The Effect Of A Researcher Composed Mouthpiece Buzzing Routine On The Intonation And Tone Quality Of Beginning Band Brass Students

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THE EFFECT OF A RESEARCHER COMPOSED MOUTHPIECE BUZZING ROUTINE ON THE INTONATION AND TONE QUALITY OF BEGINNING BAND BRASS STUDENTS

A Dissertation

Presented for the

Doctor of Philosophy

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Jason Beghtol

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ABSTRACT

The present study is an investigation of the effect of an author composed mouthpiece buzzing routine modeled by the teacher on beginning band brass students’ intonation and tone quality. The subjects (N = 43) were sixth grade beginning band brass students from a large band program in the northeast region of Mississippi. The experimental group (n = 27) buzzed a daily routine modeled by their instructor at the beginning of each class period. The control group (n = 16) received no treatment and proceeded through normal classroom activities. The duration of the instructional period was ten weeks. This study utilized a posttest only design. An independent-samples t-test was conducted to analyze the data. Taken as a whole, there were no statistically significant difference in the scores for treatment and control conditions. Results suggest the inclusion of a daily mouthpiece buzzing routine does not have a significant effect on beginning band brass students’ intonation or tone quality. Although not statistically significant, the measures lean toward improved intonation and tone quality. Results of the t-tests may have found no significant differences between means due to the wide ranges of variance in the two sets of scores.

Keywords: intonation, tone quality, mouthpiece buzzing, embouchure, modeling
DEDICATION

First and foremost, this dissertation is dedicated to my family. To my wife Ginger and my two boys Jackson and Johnson who have been very supportive, patient, and loving throughout this entire process. Also, to my mom Vicki for supporting me, not only throughout this process but also throughout my entire musical journey from the first day I put a trombone together to the present.

Secondly, this dissertation is dedicated to all of the phenomenal musical educators and influences that have inspired and guided me to this point and will continue to walk with me down my path. May you all continue to influence others for years to come with the love of music that you have shown to me.
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Thank you to my committee for insuring the quality of this research and for your guidance, as well as patience, of my experiences as a new researcher.

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Dr. John Schuesselin, Department of Music
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In the United States instrumental music has become an essential part of the public school curriculum. Although copious amounts of research investigate instrumental rehearsal techniques and strategies, there is limited research on effective techniques for teaching beginning instrumentalists and little that focuses on the psychomotor processes of learning how to play an instrument (Sehmann, 2000). To obtain high caliber performances in the future, the instrumental educator must strive for refinement of performance fundamentals from the earliest stages by focusing on a foundation that is optimal for student success (Britten, 2005; Cooper, 2004). This project will investigate the effects of the inclusion of a daily mouthpiece buzzing routine for brass instrumentalists during their first year of instruction. For brass students, developing a proper embouchure is their fundamental foundation. The resultant intonation and tone quality will be the primary focus in this study.

A review of literature revealed no prior research on the daily implementation of a mouthpiece exercise for beginning brass students. Therefore, the literature review is concerned with brass pedagogy materials from well known pedagogues as well as related research studies that had direct implications for this study. Although there is no empirical evidence supporting the benefits of mouthpiece buzzing, one can corroborate the importance of mouthpiece buzzing by
reviewing pedagogic literature. Thompson (2001) went so far as to write an entire book with a CD accompaniment completely devoted to mouthpiece buzzing.

Based on the review of literature by brass pedagogues, proper embouchure formation and development contributes to the future success of brass instrumentalists. The Schirmer Manual of Musical Terms (1978) states the embouchure is “the manipulation of the lips and the tongue in playing a wind instrument.” For brass players “the setting of the lips must be formed in such a way that they can be brought into oscillation by the motion of the air stream,” as stated by brass pedagogue, Phillip Farkas (1962). The oscillation of the lips that Farkas is referring to is called the “buzz.” Each musician must know the amount of muscle tension needed to effectuate the appropriate embouchure buzz for the correct pitch to sound through his or her instrument.

To form a proper embouchure, some brass pedagogues recommend pronouncing the letter “M” (Bailey et al., 2008; Fink, 1977; & Hunt, 1968). This does not automatically form the correct embouchure, but it does place the lips in the approximate position. Moreover, keeping the corners of the mouth firm allows for suitable embouchure formation (Bailey et al., 2008; Fink, 1977; & Hunt, 1968). By doing this, students are less likely to puff their cheeks while allowing proper air flow from the lungs to, and through, the lips (Bailey et al., 2008; Fink, 1977). The purpose of a proper embouchure is to allow the performer to play with efficiency, agility, and flexibility. Although embouchures may slightly differ according to which brass instrument is played and also may vary due to dental structure, there are commonalities to forming what Farkas (1962) refers to as “the brass player’s face.”

The purpose of a daily mouthpiece buzzing routine is to focus on setting a proper embouchure and to avoid common embouchure problems that may hinder a student’s performing
ability. Farkas (1962) believes that the slightest deviation from a proper embouchure can cause “complete chaos” in its function. Some of the most common embouchure problems are a “smile” embouchure, excessive “pucker,” “bunched-up” chin, “puffed-out” cheeks, and too much mouthpiece pressure (Bailey et al., 2008; & Whitener, 2007). These are described in further detail in the next chapter and are pictured in Appendix K.

Another topic discussed by brass pedagogues was mouthpiece placement on the lips. While no two people will find the same placement ideal, there tends to be general consensus on the optimal placement. Improper placement could cause embouchure problems and hinder student’s ability to meet their full potential, which is why proper mouthpiece placement should be monitored from the first steps of playing a brass instrument. There are many inconsistencies that can develop from improper mouthpiece placement (Farkas, 1962).

Buzzing through the mouthpiece is the primary method of sound production for brass instrumentalists. Author and brass pedagogue, James Thompson, wrote a method book specifically focusing on mouthpiece buzzing. Mouthpiece buzzing refers to producing the sound through the mouthpiece while it is not attached to the instrument. Thompson (2001) says there are many benefits to buzzing on the mouthpiece alone if done with an observant and systematic approach. By removing the instrument from the equation, mouthpiece buzzing allows the musician to focus strictly on the embouchure and proper fundamentals. Fallis (2001) states that mouthpiece buzzing may not be fun for beginning students, but the fundamental strengths he or she gains by establishing a firm foundation will enable the student to progress more quickly.

