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Science-based Bel Canto Pedagogy in Young Women's Voices

By

Claire McCullough

Accepted in Partial Completion of
the Requirements for the Degree
Master of Music, Music Education

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Master's Thesis

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Claire McCullough

5/16/18

Science-based Bel Canto Pedagogy in Young Women's Voices

A Thesis
Presented to
The Faculty of
Western Washington University

In Partial Fulfillment
Of the Requirements for the Degree
Master of Music, Music Education

by
Claire McCullough
May 2018

Abstract

The purpose of this work was to determine if *bel canto* pedagogy, combined with voice-science and spectrography, could be implemented successfully in a young women's chorus over a nine-week research period. The first chapter of this thesis describes what pedagogies and tools the author drew from to use in practice research. The second chapter summarizes the instruction that was given in each research session, as well as provides analyses of the participants' progress throughout the research period. The final chapter examines final feedback from both the participants and the author of this work, as well as the potential future use of the author's findings in various choral settings.

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I would like to express my gratitude my advisor, Dr. Patricia Bourne, for her unfailing support during the researching and writing of this thesis. I would also like to thank my committee members, Timothy Fitzpatrick and Heather Dudenbostel, for their support in the culmination of this thesis.

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Introduction

Bel canto vocal technique can generally be described as Western operatic singing. Though used by vocalists often in classical music performances, *bel canto* is less commonly used in amateur choral ensembles, especially adolescent ones. The purpose of this thesis was to determine if science-based *bel canto* singing technique, incorporating the use of a spectrograph, could be taught successfully to a young women's chorus. In order to make that determination, I developed a choral pedagogy drawn from the writings of renown voice-science pedagogues, as well as general teaching methods based in neuro-science. This pedagogy is outlined in the first chapter of this work. In Chapter 1, I have also explained the purpose and function of the spectrograph software Voce Vista as it relates to my research.

In Chapter 2, I discuss how I implemented my choral pedagogy in a choral setting over a nine-week period with female volunteers, aged 15-17, by teaching them operatic vocal technique and the choral selections *Shenandoah* arranged by Jennifer Durham and *Say Now Ye Lovely Social Band* arranged by William Averitt. I offer a detailed summary of each of my research sessions, and I analyzed my participants' vocal progress using the Voce Vista spectrograph software.

A final summary of research findings and participants' vocal progress, both individually and as a group, is reported in Chapter 3. I also provide the reader with warm-ups and repertoire suggestions based on my research that can be implemented in any relatively small mixed choir.

Chapter 1

Voice instructors use a variety of instructional strategies and pedagogical systems to achieve vocal progress in their students. Instructional strategies vary amongst instructors and are often tailored to the needs of individual students. Pedagogical systems provide both the instructor and the student with the ability to address any underlying technical issues the student may have while also giving the student strategies to achieve expressiveness in their singing.

The purpose of my research was to help participants develop and refine their own singing in a predetermined set of instructional sessions; in order to instruct the ensemble in a systematic manner, I determined a choral pedagogy that could be used in tandem with Voce Vista spectrograph software.

Developing a Choral Pedagogy for Research

In researching voice pedagogies and subsequently developing my own personal strategies to use in my research, I relied heavily on the writings of American voice pedagogue, Kenneth H. Phillips. In his work *Teaching Kids to Sing* (1996), Phillips defined five essential physiological areas which are critical in teaching a healthy vocal technique to young and adolescent students:

1. Breathing
2. Phonation
3. Resonant tone production
4. Diction
5. Expressiveness

Phillips determined that instruction on these five areas should be taught using what he terms the “psychomotor process”:

The psychomotor process for teaching [...] may be conceptualized in four steps: (1) the teacher provides a model or stimulus, (2) the student perceives and decodes

the model, (3) the student imitates the model, and (4) the student analyzes feedback regarding their effort.¹

Using Phillips' psychomotor process for teaching as the basis for instruction in my research, I developed several pedagogical strategies for Phillips' five areas of singing using research from various voice science pedagogues.

Breathing

Phillips has devised instruction for breathing into three stages: posture development, breathing motion, and breath management.² For each of these three stages, Phillips developed a variety of exercises for classroom use.

One exercise set that Phillips suggested for posture development is what he termed "Muscle Movers". These Muscle Mover exercises are intended to allow the student to stretch the body in four stages beginning with the spinal stretch (see Appendix A), the shoulder roll, the head roll, and the knee flex (an exercise which consists of bouncing at the knees to prevent students from locking their legs). Phillips suggested teaching this Muscle Mover set as a sequence, using voice cues to move smoothly between the exercises. In so doing, the teacher prepares the students for the physicality of singing.³

For helping the student to achieve the correct stance, both for sitting and standing, Phillips recommended that the teacher model a balanced stance for the students and compare and contrast the balanced stance to an unbalanced one. Furthermore, Phillips recommended referring

¹ Kenneth H. Phillips, *Teaching Kids to Sing* (Boston: Schirmer, 1996), pp. 15-16;23.

² *Ibid.*, p. 148.

³ *Ibid.*, p. 157.

students to examples of professional singers when necessary to emphasize the importance of the balanced stance.⁴

The body's breathing motion is an integral part of breathing pedagogy for the simple reason that students often, as Phillips noted, 'invert the breathing motion'; rather than breathing diaphragmatically, students often engage in clavicular breathing wherein the clavicle bones, and subsequently the chest, are lifted when inhaling and lowered when exhaling.⁵ In order to inspire students to inhale diaphragmatically, Phillips' recommended the Slow Slip exercise, as it is a simple exercise that can easily be replicated in the classroom. This exercise requires students to inhale and exhale as though they are doing so through a drinking straw, which allows for the diaphragm to descend properly without allowing the student to engage in clavicular breathing.⁶

Breath management is very closely related to the concept of breathing motion and entails the student's use of *appoggio* or breath support. In his text *Solutions for Singers* (2004), renowned pedagogue Richard Miller recommended using five staccato "s" exhalations and five staccato "f" exhalations on one breath each to begin the process of developing correct *appoggio* for students in short, manageable sets. In addition to these two exercises, Miller suggested using a long expired "s" that uses all of the students' air. Miller recommended having students place

⁴ Ibid., p. 180.

⁵ Ibid., p. 195.

⁶ Ibid., pp. 201-202.

their hands at the transverse abdominus during this exercise, which allows them to feel how the walls of the abdomen slowly move in with *appoggio* exhalation.⁷

It is important to note that Phillips drew extensively from Miller throughout his pedagogy. A modification of Miller's long "s" exercise that I also chose is the slow leak exercise of Phillips, where the students are encouraged to expel air on any unvoiced consonant while the teacher counts. Phillips' lip trill exercise, where the lips are trilled for as long as possible, is also recommended to aid students in managing their breath over a longer time period, as they would do for legato phrases during singing.⁸

Phonation

The process of producing spoken sound, known as phonation, begins years prior to any formal voice instruction for the majority of students; it is common for students to have inefficient phonation in their singing due to the habits of their speech.⁹ As a result, cultivating a healthy phonation in the speaking voice of a student, Phillips noted, is a strong entry point into developing healthy phonation habits in a student's singing voice.

One way to promote effective speech in students is through instructor-modelling of well supported speech during instruction. This allows students to be immersed in proper speaking phonation. Furthermore, Phillips wrote that the teacher should incorporate speech phonation

⁷ Richard Miller, *Solutions for Singers* (New York: Oxford, 2004), p. 6-7.

⁸ Phillips., p. 215.

⁹ Miller, *Solutions for Singers*, p. 173.

exercises for the lower, middle, and upper registers of the voice.¹⁰ For lower registration exercises, Phillips' song texts exercise proves effective, as it requires students to speak repertoire text using a diaphragmatically-supported lower register with an expressive inflection. In addition, Phillips' pulsed staccato "Ha" exercises, for both the lower and upper registers, creates an aural and physical comparison of the technical differences between these two registers for students.¹¹ Finally, spoken ascending and descending glissando exercises on a variety of neutral vowels were chosen to help students begin to navigate the adjustments between the upper, middle, and lower registers of the voice.¹²

Resonant Tone Production

Richard Miller strongly believed that balanced phonation should incorporate *chiaroscuro*, which he described as 'the equilibrium of acoustic strength manifested by an ideal distribution of lower and upper harmonic *partials* clustered in *formants*.'¹³ The vowel, Miller noted, is the crux of a resonant singing tone, and Miller recommended using IPA symbols in voice instruction so that the student may have a clear definition of each vowel sound found in their repertoire (Appendix B). This attention to vowel pronunciation for resonance will contribute to any instruction given regarding diction, especially for those wanting to achieve a *bel canto* sound for their singers.¹⁴

¹⁰ Phillips, pp. 221-224.

¹¹ Ibid., pp. 239 and 244.

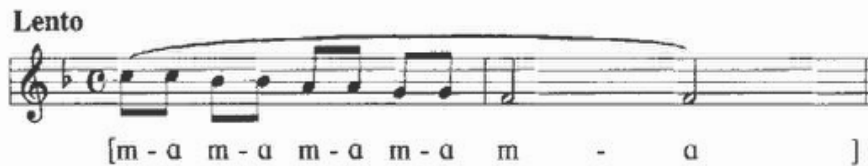
¹² Ibid, p. 249.

¹³ Miller, *Solutions for Singers*, p. 64.

¹⁴ Ibid., pp. 65-66.

In addition to procuring IPA charts as a method to teach uniform vowels and resonant tone, Miller's onset exercise for closed and open singing proved to be effective (Figure 1). This exercise requires the singer to combine proper breath support with a voiced consonant and vowel combination so that *appoggio* and vowel production can be practiced simultaneously.¹⁵

Figure 1.1 Richard Miller. *Training Soprano Voices*, "Breath Energy in Singing". p.711



EXAMPLE 4.4.

Again, drawing from Phillips and Miller, Phillips' vowel focus exercise and the humming movement exercise were adapted and applied in instruction as a complement to Miller's onset exercise.¹⁶ Both of these latter exercises can be used to prepare the singer to sustain the correct vocal resonance on longer tones.¹⁷

Diction

Diction for singing is distinct from diction that is used in every day speech. Therefore, it is paramount that diction be addressed in the choral setting so that colloquial habits from student's speech do not interfere with the clear, crisp diction that is needed for singing. As

¹⁵ Richard Miller, *Training Soprano Voices* (New York: Oxford, 2000), p. 711.

¹⁶ Phillips, p. 287.

