and/or effects to the Office of Research Compliance in writing within 5 working days of the occurrence.
5. If I will be unavailable to direct this research personally, I will arrange for a co-investigator to assume direct responsibility in my absence. This person has been named as co-investigator in this application, or I will advise ORC, by letter, in advance of such arrangements.
6. I agree to conduct this study only during the period approved by the Auburn University IRB.
7. I will prepare and submit a renewal request and supply all supporting documents to the Office of Research Compliance before the approval period has expired if it is necessary to continue the research project beyond the time period approved by the Auburn University IRB.
8. I will prepare and submit a final report upon completion of this research project.

My signature indicates that I have read, understand and agree to conduct this research project in accordance with the assurances listed above.

Jeremy M Craft	Craft, Jeremy Digitally signed by Craft, Jeremy Date: 2020.10.11 16:37:30 -04'00'	10/9/2020
Printed name of Principal Investigator	**Principal Investigator's Signature**	**Date**

B. FACULTY ADVISOR/SPONSOR'S ASSURANCES

1. I have read the protocol submitted for this project for content, clarity, and methodology.
2. By my signature as faculty advisor/sponsor on this research application, I certify that the student or guest investigator is knowledgeable about the regulations and policies governing research with human subjects and has sufficient training and experience to conduct this particular study in accord with the approved protocol.
3. I agree to meet with the investigator on a regular basis to monitor study progress. Should problems arise during the course of the study, I agree to be available, personally, to supervise the investigator in solving them.
4. I assure that the investigator will promptly report significant incidents and/or adverse events and/or effects to the ORC in writing within 5 working days of the occurrence.
5. If I will be unavailable, I will arrange for an alternate faculty sponsor to assume responsibility during my absence, and I will advise the ORC by letter of such arrangements. If the investigator is unable to fulfill requirements for submission of renewals, modifications or the final report, I will assume that responsibility.

Jane M. Kuehne	Jane M. Kuehne	10-12-2020
Printed name of Faculty Advisor / Sponsor	**Faculty Advisor's Signature**	**Date**

C. DEPARTMENT HEAD'S ASSSURANCE

By my signature as department head, I certify that I will cooperate with the administration in the application and enforcement of all Auburn University policies and procedures, as well as all applicable federal, state, and local laws regarding the protection and ethical treatment of human participants by researchers in my department.

Marilyn Strutchens	Marilyn Strutchens	10-13-2020
Printed name of Department Head	**Department Head's Signature**	**Date**

Version Date (date document created): 10/11/2020 page 3 of 10

8. **PROJECT OVERVIEW: Prepare an abstract that includes:**
(350 word maximum, in language understandable to someone who is not familiar with your area of study**):**

a) **A summary of relevant research findings leading to this research proposal:**
(Cite sources; include a "Reference List" as Appendix A.)

b) **A brief description of the methodology, including design, population, and variables of interest**

(A) Choral music educators use a wide variety of pitch and rhythm systems, including some teacher-adapted systems, however common practice does not equate to best practice (Daniels, 1986; Demorest, 2004; Kuehne, 2007; Nichols, 2013). The body of literature does not confirm a singular system as more effective than others (Demorest & May, 1995; Henry & Demorest, 1994). Though many teachers prefer to use movable systems, researchers suggested simply having a system is perhaps more important than choosing a particular system (Kuehne, 2010). The search for an effective sight-singing teaching method is further complicated by a lack of complete information on sight-singing pedagogy in undergraduate choral methods courses (Frey-Clark, 2017). Teachers therefore have generally relied on their personal learning experiences rather than research-based methods as they determine an instructional path (Daniels, 1986; Demorest, 2004; Kuehne, 2007; Nichols, 2013). Teaching and learning strategies implemented by choral directors are understudied in sight-singing (Killian & Henry, 2005; McClung, 2008). The body of education literature encourages direct instruction of learning strategies to support students as they become self-regulated learners, rather than individuals always dependent on a content chauffeur (Flavell, 1979; Mishra, 2014; Pearson & Gallagher, 1983; Pintrich, 2002). Though researchers identified some sight-singing strategies through observations of advanced singers, little research tests the efficacy or frequency of their use for novice singers (Killian & Henry, 2005; McClung, 2008).
(B) I will use a convenience sampling method for this study to recruit 45 - 60 potential participants, ages 12 through adult, with a goal of at least 40 total participants who are novice sight-singers. A research assistant (RA) will randomly assign participants to treatment and control groups and assign each a code based on group. Both groups will go through 10 days of online lessons in sight-singing (rhythm and melody) that will be housed in Canvas. Participants must log in to access content. The treatment group will receive feedback from researcher throughout. The control group will not.