This study focuses on the daily implementation of a mouthpiece buzzing routine for beginning band brass students designed to improve the students’ intonation and tone quality. In
addition, this study is an attempt to strengthen the students’ embouchure, thus leading to better intonation, tone quality and pitch accuracy. The series of exercises developed in this study addresses the concept of playing pitches that, although they may be in the same valve combination or slide position, are higher or lower than what is considered to be the normal playing range of a beginning band student. The series of exercises also addresses the concept of tone quality through the use of buzzing long tones on the mouthpiece.

Since instructor modeling will be the main method of instructional delivery in the buzzing routine, the primary areas of the related research studies are focused on instructor modeling/modeling behavior and beginning instrumental/band instruction. Also included are studies referring to pitch accuracy, intonation and tone quality.

Studies have shown modeling to be a highly effective form of instruction (Taylor, 2006; & Woody, 1999, 2003). In Teaching/Discipline: A Positive Approach for Educational Development by Madsen & Madsen (1998), modeling is defined as “a technique whereby the behavior that is to be taught is demonstrated for the learner.” The goal is for the learner to imitate the behavior that is being taught. Modeling may be exhibited by instrumental performance or singing. Instructors demonstrate counting or speaking the correct rhythm. Displaying posture to the students is also a form of modeling which is a visual demonstration of the desired behavior. Recordings, both audio and visual, may also serve as models (Hewitt, 2001). It is imperative that models be of high quality so in turn the desired behavior being taught will be of high quality, thus yielding optimum results.

In 2010, MacLeod came to the conclusion that in order for instructors to be effective models they must posses the necessary skills to model both correctly and incorrectly. The teacher
should be able to model appropriate and inappropriate tone and techniques for the students. The teachers should also develop a teaching style that is appropriate for the instructional pace of beginning band students. Additionally, they should focus on targets such as pitch accuracy, tone, and any other fundamentals towards obtaining pedagogical goals (Worthy & Thompson, 2009). Along with developing an appropriate teaching style, how a teacher delivers information to the students, whether it is correct or not, can have an effect on how students perceive the information given to them. Hamann et al (2000) discovered that subjects preferred agreeable delivery skills regardless of the quality of the content. So, modeling that is delivered well can be an effective form of communicating information to students.

The purpose of this study is to determine if an author-composed mouthpiece buzzing routine modeled by the teacher has an effect on beginning band brass students’ intonation and tone quality. Over a ten-week period, the experimental group will perform a “call and response” type of mouthpiece buzzing with their regular instructor as part of their daily beginning band class. Other than the mouthpiece buzzing routine, the control group will have the same daily instruction.

**Delimitations of the Study**

1. The subjects in the study are first-year brass instrumentalists. The researcher assumes the students have little or no prior training on the mouthpiece alone without the instrument.

2. The researcher will administer only a posttest to the subjects. There will be no pretest due to the students’ lack of ability to perform the test at the beginning of the study. The subjects’ regular teacher is responsible for the mouthpiece buzzing routine for the
experimental group and the remainder of class instruction for both the experimental and control group.

3. For the purpose of this study only trumpet, horn, trombone, and euphonium students will be tested due to their commonalities in performance technique.

**Definition of Terms**

A review of literature revealed that both the pedagogues and researchers have a common use of terminology to describe the concepts related to intonation and tone quality. The following is a list of definition of terms that are essential to this study.

1. **Aperture**
   “The opening in the lips created by the expulsion of the air column and that it should be in an oval shape” (Bailey et al, 2008).

2. **Buzzing**
   a. “The setting of the lip and face muscles in a position which will enable them to vibrate at varying speeds and intensities when the lips are blown through” (Farkas, 1962).
   b. “The lips must be formed in such a way that they can be brought into oscillation by the motion of the air stream” (Whitener, 2007).

3. **Embouchure**
   b. “Controlled tension of the opposing sets of muscles in position for the purpose of producing a tone when air is blown through the lips” (Hunt, 1968).

4. **Oral Cavity**
“The inside of the area of the mouth and throat” (Bailey et al, 2008).

5. **Pitch Accuracy**

Playing the desired pitch at the desired time. By the nature of beginning wind instrumentalists, a number of notes will be played out of tune unless the player makes physical adjustments. This is either done by adjusting their instrument or by adjusting their own body (Zurcher, 1972).

6. **Characteristic Tone Quality**

“The quality of a sound that distinguishes one instrument from another” (Millsap, 1999). “The character of the sound achieved in performance on an instrument” (Randel, 1986). “It is the baritone player’s business to sound like a baritone player and the horn player’s duty to sound horn-like” (Farkas, 1956). It is the goal of the musician to exemplify all the desirable characteristics of the instrument (Farkas, 1956).
A review of literature found no prior research on a daily mouthpiece buzzing exercise for beginning band brass students. Therefore, the review of literature is concerned with brass pedagogy materials as well as related research studies that had direct implications for this study. These are primarily focused in the area of instructor modeling/modeling behavior and beginning instrumental/band instruction. The review of literature in this dissertation is divided into these categories: 1. Embouchure, 2. Embouchure Formation, 3. Common Embouchure Problems, 4. Mouthpiece Placement, 5. Tonguing and the Initial Attack of the Pitch, 6. Buzzing on the Mouthpiece, 7. Modeling, 8. Beginning Instrumental/Band Instruction, and 9. Intonation/Tone Quality.

In many schools in the United States instrumental music has become a dominant part of the music curriculum, so much so that it has been noted by the Music Educators National Conference (now known as The National Association for Music Education or NAfME) in *The School Music Program: Description and Standards*. In this document it is recommended that beginning wind instruction begin no later than by grade five (Sehmann, 2000). Although this is stated in this document, beginning band in the Northeast Mississippi region usually begins in the sixth grade. Sehmann (2000) goes on to state that little is found in research literature concerning
effective techniques for teaching beginning instrumentalists and that there is a lack of focus on
the psychomotor process of learning how to play an instrument. Researchers have focused on
instructional delivery rather than on content (Hamann et al, 1998).

Learning proper techniques and fundamentals for beginning instrumental students should
be a primary concern for music educators (Jones, 1989). Proper fundamental techniques are
foundational for students to build upon for their future as musicians. If poor technique and
fundamentals are established, slipshod habits can be created which can hinder student progress.
With beginning instrumentalists, there are many areas that can present problems and need careful
attention. Initial goals for beginning brass students include vibrating the lips (buzzing) to
produce a sound, placing of the mouthpiece, assembling the instrument, placing of hands and
fingers, posturing, producing accurate and steady tone, being able to buzz higher and lower
pitches, sliding positions or fingerings, breathing control, tonguing attacks, notation,
nomenclature, as well as caring and maintenance of the instrument (Zurcher, 1972). It is the
responsibility of the educator to understand these objectives and approach them in a manner
conducive to student success (Britten, 2005).