¹⁷ *Ibid.*, p. 269.

correct, uniform vowels aid the singer in achieving a balanced phonation, both uniform vowels and consonants create clear diction for singing.¹⁸

For initial exercises regarding diction, I chose the following two Phillips diction exercises: the jaw prop exercise (Appendix B), to facilitate a relaxed jaw, and the forward tongue exercise, which requires students to speak the vowels [o], [i], [a], and [u] with the tip of the tongue touching the bottom front teeth.¹⁹

Having consulted the works of several pedagogues, I found that providing IPA charts for consonants and providing modelling for those consonants, in addition to vowels, will aid in diction instruction. Instruction in the sound and articulation of the five common consonants of English is also generally considered a good starting point for diction instruction. These consonants are [t], [d], [n], [l], and the non-American [r].²⁰

Following the pedagogy of Emmons and Chase in *Prescriptions of Choral Excellence* (2006), I noted that consonants should be executed quickly so that a legato line can be maintained. This diction technique is especially pertinent to my research, which is largely based around *legato* repertoire. Furthermore, Emmons and Chase recommended that the teacher instruct students to sustain the vowel in each word of a song for as long as possible during

¹⁸ Shirlee Emmons and Constance Chase, *Prescriptions for Choral Excellence* (New York: Oxford, 2006), p. 74-75.

¹⁹ Phillips, p. 319.

²⁰ Emmons and Chase, p. 81.

singing before moving to the following consonant. This allows the singer to have the clearest diction possible without compromising any resonance provided by the vowel.²¹

Expressiveness

Emmons and Chase wrote that the use of imagery in choral instruction can be used to great success for a variety of pedagogical goals. Inviting students to use their imagination to place themselves in the context of the text can be a useful tool to both help students understand what they are singing emotionally and to help elicit the appropriate facial expressions from students during performance.²² Imagery can also help students with technical issues in their singing. If a student is allowed to imagine themselves singing a phrase using *bel canto* technique, while paying particular attention to how they imagine themselves both producing the sound physically and to how the melodic line will sound, students have a higher chance of being successful when they execute the phrase in performance.²³

Though I will speak more on how expressiveness was integrated into my pedagogy in the subsequent chapter, I did select two initial exercises to begin instruction on expressiveness in my research. For this I incorporated Phillips' Down 5 and his Down 5-Up 5 exercises into my pedagogy, especially for warm-ups. I chose this exercise as a comprehensive tool for which to help my students focus on pure vowels, phrasing, and breathing.²⁴

²¹ Ibid., p. 79-80.

²² Emmons and Chase., pp. 264-267.

²³ Ibid., p. 267.

²⁴ Phillips, p. 341.

The Brain and Learning for Developmentally-typical Students

The vocal instructor uses a variety of techniques to teach specific aspects of singing; however, it is, in fact, the knowledge of how students learn and process information and the instructor's implementation of that knowledge in their pedagogy that can lead to greater success vocally for the student. In addition to researching vocal pedagogy, I investigated how the brain functions for the average learner and, from that research, developed a brain-based pedagogy that could be integrated into practical research sessions.

For the developmentally-typical student, the brain learns by first taking in information through the senses. That information is then processed in the thalamus and other networks in the brain. As a new skill is learned, synapses, or pathways, that connect various nerve networks in the brain, are created. If what the student has learned, whether a new skill or information, is maintained through what neurologist David Sousa calls rehearsal and practice, the synapsis is likewise maintained. However, if the student does not maintain what they have learned, the synapsis associated with the learning deteriorates.²⁵ Therefore, it is absolutely essential that the student be fully aware of what they are being asked to learn so that there is minimal confusion or room for the student to learn a skill incorrectly.

In order for a student to practice the skill correctly so that their performance of the skill is improved, Sousa stated that four conditions should be met: 1. The student should be motivated so that they want to improve their performance. 2. The student should have all necessary information to apply the skill. 3. The student should understand how to apply that information in

²⁵ David Sousa. *How the Brain Learns* (Thousand Oaks: Sage, 2006), p. 40.

particular situations, and 4. The student must analyze the results of their application of the skill in order to determine what changes should be made to improve the skill in the future.

Furthermore, in order for the teacher to guide students in their practice of these skills, Sousa encouraged the teacher to use four following approaches in instruction: 1. The teacher should select the smallest amount of new material that will have the most impact for the student. 2. The teacher should model the skill-learning process step-by-step. 3. The teacher should have the students practice in the classroom while the student is learning the new skill, and 4. The teacher should provide immediate and specific feedback to the student on what the student should change in order for the skill to be practiced more successfully in the future. In addition to these precepts, Sousa encouraged instructing two dissimilar skills concurrently rather than two similar concepts to avoid confusion for the student.²⁶

Sousa's recommendations for neurologically-based teaching, combined with instructional strategies to strengthen participants' vocal skills, were implemented throughout the nine research sessions (see Chapter 2). The steps Sousa outlined guided rehearsal sequencing and were a consistent reminder to model concepts for, provide practice time for, and give meaningful feedback to the participants.

Using Voce Vista Software for Vocal Instruction

Voce Vista software analyzes the singing voice by illustrating, with a spectrograph, the overtones that comprise each individual sung pitch. As previously discussed, a single pitch, or fundamental frequency, is made up of various overtones which are multiples of the fundamental frequency. If a fundamental frequency is at 220 Hz, it will have overtones present at 440 Hz, 660

²⁶ Sousa, p.97-98.

Hz, 880 Hz, and so on. Therefore, when a singer's voice is recorded by Voce Vista software, the sung pitches are translated, in real time, into fundamental frequencies and overtones that are represented by colors on the Voce Vista spectrograph. This analysis of the voice also shows how a tone is produced regarding adducted, abducted, or balanced phonation (Appendix C). This information provides the learner with the ability to instantly see a digital representation of their own phonation as they sing. The learner can determine from the spectrograph analysis if they are singing a pitch accurately and whether or not they are singing with a balanced phonation.

Using a holistic approach that considered the technical and expressive aspects of singing, I developed a pedagogy for my choral research built on a foundation of exercises and recommendations of renown voice pedagogues. Combined with a fundamental understanding of the neurological proponents of the learning process, Voce Vista spectrograph software was integrated into my pedagogy to provide real-time feedback to the students involved in the research.

Chapter 2

Research Setting

My research occurred once a week after regular classes at a regional high school over a nine-week period. The research presented in this chapter was conducted to determine if a science-based *bel canto* vocal pedagogy could be successfully implemented in a young women's choir. Due to the volunteer nature of this research project, participants' attendance was variable. Six students participated in at least one single research session; however, for the purposes of this thesis, I will rely primarily on the data collected from Student 1, Student 2, and Student 6- all of whom participated in two or more sessions each. Each research session was conducted as a choir rehearsal with participant completion of exit questionnaires. Voices of the participants were recorded at various intervals throughout the research period.

For research repertoire, I chose two English language choral settings of American folk songs: *Shenandoah* and *Say Now, Ye Lovely Social Band* (See Appendices D and E, respectively). These two works were selected due to the accessibility of the English text for the native-English speaking participants, the age-appropriateness of each piece's range, and the contrasting tempi, dynamics, and poetic expression of the two works.

In order to show evidence of the participants' vocal growth throughout the nine-week research period, I have included descriptions of nine total research sessions which detail the number of participants and summarize the instruction that was given during each session, including opening activities, warm-ups and progress that was made regarding the choral repertoire. Also included in this section is the analysis of the participant's individual vocal abilities.

Session 1

Participants: Student 1, Student 2

Opening Activities: During the first research session, my primary goal was to get to know my students and their musical and vocal abilities by establishing a friendly rapport with the students in our session and via the Introductory Questionnaire (See Appendix F) and Exit Questionnaires (See Appendix G). To foster a fun and congenial atmosphere, I led the participants in two party games and asked them questions regarding their musical preferences and what they were learning about music at school. From this discussion, as well as the Introductory Questionnaire, I learned that both participants were members of their school choirs and had been given basic IPA and vocal anatomy instruction from their choir director.

Instruction: Instruction began with a brief overview of vocal anatomy, using laryngoscopic video of sung phonation as well traditional instruction using handouts and a PowerPoint presentation (See Appendix I). I also discussed with the participants the difference between *bel canto* singing vowels and the everyday speaking vowels of American English. In order for the participants to better understand both the physical and aural differences between these vowel types, I helped the participants practice reading IPA vowels. Using an IPA tongue placement chart as a reference, Phillips' psychomotor process was incorporated by modelling each listed vowel using both a speaking and a singing vowel while the participants mirrored me. Eventually, the students noticed and discussed the contrasts between the physical sensations and the aural perception of both vowel types.

Warm-ups:

The participants were led in warm-ups consisting of stretches, breathing exercises, and vocal warm-ups. During this time, we discussed basic anatomy and function of diaphragmatic breathing as compared to clavicular breathing. I then modeled what I termed "Everyday

Breathing” (or shallow, clavicular breathing) and “Diaphragmatic Breathing” and asked the participants to mirror what they saw and heard.

Repertoire:

During this session, the participants sight read *Shenandoah*. Student 1 was assigned the soprano 1 part and Student 2 was assigned the soprano 2 part.

Primary Vocal Assessment of Students 1 and 2:

Provided below is a vocal assessment of Student 1 and Student 2 executed during Session 1. This assessment details each participants’ age and level of singing experience (see Table 1 and Table 2). Also provided is a Voce Vista spectrograph analyses of the participants’ singing, which is found in Figure 2.1 and Figure 2.2. The Voce Vista spectrograph analyzes the formants of sung sound and displays those formants on a colorized chart.