9. **PURPOSE.**

a. **Clearly state the purpose of this project and all research questions, or aims.**

The purpose of this study is to test the efficacy of structured online, asynchronous sight-singing instruction for novice vocal music readers. Research questions include: (1) Is an asynchronous format an effective means to teach sight-singing to beginning choral students? Specifically, will post-test scores indicate improvement over pre-test scores in sight-singing skill after two weeks of asynchronous direct online instruction? (2) Are individuals of different age groups able to sight-singing equally given an asynchronous instructional format? Specifically, will there be significant differences between participants' pre- and post-test scores based on their age group? (3) 3. Will individuals who gain feedback about their performance, perform better than those who do not? Specifically, will there be significant differences in the sight-singing post-test scores between participants who receive individual feedback versus participants who receive no individual feedback?

b. **How will the results of this project be used? (e.g., Presentation? Publication? Thesis? Dissertation?)**

The results of this study will be used for dissertation. In addition, the data may be used for presentation and/or publication.

10. KEY PERSONNEL. Describe responsibilities. Include information on research training or certifications related to this project. **CITI is required. Be as specific as possible.** (Include additional personnel in an attachment.) *All key personnel must* ***attach*** ***CITI certificates of completion.***

Principle Investigator Jeremy M Craft **Title:** ______ **E-mail address** jmc0177@auburn.edu

Dept / Affiliation: Music Education, Curriculum & Teaching, College of Eduation

Roles / Responsibilities:

Lead researcher. Study administration, data collection, and data processing. Consent/assent of participants.

Individual: Dr. Jane Kuehne **Title:** Assoc Prof Music Ed **E-mail address** kuehnjm@auburn.edu

Dept / Affiliation: Music Education, Curriculum & Teaching, College of Eduation

Roles / Responsibilities:

Faculty advisor/supervisor. Data and results reviewer.

Individual: Dr. Kamden Strunk **Title:** Assoc Prof **E-mail address** kks0013@auburn.edu

Dept / Affiliation: Educational Foundations, Leadership, and Technology

Roles / Responsibilities:

ERMA Representative on committee. Data and results reviewer.

Individual: ______ **Title:** ______ **E-mail address** ______

Dept / Affiliation: ______

Roles / Responsibilities:

Individual: ______ **Title:** ______ **E-mail address** ______

Dept / Affiliation: ______

Roles / Responsibilities:

Individual: ______ **Title:** ______ **E-mail address** ______

Dept / Affiliation: ______

Roles / Responsibilities:

11. LOCATION OF RESEARCH. List all locations where data collection will take place. (School systems, organizations, businesses, buildings and room numbers, servers for web surveys, etc.) **Be as specific as possible. Attach permission letters in Appendix E.**
(See sample letters at http://www.auburn.edu/research/vpr/ohs/sample.htm)

Instructure Canvas (http://canvas.instructure.com)

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12. PARTICIPANTS.

a. **Describe the participant population you have chosen for this project including inclusion or exclusion criteria for participant selection.**

☐ **Check here if using existing data, describe the population from whom data was collected, & include the # of data files.**

Potential participants for this study will be 12 years old through adult who are also novice sight-singers. Each will take a sight-singing pre-test prior to the study to determine their existing sight-singing level. All who score less than 50% will be considered novice sight-singers and will be eligible to participate in this study. Any who score above 50% on the pre-test will be excluded from the study.