Many beginning band classes are not able to split into separate sections for brass,
woodwinds, and percussion. This complicates the instructional setting. Some aspects of
instrumental technique are easier to address in their respective instrumental families. For
example, woodwinds do not buzz to produce a tone; brass students do not have to concern
themselves with placement of the reed on the mouthpiece; neither brass nor woodwind students
have to focus on hand grip/placement on a drumstick. If beginning instrumental classes are able
to separate into their corresponding instrumental families, specific details for each group can
receive more attention. Brass students can focus on mouthpiece buzzing, woodwinds can spend more detailed time on reed placement and tone production, and percussionists can devote the necessary time on correct placement of the hand on a drum stick to achieve a proper strike. In Scott Whitener’s (2007) book titled *A Complete Guide to Brass*, he states “classes of the same instrument are generally more successful at the elementary level than classes of mixed instruments.” He later recommends that keeping the class sizes small allows for more individualized attention. Teachers also have limited instructional time. Teaching beginning students can pose a number of complex demands, and it is in the hands of the educator to find the most efficient and accurate way to convey information to the students.

Based on the extensive review of pedagogical literature for brass instrumentalists, many materials were devoted to the importance and development of the brass embouchure leading to the future success in brass instrumental performing. Brass experts have written many pedagogical books and articles describing various components and techniques to forming a proper brass instrumentalists’ embouchure. The next few sections will focus on the formation of the embouchure along with common embouchure problems.

**Embouchure**

The embouchure, as stated by the *Schirmer Manual of Musical Terms*, is “the manipulation of the lips and the tongue in playing a wind instrument.” Phillip Farkas played the horn for the Chicago Symphony Orchestra, Boston Symphony Orchestra, Cleveland Orchestra, and the Kansas City Philharmonic and is considered to be one of the fathers of brass pedagogy. Farkas says that describing one’s embouchure is one of the most difficult things in the world to
Farkas (1962) describes a brass player’s embouchure as “the setting of the lip and face muscles in a position that will enable them to vibrate at varying speeds and intensities when the lips are blown through.” Whitener (2007) says “the lips must be formed in such a way that they can be brought into oscillation by the motion of the air stream.” It is the oscillation, or vibration, of the lips that produces the sound on a brass instrument (Sanborn, 2001). This sound is referred to as the buzz, or buzzing. Arnold Jacobs, who was the tubist for symphonies in Indianapolis, Pittsburg, and Chicago and is also considered as a father of brass pedagogy, compares brass players with singers. He states, “Instead of vocal chords in the larynx, we have vocal chords in the larynx of the tuba, which is the embouchure” (Frederiksen, 2006).

The instrument acts as an amplifier, magnifying the sound that is being produced by the vibrating lips (Farkas, 1962). The air passing through the lips as they are tensed is producing this vibration. As the lips are vibrating at a constant speed a certain pitch is produced. For instance, if the lips are vibrating 440 times per second then an A should sound (Farkas, 1962). Farkas goes on to say that a musician, when forming an embouchure, has determined the correct placement of facial muscles to allow the lips to go back into position while the air stream passes through them producing a steady tone. To take it a step further, to produce a higher pitch the lips must vibrate at a higher velocity. The muscles must tighten more to allow the lips to snap back at a faster rate producing a higher tone. To produce a lower pitch the facial muscles must loosen for a slower vibration still allowing air to pass through them, then going back into position to produce a lower pitch (Farkas, 1962). As stated in the Teaching Brass manual, Bailey, Miles, Siebert, Stanley, and Stein (2008) refer to this interaction as a “sort of tug-of–war” effect where there should be no winner. As the air is passing through, the muscles must form an opening to allow air to pass.
between the lips. This opening must vibrate from end to end. Farkas goes on to say that these various contractions serve a dual purpose: “1. to change the tension and thickness of the lips and 2. to change the size of the lip opening.” Both of these changes must aid each other to produce different pitches throughout the range (Farkas, 1962).

Brass musicians must know the amount of muscle tension needed to produce the appropriate embouchure buzz for the correct pitch to sound through his or her instrument. The instrumentalist will eventually have to learn how to vary his or her embouchure tension to span three or four octaves to approximately 36 to 48 different notes, and in some cases more. The musician is also required to play these notes in tune with good tone quality. The musicians are also asked to jump between registers with fluency and, to make it even more challenging, play different pitches at different dynamic levels ranging from pianissimo to fortissimo. Jacobs says that as students continue to develop on their instruments, their muscle fibers and skills will develop as well (Frederiksen, 2006).

Pedagogues have indicated that positioning the lips enables the lips to vibrate, thus producing a tone. The vibrating of the lips is referred to as buzzing. If the lips vibrate at a faster rate, a higher pitch is produced. Adversely, if the lips vibrate at a slower rate, a lower pitch is produced. So, beginning brass students must learn the amount of muscle tension needed to produce a desired pitch and buzzing the lips forming an embouchure does this.

**Embouchure Formation**

Brass pedagogues have different opinions on the proper formation of an embouchure. The ideal is to form an embouchure, which allows the musician to achieve the most success on
his or her instrument. Characteristic embouchures are not naturally inherent. One must take what nature has given and alter his or her physical make-up to form an embouchure. For example, a person’s teeth are not able to be changed, formed, or developed to correctly fit the rim of a mouthpiece. Compared to the muscles in a person’s hands or arms, the muscles that make up one’s lips are very weak (Bailey et al, 2008).

When explaining embouchure formation, Reginald H. Fink says to pronounce the letter M. When pronouncing the letter M, the teeth are slightly separated, the lower jaw is brought down, and the lips are slightly rolled inward and firm. Pronouncing an M will not automatically make a correct embouchure, but it does get the facial muscles set in a pucker-smile combination. By keeping the corners of the mouth firm, it is less likely that students will puff their cheeks. When a student puffs his or her cheeks, air escapes the straight-line air column from the lungs to the instrument (Fink, 1977). Bailey et al (2008) believe the idea is to allow the orbicularis oris muscle, the muscles surrounding the mouth, to control how much pucker is needed for the embouchure and the jaw, along with the cheeks, to control the corners of the mouth.