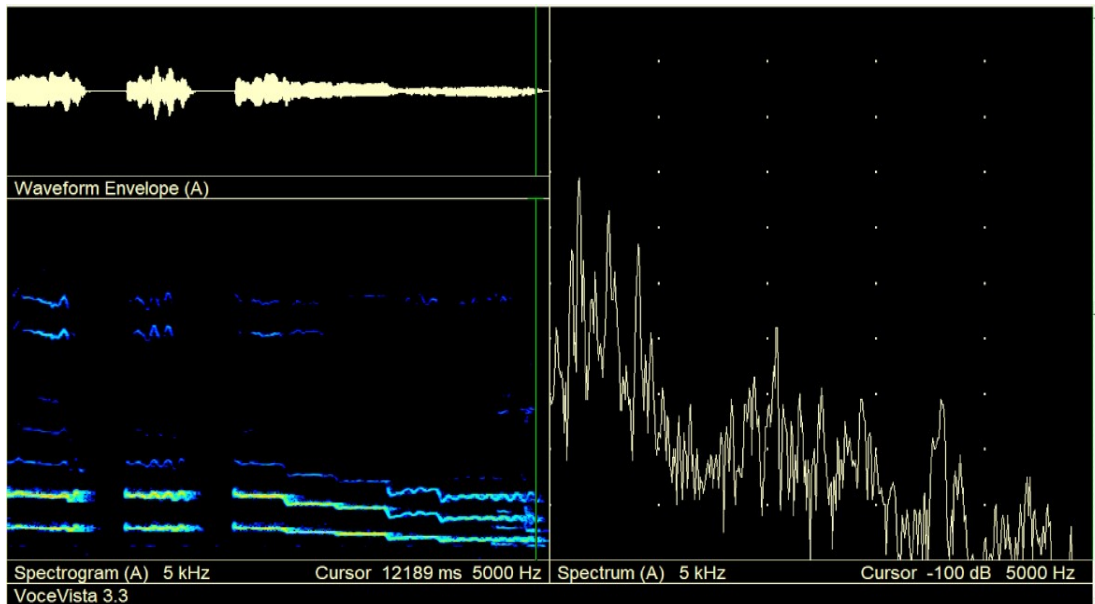
Each participants’ phonation balance, vowel accuracy, and pitch accuracy is included, determined from the Voce Vista spectrograph analysis is also included. Further assessments of participant singing can be found in Session 4, Session 8, and Session 9.

Student 1, Primary Vocal Assessment

Table 1, Student 1

Age	Singing Experience	Voice Type
17 years old	No private lessons; Participated in multiple school choirs of various levels from 7th-12th grades.	Soprano

Figure 2.1, Student 1, two onsets and one descending five note scale at A4 on [o]



Phonation Balance: From the lack of the required formants above the fundamental frequency, (the lowest formant featured throughout the analysis) seen in the Voce Vista Spectrogram (A) analysis above, it is apparent that Student 1 has a very abducted, airy tone due to their vocal folds being unable to resist the amount of air that Student 1 is using to sing. Another indication of abducted phonation is apparent by the minimal vibrato present in Student 1's tone. Voce Vista software creates waves to illustrate a singer's vibrato in the various overtones of a single pitch. What vibrato is present in the above analysis of Student 1 is not even but comes and goes as Student 1 sings the exercise.

Vowel Accuracy: Student 1 sings with Speaking Vowels in this exercise. This is shown in the Voce Vista analysis by the absence of a majority of the overtones above the fundamental frequency. If Student 1 had been using a Singing Vowel during this exercise, there would likely be more overtones above the fundamental frequency since Singing Vowels allow for optimum resonance while singing.

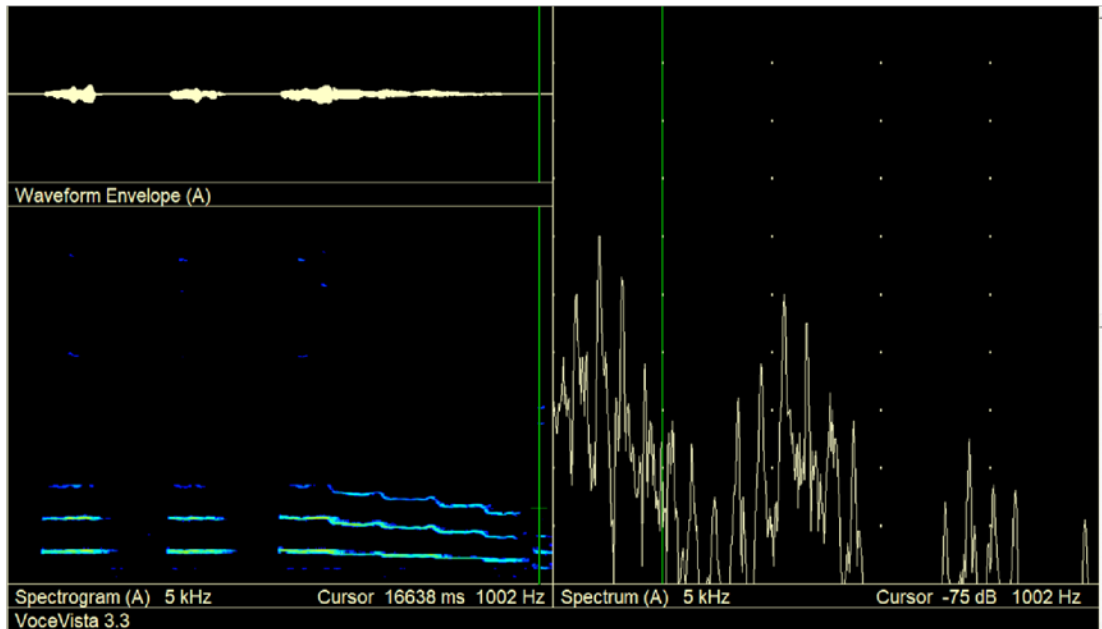
Pitch Accuracy: Though lacking a majority of the overtone frequencies needed to make a perfectly in-tune tone, Student 1 matches each of their first five pitches fairly accurately, as seen in the even amount of primary colors present in the fundamental frequencies of these five pitches and the presence of middle and high overtone frequencies for each of these pitches. However, for the final two pitches of the exercises, Student 1 is significantly under the pitch she should be singing. This is evident in the sudden disappearance of overtones in the middle of each pitch and by the lack of an even mixture of primary colors that represent the fundamental frequencies of each of the two final pitches.

Student 2, Primary Vocal Assessment

Table 2, Student 2

Age	Experience	Voice Type
15 years old	No private lessons; Participated in various school choirs from 6th-10th grades	Soprano

Figure 2.2, Student 2, two onsets and one descending five note scale at A4 on [o]



Phonation Balance: The phonation of Student 2 is very abducted in the Spectrogram (A) analysis of Figure 2.2. There is relatively no vibrato present throughout the exercise, and though the fundamental frequency of each pitch is present, the middle and high overtones of each pitch are nearly all absent. This indicates that the vocal folds are not being brought together with enough force to resist the amount of air that Student 2 is using while singing.

Vowel Accuracy: Due to the lack of vibrato and a majority of the overtones above the fundamental frequency, it is evident that Singer 2 is using a speaking vowel while singing [o] during this exercise.

Pitch Accuracy: While Student 2 does produce the fundamental frequency required to be relatively in-tune with the pitches that they are asked to sing, each pitch that Singer 2 produces lacks the middle and upper overtones required for a truly accurate pitch.

Session 2 Participants: Student 1, Student 2, Student 3, Student 4

Instruction: I began Session 2 with a brief overview of the instruction given in Session 1 to accommodate new participants, Students 3 and 4. I incorporated Phillips' jaw prop exercise into our reading of the IPA vowels from the tongue placement chart so that participants would associate a relaxed jaw with correct singing vowels.

Warm-ups: From my experiences working with the participants in our previous session, it was apparent to me that the participants needed to focus on two main vocal aspects that would aid in their learning to sing in the *bel canto* style: vowel production and balanced phonation. This was also true of Students 3 and 4, as an initial spectrogram analysis of their singing indicated a predominant use of speech vowels and an unbalanced, abducted phonation. After leading the

participants through stretches and breathing exercises, I modeled speaking a held [o] and [i] using *bel canto* technique and juxtaposed that with everyday speaking vowels. The participants mirrored me and discussed the differences between the two vowel types, *bel canto* and speaking vowels. I then led the participants in a series of descending five-note scales on each vowel, asking them to replicate the sound and physicality of their *bel canto* vowels as they sang the exercises. In order to help the participants obtain a balanced phonation, I led them through a series of Phillip's "ha" exercises descending from the middle range to F4. I also led participants in shouting "ha" using the chest voice mechanism and full breath support to help them realize that they did have a chest register, though many of them could not sing in full chest mechanism at that time.

Repertoire: Continuing with the work begun in session 1, I assigned Student 3 and Student 4 to the soprano 1 and soprano 2 lines of *Shenandoah*, respectively. After a run-through of the piece, problem spots were identified and focus on the phrasing of the piece was included. Interestingly, once Student 4 understood the *bel canto* sound she was being asked to make both in warm-ups and for our rehearsal piece, her breath support and production of *bel canto* vowels increased dramatically to the point that her singing voice was more full and able to sustain phrases across multiple measures than those of the other participants. The remaining participants struggled to complete four measure phrases in one breath. In order to help facilitate the correct phrasing, I led the group in droning each phrase of the first page of *Shenandoah* with *bel canto* diction on one breath followed by asking the group to sing each phrase while using the same physical approach and while listening for vibrato in their singing. This exercise led to the participants to successfully complete each phrase the first page of the piece successfully without "running out of breath".

Session 3 Participants: Student 1, Student 2, Student 5

Instruction: Students watched two short videos of two Western classical sopranos and compared how these professional singers sang to how I asked them to sing during our previous sessions. This provided the students with multiple examples of *bel canto* singing beyond our time together and led to a discussion of how and when *bel canto* is used in solo singing, as well as in choral ensembles, in both classical and popular music forms.

Warm-ups: By this session, warm-up exercises involving stretching, breathing, and phonation were well-established (described in detail in Session 1 and Session 2). Participants were asked to lift relatively heavy objects to replicate what happens to the body while singing after an insufficient or “high” breath is taken. Participants discussed what lifting the objects felt like and how to recognize that feeling during singing. We then practiced singing with an improper stance and using a high breath and compared that to the feeling of using a singer’s stance and taking a low, diaphragmatic breath. Voiced consonants exercises “loo”, “ma”, “vo”, and “vee” were added throughout, using Miller’s onset and legato vocal exercises to help the participants’ vocal folds stay together more firmly as they sang.

Repertoire: In addition to working through parts and phrasing for *Shenandoah*, I continued leading the group in droning various phrases throughout the piece and asking the group to apply their physical approach to droning the text to their singing of the phrases. This allowed the participants to understand that they did have the required breath needed to complete phrases if they approached exhaling while singing the text as written in the same manner as they did exhaling while droning the text. We discussed appropriate dynamic level for the piece and

practiced applying crescendo and decrescendo in the first and second pages, bringing aspects of expression into our work with the repertoire.

Session 4 Participants: Student 1, Student 2

Warm-ups: Reflecting on previous sessions, I determined that addressing the importance of conceptualizing the sound before one sings would be emphasized in this session. I discussed with the participants ways that they have conceptualized a skill before being able to do that skill and how the conceptualization of the skill is fundamental to being successful at that skill. With this in mind, I modelled singing [o] using *bel canto* technique on a comfortable pitch for the group. I then asked them to remember what I sounded like when I sang and to imagine what their own voices would sound like if they replicated my sound. I asked that they conceptualize their own *bel canto* sound and then immediately sing a given pitch on [o]. This process was unfamiliar to the participants, yet it created an immediate improvement in their singing: their tongues and soft palates were in the correct place for the [o] vowel, their phonation, while still airy, was more balanced and had a more even vibrato, and their pitch accuracy was much improved than previously noted. Applying this instructional step was inspired by the pedagogy and findings of educational neurologist David Sousa (Chapter 2).