Interested individuals will communicate via email with a research assistant who will anonymously code participants, via a random number generator, assign them to either the control or treatment group, and enter participants into the instructional delivery platform, Instructure Canvas (Instructure, n.d.). The researcher will provide individual feedback to the treatment group throughout the sight-singing modules, while the control group will not receive individual feedback.

b. **Describe, step-by-step, in layman's terms, all procedures you will use to recruit participants.** *Include in* ***Appendix B*** *a copy of all e-mails, flyers, advertisements, recruiting scripts, invitations, etc., that will be used to invite people to participate.* *(See sample documents at http://www.auburn.edu/research/vpr/ohs/sample.htm.)*

I will recruit participants by sending an email to middle and high school choral directors from Southwestern Virginia, who are also members of the Virginia Music Educators Association (VMEA). The email will describe the goals of the study, participant requirements, provide an email address to communicate their interest, and request the teacher send the invitations to their students. In addition, I will send a similar email to adult, community choral ensembles and collegiate choral programs in Southwestern Virginia inviting them to participate. The participants will email the RA to indicate their interest in participating in the study.

c. **What is the minimum number of participants you need to validate the study?** 40

How many participants do you expect to recruit? 40

Is there a limit on the number of participants you will include in the study? ☐ **No** ☒ **Yes – the # is** 60

d. **Describe the type, amount and method of compensation and/or incentives for participants.**

(If no compensation will be given, check here: ☐)

Select the type of compensation: ☐ Monetary ☒ Incentives

☒ Raffle or Drawing incentive (Include the chances of winning.)
☐ Extra Credit (State the value)
☐ Other

Description:

Participants who complete the study will be entered into a drawing for one of ten $15 Amazon gift cards (delivered virtually). With 40 participants, each individual will have a one-in-four chance of winning.

13. **PROJECT DESIGN & METHODS.**

a. **Describe, step-by-step, all procedures and methods that will be used to consent participants. If a waiver is being requested, check each waiver you are requesting, describe how the project meets the criteria for the waiver.**

- ☐ **Waiver of Consent (including using existing data)**
- ☐ **Waiver of Documentation of Consent (use of Information Letter)**
- ☐ **Waiver of Parental Permission (for college students)**

Once potential participants are registered for the Canvas site, the first module is divided into several introductory steps. Following an introductory explanation of the study, will download, review, and sign the consent form. Participants will be provided instructions to take a picture or scan the signed document and upload it to a Canvas assignment. If the consent module is not completed, participants will not be able to proceed. All modules are locked unless consent is given. If a problem exists with the uploading procedure, participants can communicate with the research assistant through Canvas messaging. Likewise, if an incomplete or incorrect consent form is uploaded, the research assistant will communicate with the participant through Canvas messaging to determine (a) if this was an error, or (b) the participant does not consent and needs to be removed from the study.

b. **Describe the research design and methods you will use to address your purpose. Include a clear description of when, where and how you will collect all data for this project.** Include specific information about the participants' time and effort commitment. (*NOTE: Use language that would be understandable to someone who is not familiar with your area of study. Without a complete description of all procedures, the Auburn University IRB will not be able to review this protocol.* ***If additional space is needed for this section, save the information as a .PDF file and insert after page 7 of this form.***)

All data will be collected in (a) Instucture Canvas or (b) Qualtrics, through Canvas.

Once they have completed a required consent module in Canvas, they will complete a short survey designed to collect (a) demographic data, (b) self-reported comfort levels about their perceived sight-singing ability. This short questionnaire is housed in Qualtrics and embedded into a module page in Canvas.