Although embouchures will differ from person to person based on the physical make up of the individual’s face, there are common characteristics that make up what Farkas calls “the brass player’s face.” Farkas had his students observe many professional players over a long duration. Students came to notice there is a definite facial expression regardless of which brass instrument he or she is playing. This is what he refers to as “the brass player’s face” (Farkas, 1962). Edward Kleinhammer (1963) stated that upon observing some of the country’s finest brass player’s embouchures they all appear somewhat different. He said it might depend on dental structure, the possibility of an overbite, and the player’s focus on a particular tonal range.
Kleinhammer goes on to say, however, if the performer has a good tone, technical flexibility, endurance, and a good range of notes as well as volume, that it is safe to assume the performer has a good embouchure.

Bailey et al (2008) strongly believe embouchures differ according to brass instrument. Nevertheless, there are common characteristics shared among the brasses. They say the inside of the performer’s mouth and throat, which they refer to as the oral cavity, should be open and relaxed with the tongue located on the bottom of the mouth. In concurrence with other brass pedagogues, they also believe the performer’s jaw is to be lowered and firm and depending on the performer’s facial structure, the chin should be flat or pointed. The upper and lower teeth are to be approximately aligned and slightly separated. Next, Bailey et al refer to the opening in the lips that is created by expulsion of air as the aperture and that it should be in an oval shape. With the proper balance of pucker, along with firm corners of the mouth, the aperture should form naturally (Bailey et al, 2008). Bailey et al (2008) conclude by saying to aid in flexibility the lips should be moist.

Scott Whitener states in his book, *A Complete Guide to Brass Instruments and Technique* (2007), that “sound and pitch are created in the mouthpiece by the vibration of the embouchure.” Whitener agrees with the previous brass pedagogues about jaw placement, teeth alignment, as well as a slight separation between upper and lower teeth. Whitener says to take a sheet of paper and hold it approximately a foot and a half away from the lips. Then, blow a stream of air at the paper while saying the word “tu” (“too”) which should cause the paper to fold back. Continue to blow using the “u” (“oo”) until the air is completely expelled. Whitener says this will give the correct sensation of blowing the air forward while forming an embouchure. When pronouncing
“tu,” the formation of the “u” brings the lips into a “slightly pursed configuration.” This configuration creates a cushion to rest the mouthpiece upon. He goes on to say that this will help protect the lips from excess mouthpiece pressure and by saying the “u” syllable the lips and the facial muscles will contract in such a way that the embouchure will respond and vibrate with the motion of the air stream.

Arnold Jacobs noted that too much attention can be placed on the appearance and feel of the embouchure and that more emphasis should be placed on a player’s sound and function. Jacobs goes on to say that everyone is born with lips and players develop them as they play music. The player’s embouchure comes into fruition through the music a performer plays, not by “mechanical procedures.” At first a player can have difficulty playing in the lower register but through trial and error the embouchure learns to adjust with the low vibratory rate. Some embouchures can appear unorthodox, yet they still work (Frederickson, 2006).

Through years of teaching brass techniques, pedagogues have concluded that even though facial structure and physical characteristics can vary from person to person, there is a general embouchure formation that can be considered a “brass player’s face” (Farkas, 1962). Having the students pronounce the letter M is an easy and fairly accurate way to position the lips for a proper embouchure formation. The purpose for a proper embouchure formation is an attempt to set the students up for optimal success.

**Common Embouchure Problems**

Farkas believed that the slightest deviation from a proper embouchure could cause “complete chaos” in the embouchure’s function. Weast (1965) says that observing and defining
problems in one’s embouchure would seem unnecessary but among the brass pedagogues there is a discrepancy on what constitutes a problem. For instance, “It doesn’t make any difference how you play as long as you get results,” is a view similar to Jacob’s embouchure approach, and is somewhat dismissive in concept. Weast’s response to that is, “Results for what?” He believes a musician should always strive for maximum development as if he or she were going to perform the most strenuous piece of music. Weast proceeds to say that music for beginning band students tends to avoid range, flexibility, and endurance problems making it incredibly difficult when music of “professional caliber” is attempted (Weast, 1965).

Embouchure problems can be categorized by how they appear and how they sound. For example, if a muscle in the embouchure quivers while a long tone is being played and there is a slight waiver of the tone, the problem can be both seen and heard. Some problems are not easily heard but are noticeable, such as an upper lip that overlaps the bottom lip. That embouchure may produce a pleasant tone but the student may suffer in a different register. That sort of problem may lay dormant for some time until the student begins working on “professional caliber” music and is unable to perform the piece due to embouchure complications. Other embouchure problems can be audible and not visual. For example, there may be a soft inner tissue vibration occurring causing a buzz or a crack in the tone that cannot be seen but aurally the tone being produced is not characteristic of the instrument. In this case visual detection is not possible (Weast, 1965). It is the responsibility of the brass teacher to quickly diagnose embouchure problems and solve them (Bailey et al, 2008). See Appendix K for images of common embouchure problems.

The “smile” embouchure (see Figure 2 in Appendix K), which is sometimes referred to as
the stretch embouchure, is in reference to the corners of the mouth being upward as opposed to downward causing the embouchure to appear as if it were in the form of a smile. The lips are set into a stretching vibrating motion, hence the term “stretch embouchure” (Kleinhammer, 1963), similar to the stretching motion of a rubber band (Bailey et al, 2008). The embouchure will not function effectively (Whitener, 2007). Long-term effects of the “smile” embouchure could result in the lack of upper range, flexibility, endurance, sharp tone (Bailey et al, 2008), and a limited dynamic range (Farkas, 1956).

Another common embouchure problem is the “excessive pucker” (see Figure 3 in Appendix K). The “excessive pucker” refers to the lip formation of the embouchure protruding outward as opposed to the optimal slightly inward roll of the lips. The corners of the mouth are slightly inward and the lips can sometimes extend around and beyond the rim of the mouthpiece (Weast, 1965). Players with “excessive pucker” will tend to have fuzzy, unclear, and sometimes a sputtering tone (Weast, 1965). They may also be very limited in their playing range as well as playing with a darker/muffled sound (Bailey et al, 2008).