Repertoire: The group sang *Say Now Ye Lovely Social Band* and continued work on parts for *Shenandoah*, especially for Student 2 who relied heavily on Student 1 to keep the rhythm and to sing the unison parts correctly. To help create some independence between the two participants, I had them speak and clap the rhythms of their lines independently and together. Conceptualizing the sound into our repertoire rehearsal was integrated by modelling both the incorrect and correct sounds and having the group mirror me. Once I was sure that they could produce the correct *bel canto* sound, I asked the group to conceptualize singing the correct sound at the start of each

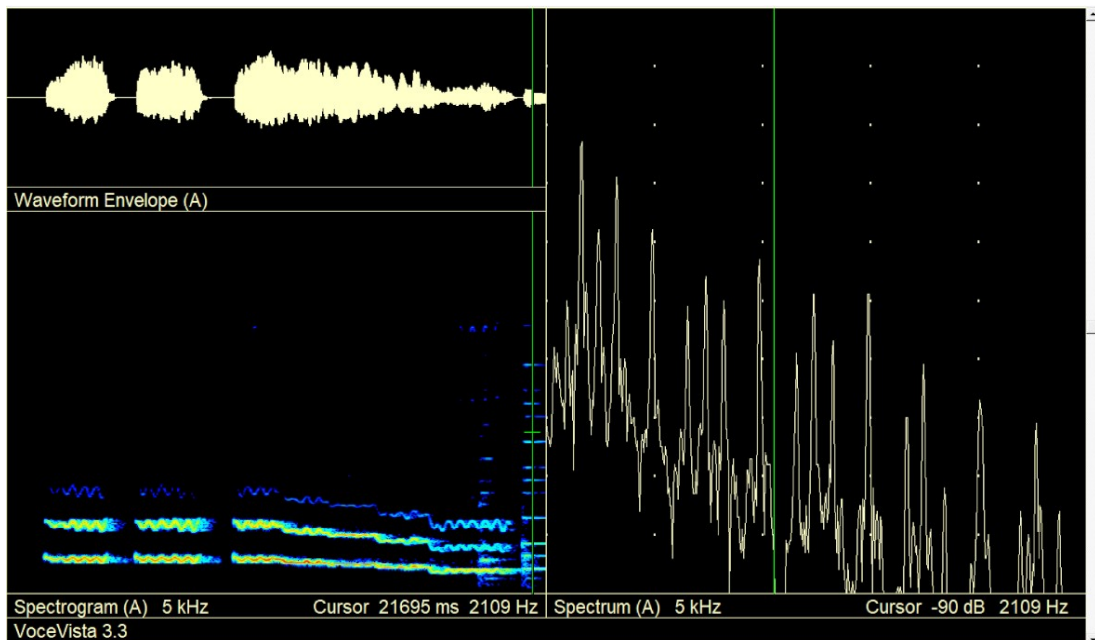
phrase, applying this through the second page of *Shenandoah* as well as the first page of *Say Now Ye Lovely Social Band*. Participants shared with each other the differences in their thinking using the conceptualizing method and what they heard in their singing afterward.

Participant Analysis

Having determined that sufficient vocal progress had been made, another voice recording was made of Students 1 and 2 using the Voce Vista software which are analyzed below.

Student 1

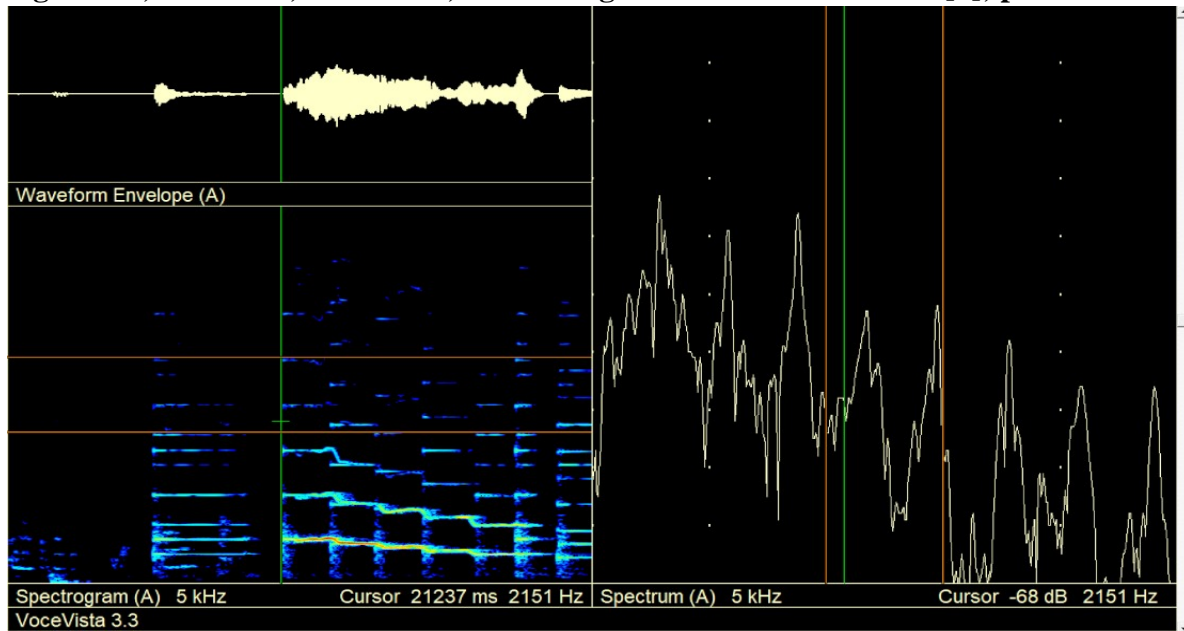
Figure 2.3, Student 1, two onsets and one descending five note scale at A4 on [o]



Spectrograph Analysis: Student 1's phonation, while still fairly abducted, is much more balanced in the analysis of their singing from Session 4 than in their previous Session 1 analysis. In Figure 2.3, it is clear from the evenness of the vibrato, the improvement of the vocal onset, and the amount of primary colors in the first and second formants that, while still lacking middle and upper overtones for each pitch, the phonation of the fundamental pitches is more in

alignment with the standards of *bel canto* technique than previous analysis indicated. Student 1's vowel is also more in line with *bel canto* technique, as can be seen from a lack of incorrect overtones in each pitch. This is a result of Student 1 using a lifted soft palate, raised tongue, and rounded lips while singing.

Figure 2.4, Student 2, two onsets, descending five note scale at A4 on [o]; piano interference



Spectrograph Analysis: Despite the audio interference present in the Figure 2.4 analysis from the piano, it is apparent that Student 1 is using no vibrato as a result from very abducted phonation on all pitches. While there are some middle overtones present in this figure, these overtones are not vibrating at the correct frequency which is a result of both unbalanced phonation and incorrect vowel production.

Session 5 Participants: Student 1

Warm-ups: Five point down on “o”, “o-ee”, “vo-vum”, arpeggios, Millers onset exercise;

I modeled a phrase both speaking and singing and had the student repeat. I modeled the phrase incorrectly and asked student to indicate what was incorrect. I asked the student to indicate what she felt she needed to work on overall. She responded that work was needed having vibrato consistently throughout each phrase. I modeled this and had her conceptualize the task and then immediately sing the phrase. This resulted in a more consistent vibrato from Student 1 throughout the phrase.

Repertoire: The participant sang her part in *Shenandoah* and we worked through problem spots throughout the piece. Since the student was struggling with her registration in the ascending phrases, I asked her to connect chest voice to head voice more smoothly. After taking intervals and phrases of the melody and turning into them into short warm-ups in various keys, the student was able to connect chest voice and head voice more smoothly when singing the piece as written. When the student was under the pitch, I asked her to conceptualize singing the pitch correctly as well as to imagine vocal folds stretching forward as they sang. This helped the student to sing the pitch more accurately.

The student stated that she felt that she was “reaching” for high pitches in the piece. I provided *bel canto* modelling of one of the problematic vocal lines and asked her to, again, conceptualize singing the pitch with bel canto technique rather than to think of “reaching” for the pitch. With this approach, the student sang the problematic line again. The student’s phonation improved so that she was able to sing the higher pitch with the correct intonation.

Session 6 Participants: Student 1

Warm-ups: Warm-ups for head voice on [o], [o] and [i], onset exercises up to C5, chest exercises on [o] and [i] going down to G3. The student held a chair at eye-level during breathing exercises to keep the chest and ribcage from collapsing. She responded positively to this exercise, stating that comparing the engagement of muscles while holding the chair to how she stood when not doing so helped her maintain a singing stance more easily.

Repertoire: The participant learned notes and rhythms for the second half of *Say Now Ye Lovely Social Band*. In addition, the participant was asked to crescendo from note-to-note in order to keep the breath flow moving during phrases requiring a crescendo. The student responded positively to this instruction and was able to maintain crescendos throughout each appropriate phase more consistently.

Though Student 1 had achieved consistent progress and vocal growth while singing warm-ups by this session, she still struggled to use the same technical approach to singing in the choral pieces. I related to Student 1 that this was my own experience as a singer; I encouraged her to concentrate on the sound desired before actually singing, in order to be consistent with vocal technique while rehearsing the choral pieces. In addition to this instruction, I continuously modeled short phrases throughout the rehearsal. After I modeled each phrase, Student 1 was asked to conceptualize themselves singing the phrase with a *bel canto* sound followed by singing the phrase and giving their own feedback as to how they sang. Student 1 also reviewed Voce Vista analysis of her singing and we discussed that analysis in depth.

Session 7 Participants: Student 1

Warm-ups: In this session, the juxtaposition of head and chest voice was used with [e] descending exercises in order to help the participant use the same breath support for the two different registers. Onset exercises using [a] in the upper head voice were also added as the student now had the vocal strength required to phonate pitches above G5.

Repertoire: We rehearsed both pieces in this session. As the student had previously indicated that being able to see the Voce Vista analysis of her singing in real time, the main focus of this rehearsal was to incorporate the Voce Vista analysis fully into our work. Doing so was very beneficial to the student's own sense of her singing, as the Voce Vista analysis helped to confirm her own personal analysis through feeling and hearing of what was correct, as well as changes needed for further improvement.