The study includes nine daily modules of asynchronous sight-singing instruction. Each is 5-10 minutes in length. Participants will be encouraged to log in daily, to not skip days between lessons, to have 9 days of continuous instruction. The researcher will provide an instructional video and an audio recording of a sight-singing practice example on specified days following instruction. Participants will use recordings to independently demonstrate understanding. Those in the treatment group will receive individualized feedback from the researcher about rhythmic and/or melodic accuracy, and reminders strategy use, such as maintaining a steady beat. After 4 days of rhythm instruction, participants will complete a rhythm post-test. After the 4 days of melodic instruction, they will complete a melody post-test and a rhythm+melody post-test. After the post-tests are completed, participants will complete a post-survey designed to collect (a) their self-reported sight-singing ability and (b) their impressions about the instruction they received. Pre- and post-tests and pre- and post-surveys were edited after expert analysis. All data will be anonymously coded so pre- and post-test data for individual participants can be compared. If participants inadvertently include identifiable information, it will be anonymized. Three trained subject-matter experts (one is the researcher) will assess each participant's pre- and post-tests. Data for the surveys will be analyzed by the researcher.

Participants will use a smartphone recording app, "EasyVoiceRecorder", to record all pre- and post-tests. Participants will upload their voice recordings to Canvas through the "quizzes" function which allows for private file upload

13. PROJECT DESIGN & METHODS. *Continued*

c. List all data collection instruments used in this project, in the order they appear in Appendix C.
(e.g., surveys and questionnaires **in the format that will be presented to participants**, educational tests, data collection sheets, interview questions, audio/video taping methods etc.)

1. Pre-test and rubric
2. Post-test and rubric
3. Pre-survey
4. Post-survey

Participants will use a smartphone to record all pre- and post-test recordings.

d. Data analysis: Explain how the data will be analyzed.

Data will be analyzed using a quantitative approach using parametric and non-parametric statistical procedures. These may include: Descriptive Statistics, Dependent Samples t-tests with Bonferroni adjustment, Independent t-tests, Kruskal-Wallis H test.

14. RISKS & DISCOMFORTS: List and describe all of the risks that participants might encounter in this research. ***If you are using deception in this study, please justify the use of deception and be sure to attach a copy of the debriefing form you plan to use in Appendix D.*** *(Examples of possible risks are in section #6D on page 2)*

(1) There is a risk that a participant recording audio of themselves singing may cause discomfort.
(2) There is also a risk of breach of confidentiality.

15. PRECAUTIONS. Identify and describe all precautions you have taken to eliminate or reduce risks as listed in #14. If the participants can be classified as a "vulnerable" population, please describe additional safeguards that you will use to assure the ethical treatment of these individuals. ***Provide a copy of any emergency plans/procedures and medical referral lists in Appendix D. (Samples can be found online at http://www.auburn.edu/research/vpr/ohs/sample.htm#precautions)***

(1) Participants are not required or encouraged to listen to their audio recordings prior to submission. Additionally, participants are requested to only record their submissions once, which could eliminate self-review of recordings.

(2) Participants will communicate with a research assistant about their interest in participating in the study. The research assistant will provide each participant with a code developed from a random number generator and then alter the code to indicate treatment or control group assignment. The research assistant will keep all codes in a secure location for the duration of the study.

If using the Internet or other electronic means to collect data, what confidentiality or security precautions are in place to protect (or not collect) identifiable data? Include protections used during both the collection and transfer of data.

Qualtrics: Participants will enter their randomly generated code at the start of both the pre- and post-surveys. Participants' names will not be associated with their pre- and post-surveys, only their random codes.

Canvas: Participants will be registered into Canvas using only their email address and their randomly generated code.

Google Sheet Pre-/Post-test Rubrics: Each rubric will be identified only with the participant's randomly generated code.

16. BENEFITS.

a. List all realistic direct benefits participants can expect by participating in this specific study.

(Do not include "compensation" listed in #12d.) Check here if there are no direct benefits to participants. ☐

Participants may be able to sing at sight basic rhythmic and pitch patterns. In addition, participants may begin to develop rehearsal and performance strategies as they relate to the sight-singing process.

b. List all realistic benefits for the general population that may be generated from this study.

Vocal music educators may have a potential instructional structure for teaching novice vocalists how to sight-singing, including a series of scaffolded sight-singing examples. This research could also provide support for a model for teaching sight-singing asynchronously.