The “bunched-up” chin (see Figure 4 in Appendix K), sometimes referred to as a “peach pit” chin, occurs when the chin is pronounced excessively upward (Zingara, 2006) when the ideal position is for it to be slightly down and out (Bailey et al, 2008). The chin appears in somewhat of an oval shape with multiple dimples similar to the pit of a peach. This is generally caused by the rolling or bunching of the bottom lip and the clenching of the jaw (Bailey et al, 2008). Poor tone quality, lack in low range, as well as flexibility may ensue (Bailey et al, 2008). The position of the chin is critical to correct playing, so critical that no great advancements can be made until this problem is addressed and corrected (Farkas, 1962).
When forming a proper embouchure the cheeks should not be allowed to inflate and “puff” outward. This problem is referred to as “puffed-out” cheeks (see Figure 5 in Appendix K). Weak embouchure muscles allowing the cheeks to inflate disturbing the airflow from the lungs to the instrument create “puffed-out” cheeks. It prevents the muscles from contracting and supporting the proper embouchure (Whitener, 2007). Musicians with “puffed-out” cheeks tend to play with less accuracy, sensitivity, and strength. It is also very difficult to play in the softer dynamics (Bailey et al, 2008).

This next embouchure problem is excessive mouthpiece pressure (see Figure 6 in Appendix K), which is probably the most common (Bailey et al, 2008). Excessive pressure exists when musicians push the mouthpiece against their face more than necessary, typically, to squeeze out notes in the higher register (Bailey et al, 2009 & Farkas, 1962). This compresses the facial muscles resulting in fatigue, poor tone quality, lack of flexibility, and lack of sensitivity. The mouthpiece rim rests against the lips to form the seal that connects the musician with the instrument. The musician blows outward causing the lips to blow outward against the mouthpiece so some pressure needs to be applied against the embouchure for support. Without the mouthpiece, the lips would have added strain to maintain themselves, reducing endurance. So, the correct amount of mouthpiece pressure is necessary for proper embouchure support (Bailey et al, 2008).

Embouchure problems do not always have a predictable outcome. Specific problems can have different effects on different students. Some students are able to work through embouchure problems to become superior musicians. There are a variety of different ways to overcome embouchure problems and clever players will usually find them. Herein lies the problem, a
highly creative and adaptable player can make more out of a faulty embouchure than a less gifted player on a proper embouchure (Weast, 1965).

As stated earlier by Weast, an embouchure problem is “any aberration that causes muscle strain, poor tone quality, consistent tonal inflections (scooping, dipping, quivers), limited endurance, inaccurate notes, limited range, poor flexibility, and just as important, embouchures which cannot realize their full, maximum potential.” It is the instructor’s duty to be aware of common embouchure problems so he or she may identify these problems as they occur among his or her students. Identifying common embouchure problems, and potentially eliminating them, allows the students a better chance for a proper, more successful embouchure. A more successful embouchure gives the students an adequate foundation to begin as a brass instrumentalist. Images of these common embouchure problems can be located in Appendix K.

**Mouthpiece Placement**

One of the leading enigmas is how to find the most advantageous position for placing the mouthpiece on the lips. Not all people will find the same location ideal, but there tends to be a general consensus on where the placement should be. The ideal mouthpiece placement was realized through years of successes and failures by hundreds of players (Farkas, 1962). Fink (1977) says that the embouchure is not formed on the mouthpiece but rather the mouthpiece is placed on the embouchure and that after a few times of placing the mouthpiece on the embouchure the student will learn how far to spread his or her jaw to form an airtight seal with the mouthpiece.

Mouthpiece placement should merit careful consideration since embouchure problems
stem from improper placement of the mouthpiece on the embouchure. For beginning brass students, the lips are flaccid with no preconceived notions of where the mouthpiece should be placed, it is easier to establish proper position as opposed to students who have already began using improper placement, even if it has been only a few months (Farkas, 1962). A beginning student should make every attempt to establish a well-centered mouthpiece placement provided the student has normal lips and dental structure (Fink, 1956). It is preferred that the mouthpiece be centered horizontally on the lips albeit, some professionals play slightly off center due to variations in dental structure. Vertical placement, however, is more critical and cause for debate. Mouthpiece location is usually described in terms of proportions of upper and lower lip in relationship to the mouthpiece rim (Whitener, 2007).

There is not a standard embouchure for every brass instrument. Placement of the mouthpiece can vary slightly between the brass instruments (Whitener, 2007). Each instrument tends to respond better to a particular lip position helping formulate a general embouchure setting (Farkas, 1962). In regards to a trumpet embouchure, Whitener (2007) says that equal proportions of upper and lower lip in the mouthpiece is generally preferred but, sometimes the musicians will use a slightly higher placement, approximately 60 percent upper lip and 40 percent lower lip. Placement for the horn is two-thirds upper lip and one-third lower lip in the mouthpiece. Again, this is generalized and the proportions are not mathematically exact.

Trombone/Euphonium placement, on the other hand, isn’t as consistent or as specific as the trumpet and the horn. (The trombone and the euphonium will be referenced together because of their similar size and placement of mouthpiece.) Most professional players use more upper lip than lower lip in the mouthpiece, similar to the two-thirds upper lip and one-third lower lip
formation like the horn (Fink, 1977), but enough musicians have been highly successful using more lower lip than upper lip in the mouthpiece to prevent any strict rule about placement (Farkas, 1962). Whitener (2007) recommends for trombone and euphonium players to use a placement that is somewhat above half and half. Perhaps the unspecific placement of the trombone/euphonium mouthpiece is due to the fact that it is larger. Since the trumpet and horn mouthpieces are smaller, a sixteenth of an inch misplacement can proportionally be more unsatisfying than the misplacement of the larger mouthpieces. Much like the trombone/euphonium location, the placement of the tuba mouthpiece is somewhat above half and half (Whitener, 2007). The tuba mouthpiece placement seems to be more consistent, perhaps due to the fact that the large mouthpiece is stopped by the nose (Farkas, 1962).

The pedagogues concluded that the purpose for finding the most adequate location to place a mouthpiece is to find the position that is the most advantageous and what is considered to be proper mouthpiece placement was realized through the years from successes and failures (Farkas, 1962). The pedagogues also state that beginning students’ lips have no preconceived notion of mouthpiece placement and he or she should strive for a placement that is well-centered. Because of the students’ lips having no preconceived notion, it is easier to position the mouthpiece appropriately from the beginning of instrumental play as opposed to adjusting students who already established improper placement, even if it has been a few months.