Session 8

Participants: Student 1, Student 2, Student 6

Instruction: With the addition of a new student, I led a brief review of the instruction materials from Sessions 1 and 2.

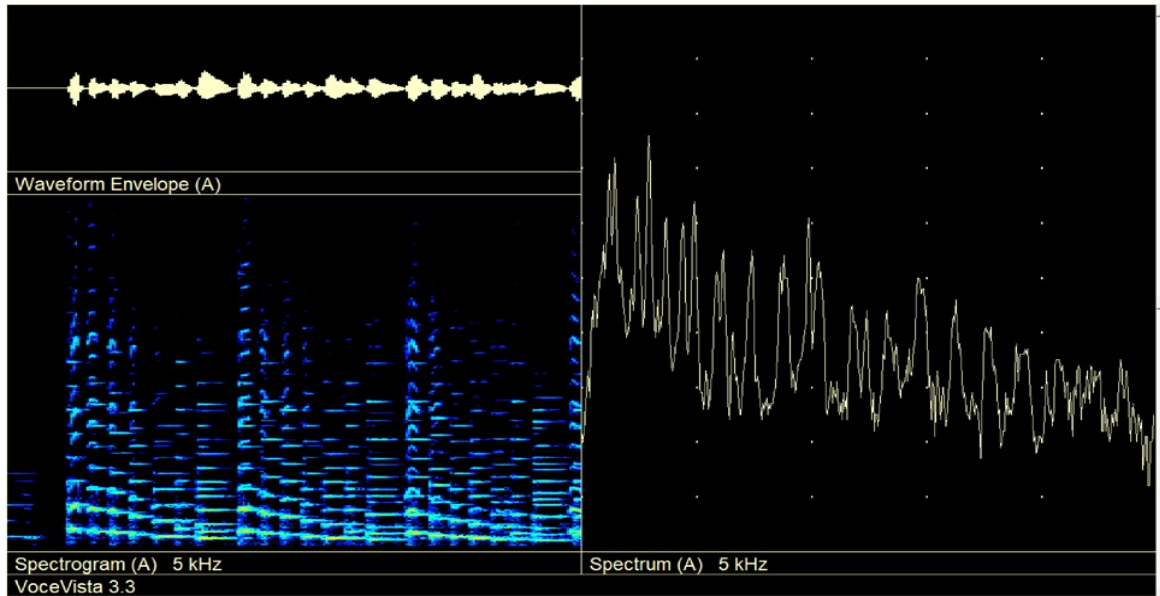
Warm-ups: In addition to our regular voiced consonant and onset exercises, students continued to work through more advanced registration exercises using legato arpeggios and ascending/descending five note scales.

Repertoire: *Shenandoah* was the primary focus of this rehearsal. With the addition of a new participant and the return of Student 2 after a long absence, the group struggled to maintain a steady tempo while singing this piece. The participants stepped together on the beat which dramatically improved their ability to not drag the tempo.

Participant Analysis

Student 2

Figure 2.5, Student 2, descending five note scale at E3 on [e]; some piano interference



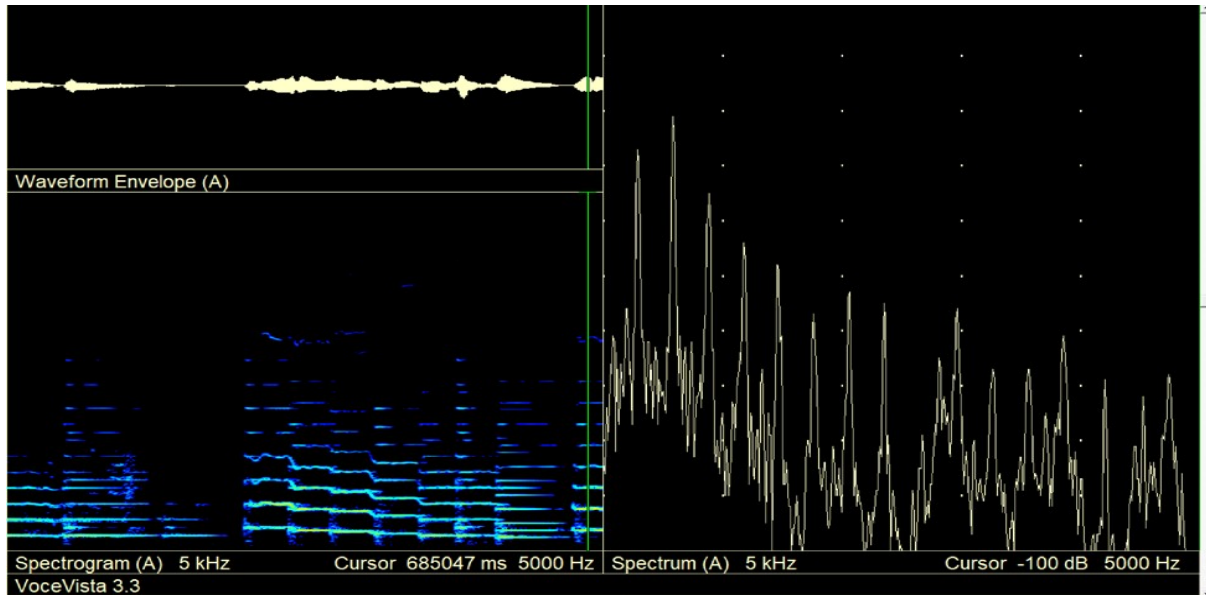
Spectrograph Analysis: Again, there is some audio overlap from the piano accompaniment of this exercise. However, it is important to note here that Student 2 has improved in her overall phonation. She is less abducted in her singing than prior, which is apparent from the amount of overtones present in the analysis, and she is phonating much more strongly in her lower register than previously.

Student 6

Table 3, Student 6

Age	Experience	Voice Type
15 years old	Private lessons; Participated in various school choirs from 8th-10th grades	Soprano

Figure 2.6, Student 6, a descending five note scale at D4 on [a]; some piano interference



Phonation Balance: The phonation of Student 6 is very abducted in the Spectrogram (A) analysis of Figure 2.6. There is some vibrato present throughout the exercise though it is not stable. The fundamental frequency of each pitch is present, as are the middle overtones. However, the high overtones of each pitch are virtually absent. This is the result of an abducted or breathy tone.

Vowel Accuracy: Because of the unstable vibrato and a lack of a majority of the high overtones above the fundamental frequency, the analysis here indicates Singer 6 is using a spread speaking vowel while singing [a] during this exercise.

Pitch Accuracy: Student 6 does sing with basic pitch accuracy. The fundamental frequency and the middle overtones are present in her phonation. However, in this analysis, she lacks the high overtones needed to have completely accurate pitches for this exercise.

Session 9 Participants: Student 1, Student 6

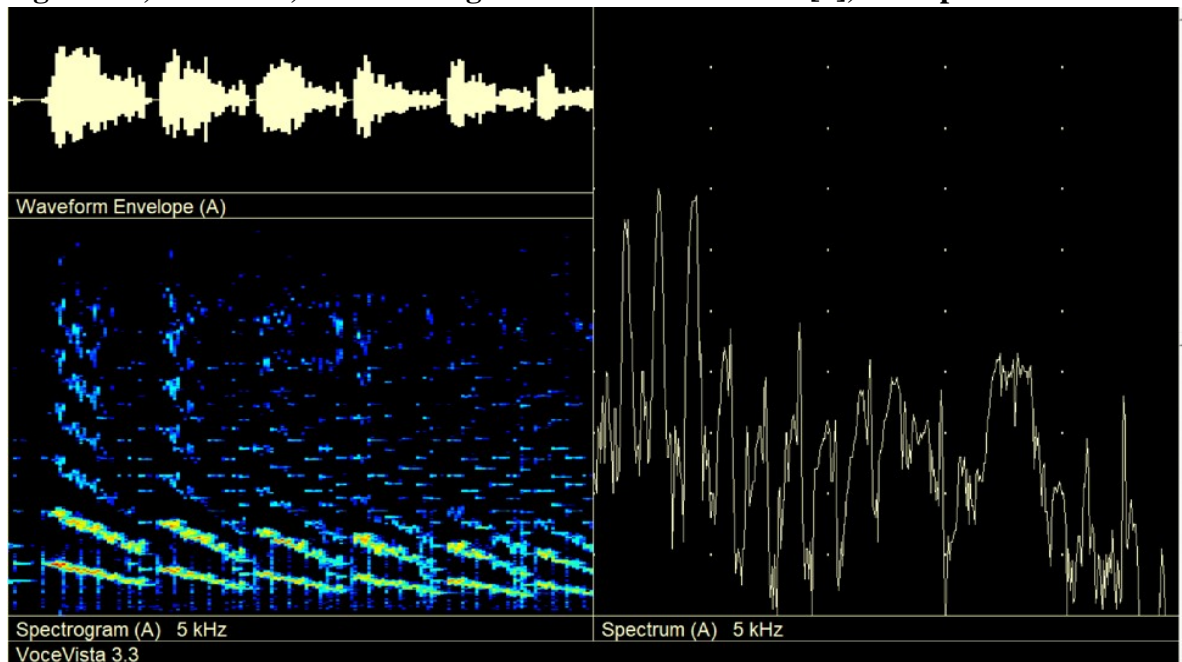
Warm-ups: Warm-ups included a comprehensive review of all the vocal exercises given.

Repertoire: The participants ran-through *Shenandoah* for the final time. Their accuracy for notes, rhythms, expression, and dynamics was improved, yet they still struggled to maintain the correct tempo for the piece, wanting to slow the tempo considerably, especially on the second and third pages of the piece. I asked the participants to step to the beat as they sang while I conducted them *a capella*, and this fixed the issue to a degree. However, even in the final performance of the piece during rehearsal, the tempo was kept tenuously. Nonetheless, the group demonstrated significant improvement from the prior session.