17. PROTECTION OF DATA.

a. Data are collected:

☐ **Anonymously with no direct or indirect coding, link, or awareness of who participated in the study (Skip to e)**

■ **Confidentially, but without a link of participant's data to any identifying information (collected as "confidential" but recorded and analyzed as "anonymous") (Skip to e)**

■ **Confidentially with collection and protection of linkages to identifiable information**

b. If data are collected with identifiers or as coded or linked to identifying information, describe the identifiers collected and how they are linked to the participant's data.

The research assistant will code participants using a random number generator. Names will be replaced with randomly generated codes. The research assistant will randomly assign participants into treatment or control groups and alter codes to reflect their assignment. Specifically, the number "one" will indicated treatment, and "zero" will indicate control group. Email addresses are needed to register participants in the Canvas system.

c. Justify your need to code participants' data or link the data with identifying information.

Participants are coded to track responses across time.

d. Describe how and where identifying data and/or code lists will be stored. (Building, room number?) **Describe how the location where data is stored will be secured in your absence. For electronic data, describe security. If applicable, state specifically where any IRB-approved and participant-signed consent documents will be kept on campus for 3 years after the study ends.**

A code list hard copy will be kept in a locked file cabinet in Snidow Chapel on the University of Lynchburg campus in the researcher's office (faculty office 3; Lynchburg, VA). A digital version of the code list will be kept in Box, an authenticated cloud storage system and will be password protected. The password will only be known by the research assistant.
All pre- and post-test recordings will be stored in Box with the code list, following their

e. Describe how and where the data will be stored (e.g., hard copy, audio cassette, electronic data, etc.)**, and how the location where data is stored is separated from identifying data and will be secured in your absence. For electronic data, describe security**

Following the coding of data by the research assistant, data will be stored in Quatrics online (surveys) and as both SPSS and excel files (pre- and post-tests) on the researcher's passworded computer in a passworded folder, and in the online Box folder that requires proper authentication for access.
All pre- and post-test recordings will be stored in Box with the code list, following their download from Canvas. Recordings will be destroyed following the publication of the researcher's dissertation and any subsequent publications are completed.

f. Who will have access to the participants' data?

(*The faculty advisor should have full access and be able to produce the data in the case of a federal or institutional audit.*)

Dr. Jane Kuehne (dissertation chair), Dr. Kamden Strunk (ERMA committee member), the researcher, and the research assistant will have access to the participants' data.

g. When is the latest date that identifying information or links will be retained and how will that information or links be destroyed?

(Check here if only anonymous data will be retained ☐)

Data will be kept until all publications, poster sessions, presentations, and workshops are complete. Once completed, data will be destroyed (if paper, it will be shredded, if electronic it will be deleted, and the "trash" folders will be deleted -- on computer, in Box, on Qualtrics.

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AUBURN UNIVERSITY INSTITUTIONAL REVIEW BOARD
REQUEST for MODIFICATION

For Information or help completing this form, contact: **THE OFFICE OF RESEARCH COMPLIANCE (ORC)**
Phone: 334-844-5966 **E-Mail:** IRBAdmin@auburn.edu **Web Address:** http://www.auburn.edu/research /vpr/ohs

In MS Word, click in the white boxes and type your text; double-click checkboxes to check/uncheck.

- **Federal regulations require IRB approval before implementing proposed changes.**
- **Change means any change, in content or form, to the protocol, consent form, or any supportive materials (such as the Investigator's Brochure, questionnaires, surveys, advertisements, etc.). See Item 4 for more examples.**
- **Form must be populated using Adobe Acrobat / Pro 9 or greater standalone program (do not fill out in browser). Hand written forms will not be accepted.**