**Tonguing and Initial Attack of the Pitch**

For brass players, the function of tonguing is to aid the initial flow of air providing different sounds at the beginnings of notes (Bailey *et al*, 2008). The sound begins with the
vibration of the embouchure produced by the air stream flowing through. The tongue gives the
beginning of the sound a clear and controlled attack. The tongue should be relaxed and work in
conjunction with the embouchure whether articulating in the higher or lower registers (Hunt,

When starting a note, the tip of the tongue should make contact with the backside of the
upper teeth (Bailey et al, 2008). The most common syllables are “tu” and “ta.” These syllables
have a clear beginning making for more precise attack of the note. For a more legato sound, a
softer pronunciation such as the syllables “du” and “da” are typically used so the attack isn’t so
percussive. The “tu” and “du” syllables are usually recommended because they form the
embouchure in a way similar to the desired embouchure formation. However, some low brass
players prefer the syllables “ta” and “toh,” and their legato counterparts “da” and “doh,” because
it makes the oral cavity slightly more open (Whitener, 2007). Whitener goes on to say these
syllables do not automatically position the embouchure like “tu” and “du.” Therefore, the players
that use “ta” or “toh” must learn to create a habit-forming method of contracting the muscles
after embouchure formation as a normal part of their preparation.

There is a concern if there is too much jaw movement. Beginning students should begin
using “tu” to establish proper embouchure formation. Once established, the player may then use
a “ta” or “toh” syllable (Whitener, 2007). The beginning of a note could be started with a “hu”
attack. The tongue is not in use when pronouncing a “hu” syllable. The underlying problem is
that the player cannot be quite sure when then vibration of the lips will “catch” the air stream
lacking the desired precision of the initial attack of the note. Such uncertainty is unthinkable in
the split-second timing needed for musicians. This is why using the tongue to begin a note is
preferred so the lips of the musician’s embouchure can vibrate “the exact moment they should” (Farkas, 1962).

**Buzzing on the Mouthpiece**

Much time and energy should be devoted to the lips and focusing on processes that will facilitate the sub-conscious level helping make decisions for the muscular actions in embouchure formation (Sanborn, 1997). James Thompson refers to this as creating good habits. Thompson wrote a method book specifically for mouthpiece buzzing. In his book, *The Buzzing Book* (2001), Thompson says there are many benefits to buzzing on the mouthpiece if it is done with an observant and systematic approach. It seems the more advanced a musician is, the more important basic fundamentals like mouthpiece buzzing becomes (Sanborn, 2004). Buzzing helps a musician use more air; because by being separated from the instrument, there is less air resistance. Less air resistance allows for greater airflow. Greater airflow allows the lips to be more relaxed to vibrate more freely producing a more resonant sound.

Fink (1977) says after buzzing on the mouthpiece that pitch placement on the instrument is more secure as well as creating a louder/fuller tone. Mouthpiece buzzing also requires the musician to be more dependent on his or her listening skills to produce the desired pitches similar to the way a vocalist does. The musician has to form the embouchure to create the internalized pitch without the aid of the instrument helping center the pitch through the characteristics and responsiveness of the instrument. Thompson (2001) goes on to say mouthpiece buzzing aids in finding the most efficient and consistent mouthpiece placement for the individual. Finally, and what Thompson considers to be the most important, buzzing on the
mouthpiece allows the player to more easily develop and achieve refined aural/physical habits.

Thompson continues his discussion by claiming that buzzing on the mouthpiece while holding it in a person’s hand can lead to alterations in neck and shoulder posture and recommends the use of a BERP if possible. A BERP is a plastic buzzing apparatus that is affixed to the lead-pipe of the instrument allowing the musician to correctly hold his or her instrument while buzzing with the correct body posture. The mouthpiece is inserted into the BERP just as it would be as if it were inserted into the lead-pipe of the instrument. Thompson says the use of a buzzing apparatus employs the musician to use the same habits for mouthpiece buzzing as well as playing on the instrument.

Kleinhammer (1963) says that making music on the mouthpiece alone can have good results since the instrument is absent. Hindrances to correct and relaxed playing are more readily detectable. He describes a scenario where the musician will set his or her instrument to the ideal location for a specific pitch, concert F in this case. To produce the ideal pitch with the best tone quality the lips should be buzzing an F while the instrument is in the position for the pitch F. If done correctly, the musician can pull his or her face away from the instrument entirely and maintain the buzz on the mouthpiece producing the pitch, F. When the buzz is in tune and the mouthpiece is replaced on the instrument resonating the same pitch (Chappell, 2008), or as Sanborn (2003) refers to this as the vibration of the lips and vibration of the pipe being in sync, Kleinhammer says this is the musician’s finest tonal quality.

In 2002, James Roberts surveyed some of the leading American trombonists about their current practice strategies. Buzzing on the mouthpiece is strongly endorsed by those who were contacted. Of those that responded, 69.8% incorporate buzzing into their warm-up routine, and
39.5% view mouthpiece buzzing as extremely beneficial. 71.8% view buzzing as developmental in nature. Roberts includes a prioritized list of ways mouthpiece buzzing can be helpful.

1. Developing a focused, centered sound
2. Pitch accuracy
3. Diagnostic value (air/lip/ear)
4. General focus – ease of response
5. Breath flow, control, and support
6. Slur quality and control
7. Embouchure efficiency – promotes embouchure tissue relaxation
8. Warm up faster – develop control
9. Develop range “Warm up while driving a car!” – reduce reliance on mouthpiece pressure
10. As a remedial approach – aid to concentration

Good teachers realize the importance of fundamentals and know that students should establish a solid fundamental foundation (Morrison, 2002; Unverricht, 2008). Building muscles for proper embouchure formation takes time and practice (Criswell, 2009). From the beginning, it is a daily struggle for beginning brass students to produce a characteristic sound on their instruments. During the first few meetings of beginning band class, students are very enthusiastic about playing a new instrument and will make any kind of sound they can. This is an opportune time to introduce the students to buzzing on the mouthpiece. Bailey et al (2008) state mouthpiece buzzing can, and should, be introduced on the very first day. The students will have to spend a great deal of time on this task before they can move on to making music (Sanborn, 2004).
Fallis (2001) states beginning students should first approach the mouthpiece before attempting anything on their instruments. The beginning student should spend at least two weeks playing on the mouthpiece alone. At this stage, forming the correct embouchure, along with an adequate air stream, is the primary focus and is of the utmost importance. Fallis’ prescription is for the students to practice mouthpiece buzzing ten minutes twice a day for two weeks without attaching it to the instrument. After this two-week period the embouchure has formed a well controlled buzz and the student may then begin playing the instrument. From this period on, the student may buzz five to ten minutes, once daily, before playing the instrument.