Participant Analysis

Student 1

Figure 2.7, Student 1, a descending five note scale at E4 on [o], some piano interference

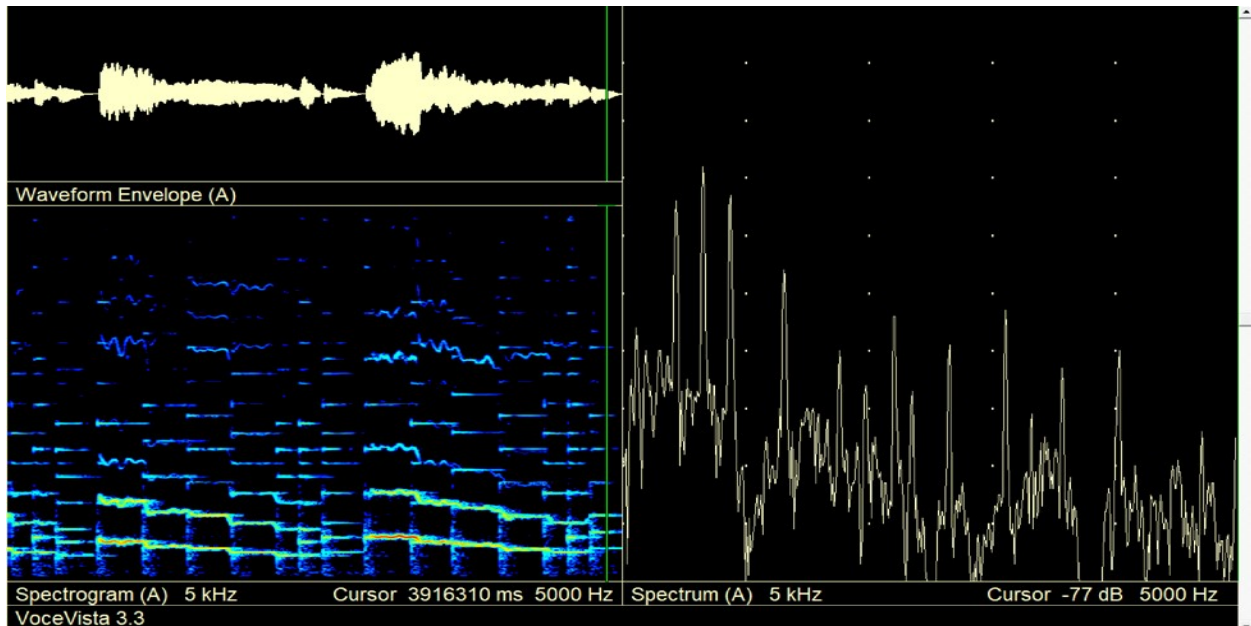


Spectrograph Analysis: Student 1 has shown improvement in her phonation overall in her phonation and vowel production. This shows in the spectrograph analysis by the increased amount of overtones present for each pitch and in the consistent vibrato shown in both

Spectrogram(A) and Waveform Envelope (A) Despite audio interference from the piano accompaniment, there is an obvious increase in the fundamental frequency and overtones in her singing. This indicates that she has more adduction in her singing and is producing an [o] vowel with a raised soft palate. There is also a significant increase in the amount of vibrato that Student 1 is able to produce. This is another indicator of Student 1 singing with a more balanced phonation than even the previous session had indicated.

Student 6

Figure 2.8, Student 6, descending five-note scale at A4 on [o], piano interference



Spectrograph Analysis: Student 6 is marginally improved from the previous session. The spectrograph shows she is able to sing with more overtones than prior, though some overtones are absent. Her phonation is also slightly more balanced and adducted than the previous sessions' analysis, which can especially be seen in the Waveform Envelope (A) analysis.

Chapter 3

The purpose of this research was to investigate the application of *bel canto* into a treble choir. While the nine-week research sessions began with the hope of consistent attendance among the high school participants, the participants' attendance was largely inconsistent due to the volunteer, afterschool nature for participation. Therefore, the findings of this research, while based in fact, are not final or conclusive.

Further research in this field is warranted to determine the full extent of the use of the specific pedagogies, instruction sequencing, and the Voce Vista spectrometric software described in the previous two chapters. Nonetheless, the research findings of this study, summarized below, do indicate progress for the participants overall, both vocally as illustrated by the Chapter 2 Voce Vista analysis, and with regard to the participants' own concept of their singing abilities.

Final Analysis of Participant Progress

Upon reviewing the data of the research participants Student 1, Student 2, and Student 6, it is apparent that Student 1, the participant who attended the most research sessions, demonstrated the most improvement in her singing ability. At the first research session, Student 1 sang with abducted phonation, speech-like vowels, and moderate pitch-accuracy. By Session 9, Student 1's singing had markedly improved in phonation, vowel production, and pitch-accuracy. The overall research results for Student 2 are less definitive, as she participated inconsistently in sessions. Nonetheless, she did show improvement in her singing from Session 1 to her final session, Session 8 (see Fig. 2.5). Having begun with a very abducted sound with a virtually undeveloped chest voice, Student 2 demonstrated (by Session 8) improvement in her ability to

sing with more balanced phonation and in her ability to sing in all registers, especially in her upper and lower ranges.

Of the three participants whom I featured in this thesis, Student 6 had the least amount of experience having only participated in two research sessions (See Fig. 2.7). Student 6, however, did demonstrate some improvement from Session 8 to Session 9, primarily in singing with more balanced phonation and a more consistent use of air throughout a single phrase.

As a choir, the final session participants, (Student 1 and Student 6), were able to perform *Shenandoah* in unison with attention to dynamics and phrasing while singing with a general, though inconsistent, *bel canto* technique. However, as an ensemble they struggled to keep the same tempo and had a tendency to slow down quite markedly while singing the piece. It is my observation that had all the participants' attendance been consistent throughout each session, this issue with tempo would have been minimized, if not averted entirely. However, due to the on and off attendance of the participants overall, it was very difficult for them to sing the song in the same tempo all the way through.

Exit Questionnaire Feedback

In order to better understand the participant's personal experiences with the research methods utilized, I conducted an Exit Questionnaire with Student 1 and Student 6 at the end of Session 9. Student 2 was given an electronic version of this questionnaire as she was not able to attend the final research session (See Appendix D). Among participant responses, three pedagogical areas struck me as important outcomes of my research: 1. the instruction of vocal anatomy, 2. the use of the spectrograph, and 3. the instruction of conceptualizing a sung sound before singing.

First, each participant stated that the instruction of vocal anatomy was helpful to them in their understanding of how to sing in the *bel canto* style. Student 1 stated that the use of the Tongue Placement for Vowels chart (Appendix H) helped her better understand where to place her tongue for certain singing vowels while both Student 2 and Student 6 stated that learning about diaphragmatic breathing for singing, both functionally and practically, helped them feel more confident about their own use of breath while singing.

With regard to the use of the spectrograph in my research program, all three participants were able to state in their own words how the spectrograph functioned, and they all indicated that the spectrograph analysis helped them to understand more fully what they were doing well with in their singing and what they needed to improve.

Finally, Student 1 and Student 6 both stated that being able to conceptualize the *bel canto* sound desired, before singing, helped them in the ability to achieve that sound when singing. Though this is possibly the simplest concept that I taught to the participants during our sessions together, I believe that it is as equally important as the anatomical and technological aspects of the pedagogy presented in this thesis. The ability to imagine a sung sound and then immediately sing that imagined sound directly relates to Sousa's findings on how the brain learns and functions. Using the tool of sound conceptualization was as important to the outcome of my research as was my instruction in vocal anatomy and use of the spectrograph.

Implications for Future Study and Use in the Choral Classroom

Though this research was not comprehensive and further study is required to determine the long-term benefits of using this pedagogy in a choral setting, incorporating *bel canto* technique into the choral field is a longstanding tradition of many Western choir conductors, both

professional and amateur. Michael Fuchs (2014) stated that the vocal benefits of *bel canto* singing in a chorus (such as improved intonation) will encourage improvement in other vocal areas of the chorus such as vocal agility²⁷

Research findings do, in fact, indicate that the pedagogical approach I used can help the choir conductor achieve a successful choral sound and aide in the vocal ability and confidence of the individual chorister. Though I chose to use a young adult women's chorus for this study, the pedagogy applied can be used for any youth or adult choir if the conductor wants to achieve a *bel canto* sound using science-based pedagogies.

Having used exercises from esteemed vocal pedagogues successfully through sequential instruction, the following warm-ups are for use with small to medium sized youth or adult choirs. In addition, repertoire which, due to text-setting and genre, is particularly suited to *bel canto* technique is also recommended.

Warm-ups:

Spinal Stretch, Slow Sip, Jaw Prop, Down 5, Down 5-Up 5

Repertoire:

Ave Maria by Franz Biebl (SSAATTBB)

Amor de Mi Alma by Z. Randall Stroepe (SATB)

The Turtle Dove (2 part, arr. By Linda Spevacek)

Peace Flows into Me (SATB, Jake Runestad)

Riversong (2 part, Andy Beck)

²⁷ Michael Fuchs, *A Conductor's Guide* (Cincinnati: CCM, 2014), pp. 21-23.

Concluding Remarks

This research indicated growth in the featured participants' vocal abilities throughout the nine-week research session. The Voce Vista spectrograph was successfully incorporated in each choral session, providing real-time feedback to the participants, and was an integral component of my voice-science and neurologically-based choral pedagogy.

Despite on-and-off attendance from participants, the students showed vocal growth, both technically and expressively, by the end of the nine-week research session and were able to successfully perform a choral piece using *bel canto* technique. Most importantly, the students expressed that their confidence in their singing ability improved during the research.

As an educator, the participants' vocal improvement was encouraging; however, the participants' statements regarding how their confidence in their singing had increased during our research was equally important to me. It taught me the value of not just instructing students to sing well but also of creating a healthy choral environment where students are valued for their personal vocal strengths and not simply for their technical facilities.