1. Today's Date	February 23, 2021

2. Principal Investigator (PI)

Principal Inves. (title):	Ph.D. Candidate	**Faculty PI (if PI is a student):**	Dr. Jane Kuehne
Department:	Curriculum & Teaching	**Department:**	Music Education: Curriculum & teaching
Phone:	5409151321	**Phone:**	334-844-6852
AU E-mail:	jmc0177@auburn.edu	**AU E-mail:**	Kuehnjm@auburn.edu
Contact person who should receive copies of IRB correspondence (Optional)			
Name:		**Department Head:**	Marilyn Strutchens
Phone:			
AU E-mail:			

3. AU IRB Protocol Identification

3.a. Protocol Number	#20-433
3.b. Protocol Title	The Efficacy of Asynchronous Instruction for Novice Sight-Singers

3.c. Current Status of Protocol—For active studies, check ONE box at left; provide numbers and dates where applicable

- ☒ **Study has not yet begun; no data has been entered collected**
- ☐ **In progress If YES, number entered**
  Adverse events since last review
- ☐ **Data analysis only**

Approval Dates: From 11/18/2020 To ---------

- ☐ **Funding Agency and Grant Number:** **AU Funding Information:**
- ☐ **List any other institutions and/or IRBs associated with this project:**

4. Types of Change

Mark all that apply, and describe the changes in item 5

- ☐ **Change Key Personnel**
  Attach CITI forms for new personnel.

The Auburn University Institutional Review Board has approved this Document for use from
02/23/2021 to --------------
Protocol # 20-433 EP 2011

☐	**Additional Sites or Change in Sites, including AU classrooms, etc.** Attach permission forms for new sites.
☐	**Change in methods for data storage/protection or location of data/consent documents**
☐	**Change in project purpose or project questions**
☒	**Change in population or recruitment** Attach new or revised recruitment materials as needed; both highlighted version & clean copy for IRB approval stamp
☐	**Change in study procedures** Attach new or revised consent documents as needed; both highlighted version & clean copy for IRB approval stamp
☐	**Change in data collection instruments/forms (surveys, data collection forms)** Attach new forms as needed; both highlighted version & clean copy for IRB approval stamp
☐	**Other** (BUAs, DUAs, etc.) Indicate the type of change in the space below, and provide details in Item 5.c. or 5.d. as applicable. Include a copy of all affected documents, with revisions highlighted as applicable.
▶	

5. Description and Rationale

5.a. For each item marked in Question #4 describe the requested changes to your research protocol, with an explanation and/or rationale for each.
Additional pages may be attached if needed to provide a complete response.

▶ I am making a change in how participants will be recruited. The initial protocol indicated that participants would self-enroll in the online 10-day course for this study, however no individuals indicated interest and I currently have no participants. In an effort to recruit in a timely manner, I am changing the recruitment protocol to enlist singular classrooms of students from approximately six schools to be recruited through their teachers who are part of the original recruitment pool of teachers. I will contact each teacher individually versus sending another email through the original distribution lists. This recruitment strategy will eliminate the need for self-enrollment by individual participants. Instead students will be assigned an anonymized login by the research assistant and they will log in and go through the course as described in the original IRB protocol. The Principle Investigator gained access to choral director email addresses through the District VI

Choral Representative of the Virginia Music Education Association (email attached). An email was sent to gain access to this contact database.

5.b. Briefly list (numbered or bulleted) **the activities that have occurred up to this point, particularly those that involved participants.**
▶ A recruitment email and follow-up email were sent to approximately 60 choral directors using the process outlined in the original IRB protocol.
5.c. Does the change affect participants, such as procedures, risks, costs, benefits, etc.
▶ There is no anticipated impact to participants, including risks, costs, benefits, etc.
5.d. Identify any changes in the safeguards or precautions that will be used to minimize described risks.
▶ No changes to safeguards or precautions are needed.
5.e. Attach a copy of <u>all</u> "stamped" IRB-approved documents currently used. (information letters, consents, flyers, etc.
▶ The original approved and stamped IRB protocol and consent/assent documents are attached.
5.f. Attach a copy of all revised documents (high-lighted revised version and clean revised version for the IRB approval stamp).
▶
6. Signatures **Principal Investigator** Jeremy Craft **Faculty Advisor PI, if applicable** Jane M. Kuehne