Unverricht (2008) says to include mouthpiece buzzing at every class meeting along with all student evaluations. He agrees with making mouthpiece buzzing a part of the student’s daily routine. Unverricht continues that students should begin practicing various pitches from the beginning along with sirens, slides both up and down, and other images. Herriott (2009) describes sirens as slow glissandi up and down. Try to make them even as they progress through the registers (Sanborn, 2003). Begin with the interval of a fifth and then as progress ensues increase the range (Herriott, 2009) ending on an octave (Bailey et al, 2008). It is important that there are no interruptions in the sound. Try to make it “seamless.” Herriott says to emulate an air-raid siren. Bailey et al, (2008) then recommends buzzing scales and intervals without the siren, or glissando, effect.

Unverricht encourages instructors to try using pitch, articulation, and rhythm echoes from the first day. Echoes are teacher models used in a question and answer format without notation (Cooper, 2004) and may be important for music educators (Steele, 2010). If woodwind and brass students are together, have the brass students buzz on their mouthpieces along with notes the
woodwind students are playing. Norwegian trombonist Astrid Nokleby began working with students younger than the average age of beginning band students, on playing the trombone. Nokleby recommends teaching without using sheet music to focus more on the language of sound first before notes on paper. She then instructs the teacher to choose songs based on his or her experience incorporating technical aspects for the students (Kavanaugh, 1996). Gibson (1967) recommends buzzing melodies on the mouthpiece that are recognizable to the students, for example, patriotic or folk music such as America. To avoid too much pressure while working on the mouthpiece, students should hold the mouthpiece with their thumb and first two fingers (Unverricht, 2008) at the base of the shank (Herriott, 2009).

For more advanced students, brass pedagogue Charlie Vernon (1995) recommends for his students to spend the majority of their mouthpiece buzzing time buzzing the actual music he or she is working on. When beginning mouthpiece practice, Vernon recommends beginning in the middle range, then extending in both directions in the high and low registers. The goal is to make every register sound as free and easy as the middle register. The lips should not be forced to buzz too loud or too high.

Although for beginning students buzzing on the mouthpiece may not be fun, the fundamental strengths they gain by establishing a firm foundation will enable them to progress more quickly than if they began directly on the instrument itself from day one (Fallis, 2001). Through his years of brass pedagogy, Fink (1977) has found mouthpiece buzzing to develop more firmness in the embouchure making for more secure instrumental playing and since there is minimal research on mouthpiece buzzing, it poses the fundamental question of this study: “Would the incorporation of a daily mouthpiece buzzing exercise have an effect on beginning
Modeling

Teachers often work on rehearsal strategies and methods of instruction to guide students to be more artistic and musical in their performances. Teachers address areas such as dynamics, rhythm, phrasing, etc., to help the students mature musically. One of the methods teachers use to get their interpretation across to the student is modeling (McAllister, 2009). Since the primary delivery of information in this study is through the use of teacher modeling, this section is devoted to literature on the effect of modeling. Modeling is a way of representing, understanding, storing, and communicating information to others (Grimland, 2005). In 2006, Jeremy Polk wrote an article titled, “Traits of Effective Teachers,” stating that modeling is one of the ten basic characteristics of effective teachers and that it is the skill that effective teachers do best. When modeling, the goal of the teacher is to have the student imitate what is being instructed (Grimland, 2005). During modeling instruction alternations between teacher demonstration and student imitation happen constantly (Dickey, 1992).

In 1992, Dickey reviewed research investigating various types of modeling in the classroom. He stated that verbal instruction, albeit necessary, could be misinterpreted. The students may misconstrue words. When verbal instruction is used for directions such as, “the starting pitch is concert F” or “play like I play,” it should be concise and kept to a minimum. Make sure the instruction is primarily nonverbal (Fredrickson, 2005; Goolsby, 1997). He concluded that modeling was an effective way of communicating information in music classrooms. Dickey also concluded that modeling is more effective than verbal descriptions and
in order for teachers to be effective models they must possess the necessary skills to model both correctly and incorrectly (MacLeod, 2010).

There are different forms of modeling. One way is to demonstrate the musical behavior by performing the behavior on an instrument or by singing (Jones, 1989) the desired behavior to the student. Another is to count or speak the correct rhythm. Posture may also be modeled providing the students a visual demonstration of what is to be expected. Even a recorded model can be a highly effective tool to use for a student (Hewitt, 2001).

Studies have shown modeling to be a highly effective form of instruction (Droe, 2006; Taylor, 2006; Woody, 1999, 2003) tends to be superior to cases without a model (Henley, 2001), but not in all cases (Montemayor, Wiltshire, & Morrison, 2004). In 2001, Paul Henley performed a study using 60 high school instrumentalists using model versus no model along with a steady increase in tempo versus alternating fast and slow tempos. The subjects were assigned to one of six experimental groups. Each subject sight-read an etude and then practiced the etude six times using one of six different methods combining one of the two variables, modeling and tempo. Then each subject performed a posttest. Each subject played the etude a total of eight times (pretest, six treatment trials, posttest). Results indicated no significant difference in tempo patterns but there was a significant difference with the model versus no-model treatment finding the model treatment to be superior (Henley, 2001).

Another study in 2006 by Woody found no significant difference between aural modeling, verbal instruction, and imagery/metaphors. Subjects were 36 college level pianists. They performed a musical passage after being given one of those three forms of instruction. The results indicated the pianists could accommodate all three types of instruction used in the study.
An earlier experiment by Thomas Goolsby (1996) showed experienced teachers model more during a rehearsal than novice teachers. Goolsby examined the rehearsal time spent in verbal instruction, verbal discipline, nonverbal modeling, and actual instrumental performance in experienced, novice, and student band director’s teaching methods and determined that less experienced directors do not model nearly as much as experienced directors.