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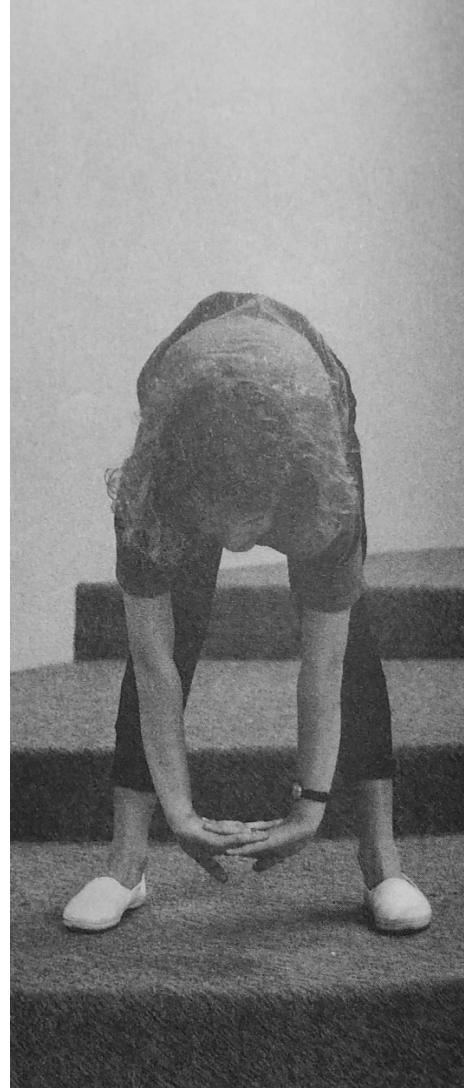
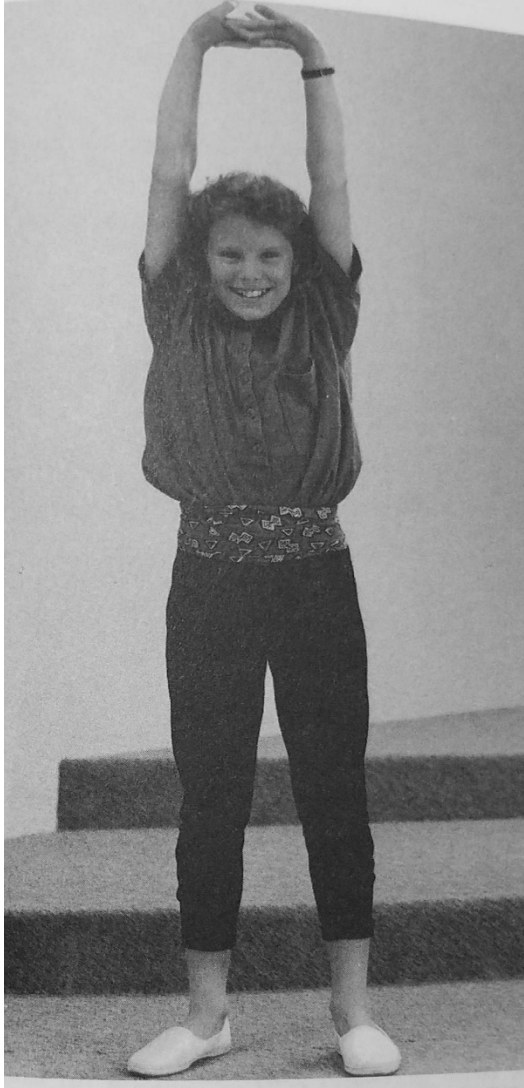
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Appendix A

Spinal Stretch Exercise, Phillips, Kenneth, *Teaching Kids to Sing*, pp. 155-56.



Appendix B

Jaw Prop Exercise, Phillips, p. 318



Figure 10-2. Two-Finger Jaw Prop.



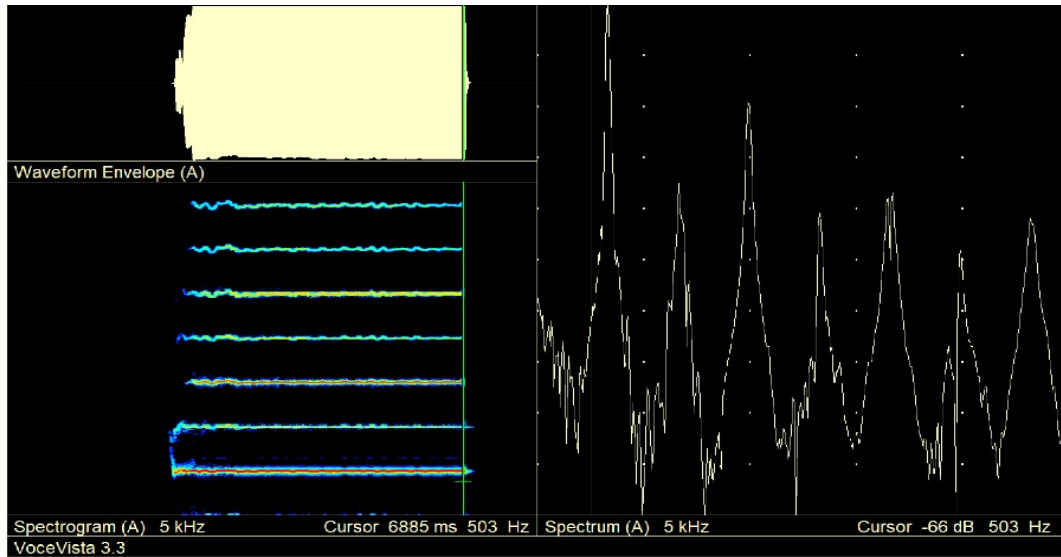
Figure 10-3. Two-Fist Jaw Prop.



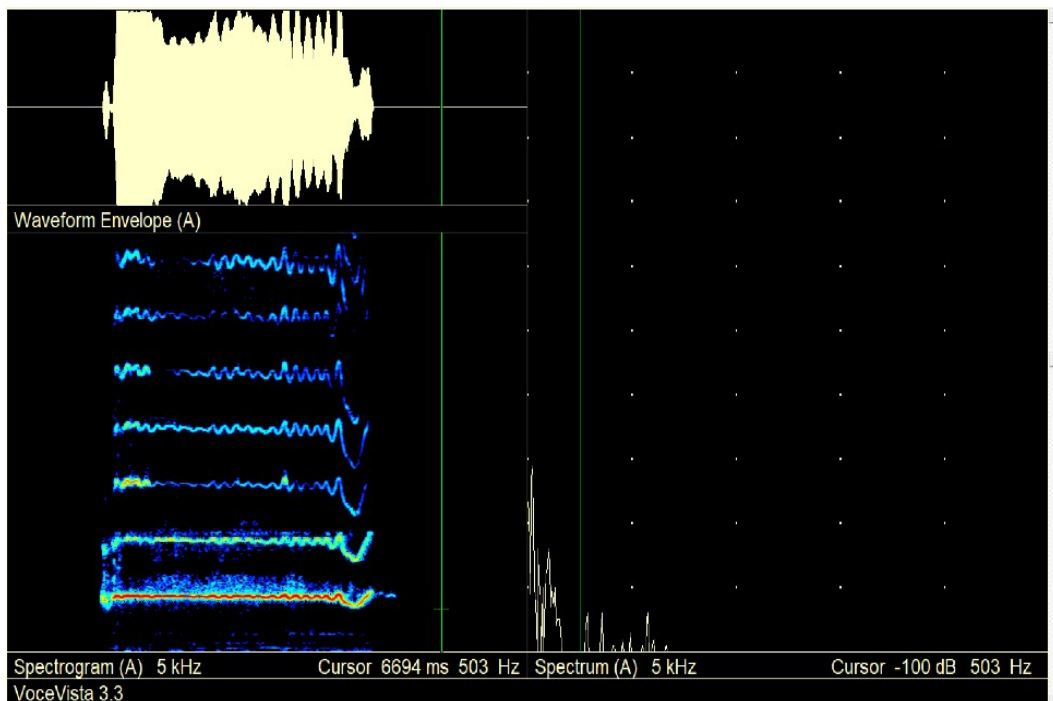
Figure 10-4. One-Hand Jaw Prop.

Appendix C

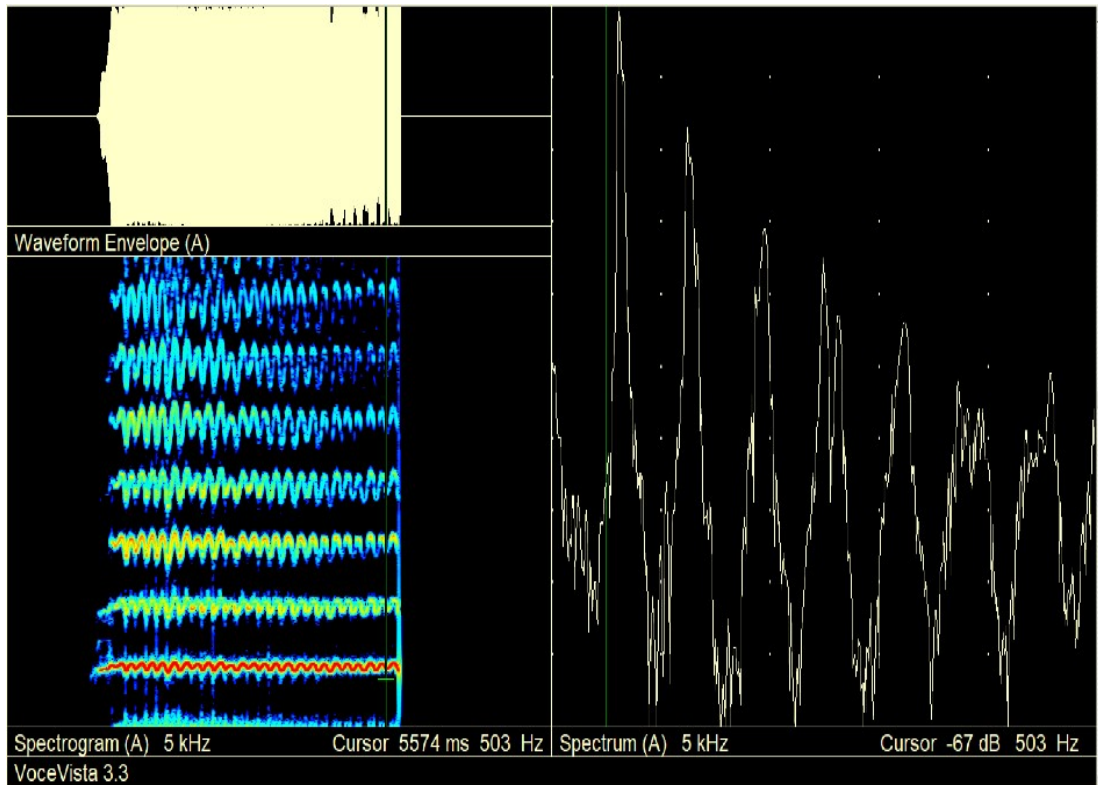
Voce Vista Analysis of Overly-Adducted (Strained) Phonation on E4 [o], soprano



Voce Vista Analysis of Overly-Abducted (Breathy) Phonation of E4 [o], soprano



Voce Vista Analysis of Balanced Phonation on E4 [o], soprano



Appendix D

Shenandoah, arranged by Jennifer Dunham, p. 1.

Shenandoah

Traditional American Folk Song
Arranged by Jennifer Durham

SOPRANO 1 *p*
Oh She-nan doah, I long to see you. A -

SOPRANO 2 *p*
Oh She-nan doah, I long to see you. A -

ALTO *p*
Oh She-nan doah, I long to see you. A -

5
way, you rol-ling riv-er. Oh She-nan doah, I long to

way, you rol-ling riv-er. Oh She-nan doah, I long to

way, you rol-ling riv-er. Oh She-nan doah, I long to

11
see you. A - way, I'm bound a - way 'cross the

see you. A - way, I'm bound a - way 'cross the

see you. A - way, I'm bound a - way 'cross the

Sheet Music Plus Order 873770752 13 copies purchased by Claire McGillough on Jan 23, 2017

Appendix E

Say, Now Ye Lovely Social Band, arranged by William Averitt, p. 1.

FOLK HYMNS

Treble Clef Music Press

Say, Now Ye Lovely Social Band

(Bound unto Canaan: Three Shaped-note Hymns, No. 1)

SSA Chorus *a cappella*

The Sacred Harp (1844)
tune: "Clamanda"

arranged by William Averitt

Marked, with steady movement $\text{♩} = 66$



Soprano I
Say, now ye love - ly so - cial band, Who_ walk the_

Soprano II
Say, now ye love - ly so - cial band, Who_ walk the_

Alto
Say, now ye love - ly so - cial band, Who_ walk the_

way to_ Ca - naan's_ land; Ye who have fled from So - dom's plain,

way to_ Ca - naan's_ land; Ye who have fled from So - dom's plain,

way_ to Ca - naan's_ land; Ye who have fled from So - dom's plain,

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Appendix F

Introductory Questionnaire

Please write your identification number below and answer the following questions.

1. What is your age?

2. Do you currently take private voice lessons?

3. How long have you been a part of your current school choir?

4. Have you been in any choirs previously? If so, how long?

5. How would you describe what happens physically while singing?

6. How do you think singing is different to speaking?

7. What do you like about singing in a choir?

8. How do you think solo singing is different than choral singing?

Appendix G

Claire McCullough, candidate for M.M. in Music Education

Master's Thesis Participant Weekly Questionnaire

Please write your personal identification number below and answer the following questions.

1. Was the information taught to you this week presented in a clear and concise manner?
2. Did the use of the spectrograph in our research session help you to understand your own singing better, either physically or musically? If yes, How so? If no, why not?
3. What do you feel you have learned about singing posture this week?
4. What do you feel you have learned about breathing for singing this week?

5. What do you feel you have learned about vowel production in singing this week?

6. Do you find that you are able to apply the techniques taught in our warm-ups to our repertoire easily or not?

7. Is there anything you were taught today about which you are uncertain or confused and why?

8. Is there anything you were taught today about which you feel confident and why?

9. What part of our session did you enjoy most and why?

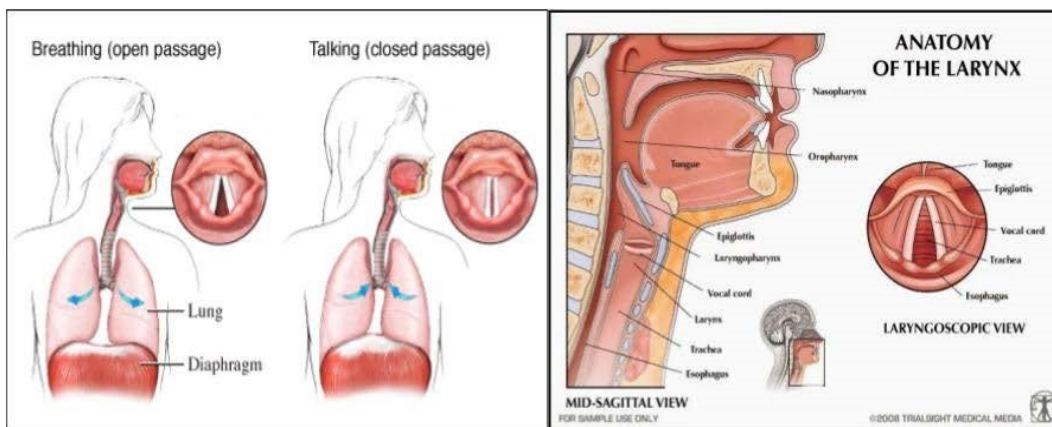
Appendix H

Sessions 1 and 2 Power Point Slides

Bel Canto Singing in Choir

Research Session 1 and 2

Vocal Anatomy



Source Unknown

Stance

Healthy Singing Posture:

- Feet shoulders width apart
- Head up
- Shoulders relaxed
- Sternum up
- Ribs out
- Knees bent

Is this same/different from everyday standing?

Breathing for Singing

Breathing IN:

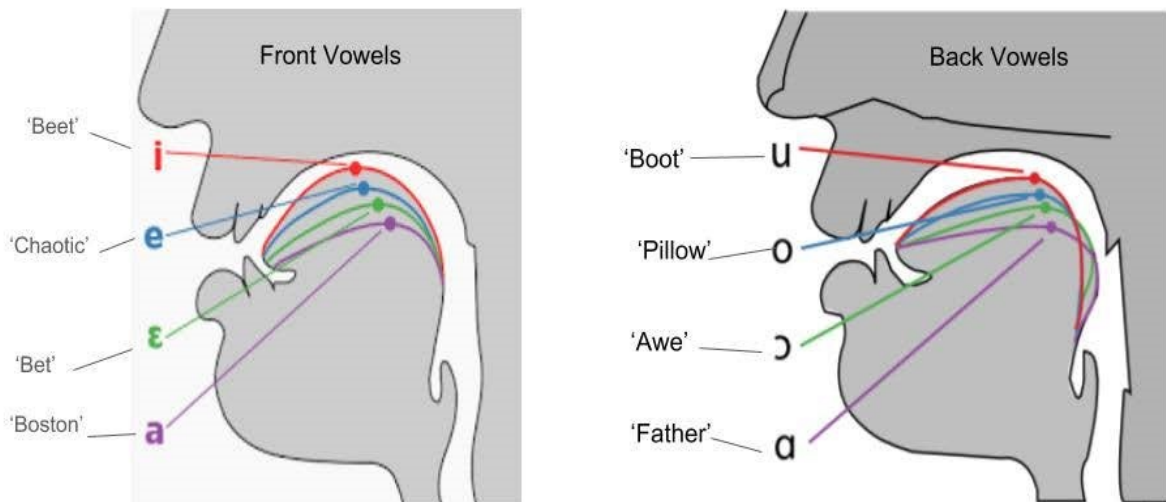
- Breathe in through nose or mouth
- Lungs expand and fill
- Ribs stay expanded
- Diaphragm goes down

Breathing Out:

- Breathe out through mouth
- Lungs deplete and go inward
- Ribs stay expanded
- Diaphragm goes up

Is this same/different from everyday breathing?

Tongue Placement for Vowels



Source: Wikimedia Commons

Singing with Vowels

[o]- Tongue is back; jaw is relaxed; lips are rounded

[i]- Tongue is forward; jaw relaxed; top lip is natural “semi-circle” shape

- Breathe use is balanced; not “breathy” or “pushed”
- Vocal folds are closed
- Vibrato is present
- Singer’s formant or “ringing” is heard

Is this the same/different from everyday vowels?

Appendix I

Final Questionnaire: Students 1 and 6 Transcript

Student 1

Q: What did you expect to get out of this research experience?

A: I didn't really know what to expect. I was hoping to be more confident about singing.

Q: And what did you get out of it?

A: I feel a lot more confident about singing, um, with that in-between tone-especially the higher notes...just getting the right kind of tone on those, which is something I had a hard time with.

Q: How would you describe the tone you're talking about?

A: Getting that balanced tone instead of it being airy or heavy- not being so heavy.

Q: How would you describe what you knew about the physicality of singing before as compared to [what you know about] the physicality of singing now. Has [your understanding of the physicality of singing] changed at all?

A: It is mostly the same except that I understand what is going on anatomically with the vocal folds. But the whole idea of breath was the same idea just expressed differently.

Q: What have you taken away from vowels in terms of how you make vowels, how they sound?

A: Having the chart of where they were on the tongue was really helpful because I've noticed that but I've never really sat there and thought about it.

Q: What do you take away most from this research?

A: The spectrograph is cool and helpful because you can see how you're singing.

Q: How did the spectrograph help you?

Sometimes, when you're singing in a choir, it's hard to get feedback right away. You may change something but you don't know if you changed it positively or not. So, this helps you get feedback right away.

Q: If you were offered a course similar to this in high school, would you take it?

A: Yes, I definitely would take it.

Student 6

Q: What did you expect to get out of this research experience?

A: I came in here hoping I'd be able to learn how to get more breathe support and I did.

Q: Is there anything you've felt you've learned in terms of bel canto singing- the vowels, the breath?

A: Yes. Having the chart- what your mouth should look like- that was so helpful. It helped me to get the sound forward and learn how to sing big.

Q: What do you feel you took away from this [research]?

A: I really like the [spectrograph].

Q: If you were offered a course similar to this in high school, would you take it?

A: Yes, I definitely would take it.

Exit Questionnaire for Student 2

What did you expect to get out of this research experience coming into it?

I wasn't really sure as to what to expect. I just knew that I would be singing for another hour on Tuesdays.

What did you get out of this research course?

I ended up learning how to sing louder and manage myself better. By that I mean my breath.

How would you describe what you previously knew about singing before you began this research project compared to what you know now about singing?

I knew that in order to sing loud i needed to support myself, but i was originally taught to use my lower muscles, not my full abs. You taught me to use them all at once rather than just part of them, to use them all and to make my belly bounce:)

What have you learned about vowels? How do you make them? How do they sound? The new way you taught us vowels was much more in depth. They are much more put together sounding.

What do you take away most from this research? i.e., use of the spectrograph, the repertoire, the vocal warmups, etc.

The spectrograph helped me so much!!!!!! I honestly wish we had one in class. It helped me to learn where my voice is at the present point in time.

At the beginning of this research, we went over the anatomy of singing, and in the second half we discussed conceptualizing singing and the sound that you want to make in order to help you sing in the Bel Canto style. Do you think that learning how both singing works physically and how to conceptualize the sound you sing was or was not beneficial to your singing ability? I'm a very visual person, so being able to see the spectrograph when we sang helped me to conceptualize everything into something I understood.

What do you now know about how the spectrograph works in analysing singing? (this can be about how it displays your singing or about what it particularly analyses about your sound) The spectrograph picks up every single pitch there is, including the pitches that dogs can hear. The more color there is in one spot, the more of the tone is in the center.

Did using the spectrograph help you with your own singing?

Yes, yes, yes. I'm a super visual person so being able to "see" my voice working helped me to know what I need to work on next or to continue working on.

Would you be willing to take a choir course similar to this, a course that integrates a Bel Canto (operatic) style of singing with the spectrograph analysis and vocal anatomy, if it were offered to you?

Possibly. I'll be honest, I'm not the biggest opera fan, but I know that I can apply all of the things we talked about and learned to my everyday class. I think that if I was to have started Bel Canto singing earlier on in life, I would keep doing it.