A later study performed by Colprit (2000) was an observation and analysis of the Suzuki Method for teaching the study incorporated modeling in the teaching approach of 12 expert Suzuki string teachers. The purpose of this study was to determine how rehearsal time is dispersed. Even though a large portion of the communication is teacher talk, 20% of the communication is teacher modeling. Evelyn Orman (2002) performed a similar study to observe and analyze the use of class time in elementary general music classes in relation to the Standards for Music Education. Subjects were 30 experienced elementary music specialists teaching in a large, affluent metropolitan area ranging from 10 to 26 years of experience. As with the Colprit observation, Orman observed the majority of time spent is teacher talk at 46.36% and teacher modeling was next at 21.57%. Some teachers are inadequate models therefore are hesitant when using modeling as an instruction tool.

Sang (1982), who performed many studies on instructor modeling, found a significant relationship between a teacher’s ability to model and the amount of time spent modeling when instructing. He included three observable teaching techniques as independent variables: modeling skills, discrimination skills, and diagnostic skills. The subjects were students from two consecutive semesters of a university instrumental music methods courses. A panel of judges used an observational instrument devised for the study to quantify the observations from the
videotaped sessions of the subjects teaching in a field situation. The results indicated that all three of the teaching techniques contribute to instructional effectiveness. More specifically, modeling was noted as the most effective single contributor to variance in instructional effectiveness.

As a result of his previous study, Sang (1987) performed a second study to observe the inconsistencies between modeling theory and the amount of verbalization in actual teaching segments. Nineteen teachers of first-year instrumental music classes randomly chose students to aid in the participation of this study. Each teacher was given a series of tests to determine their modeling ability. After one year of study the students were asked to perform the same exercise used to evaluate the teacher’s modeling ability. The results were recorded and evaluated by a panel of professional musicians. Sang found there to be a significant relationship between a teacher’s ability to model and the amount of time teacher modeling was used in instruction. Sang further concluded that a teacher’s modeling ability combined with the teacher’s use of demonstration has a bearing on level of student performance (Dickey, 1992; Hellman, 2002; Sang, 1987).

In a more recent study, Katherine Frewen (2010) performed an experiment showing that children who were more familiar with the melody played more accurately than the children who were not. The experimental group listened to a model of a melody repeatedly to familiarize themselves with music while the control group had no model. Then both groups played a four-measure melody on a keyboard. The control group performed less accurately than the experimental group. Another modeling study performed by Taylor (2006) examines the effectiveness of instruction in an elementary music setting. Eight Orff-based instructors that were
level 1 certified or higher were videotaped during class and analyzed. The results indicate most student problems were related to precision. Most of the instructional targets were related to students’ technique. This study also indicates students were more successful when their instructors used clear, explicit directives and positive modeling.

It is up to the instructor to give the best, and most accurate, model possible (O’Herron, 2007; Yarbrough et al, 1991; Yarbrough et al, 1992). The better a model is portrayed for the students, the better their behavior reciprocation (Dammers, 2009; Yarbrough et al, 1991). In a study performed by Hewitt (2001), 82 seventh through ninth grade instrumentalists (woodwind, brass, and percussion) were randomly assigned to one of eight treatment groups and measured on the effects of modeling, self-evaluation, and self-listening on performance. The results indicated that subjects who listened to a model improved more in the areas of tone, melodic accuracy, rhythmic accuracy, interpretation and overall performance, but not in the areas of intonation, technique/articulation, or tempo. Modeling groups were no different in any of the performance sub-areas when subjects were not self-evaluating.

In 2002, Hewitt performed a similar study, this time on the self-evaluation tendencies of junior high instrumentalists. The purpose of this study was to determine the students’ self-evaluation tendencies over time, to examine if the model or no-model treatment had an effect on the self-evaluation, and to determine if there is a relationship between self-evaluation accuracy and achievement in music performance. The subjects were 41 junior high woodwind, brass, and percussion students in grades 7 through 9. At the beginning of the school year the students were auditioned by their band director and placed into 3 groups based on their performance. The groups were labeled low-ability ensemble, middle-ability ensemble, and high-ability ensemble.
The subjects were assigned to either a group with an aural model or a group with no model. Recordings performed by university music majors served as the aural models. The dependent variables in the study were music performance achievement and self-evaluation accuracy. The results showed no improvement of self-evaluation scores over time regardless of model-group condition. The results did indicate a moderate positive correlation between model-group tempo and combined group interpretation posttest scores (Hewitt, 2002).

In 1980, Baker performed a study where students were exposed to appropriate and inappropriate models to determine what they perceived to be considered “correct” based upon the model presented to them. Two studies were performed simultaneously involving 39 fourth-grade students and 36 third-grade students. The fourth-grade subjects were randomly assigned to groups while the third-grade subjects were left intact due to the inflexibility of their schedule. The researcher taught seven lessons over a four-week period on tempo and dynamics to each group. Duration of the lessons ranged from 25 to 30 minutes each. The deemed “appropriate” classes learned to sing three lullabies softly and slowly along with three sea shanties sung loudly and quickly. The group labeled as “inappropriate” learned to sing three lullabies loudly and quickly along with three sea shanties sung softly and slowly. A recording of each song was used for teaching the music. Recordings were also made of the subject’s performances. Although there was no statistical difference on the preferred responses of the students with appropriate models and students with inappropriate models, there was indication of a significant correlation between what the students considered “correct” and the model presented to them, whether appropriate or inappropriate (Dickey, 1992).

By exposing students to models they eventually become more aware of musical attributes
and tend to notice more details in their own playing when self-evaluating. Mark Montemayor and Emily Moss (2009) performed an experiment with two groups of pre-service teachers. The experimental group was given a recording of the ensemble piece they were working on with an ensemble. When self-evaluating, the experimental group displayed greater concern for accuracy, and their evaluations were more critical of the ensemble. Despite the results in favor of teacher model use for instruction there is still a relatively infrequent use in the classroom (Dickey, 1992).

Similarly in 1989, Benson performed a self-observation study to determine the effects of observational analysis of one’s own modeling in an applied setting to see if there is a change in behavior. Three violin teachers were videotaped teaching violin lessons to children between the ages of 10 and 12. The treatment was the observation and analysis of models. The results indicated the experimental teacher “acted into a new way of thinking” as stated by Madsen & Madsen (1983). A problem is that future teachers sometimes don’t know why they should focus on their own performance ability, because they are pursuing teaching as a career, not performance (Polk, 2006). Modeling can be an important tool and should be implemented whenever possible (Polk, 2006).

Research has shown modeling to be a highly effective form of instruction (Taylor, 2006; Woody, 1999, 2003) and tends to be superior to cases with no-model (Henley, 2001), but not in all cases (Montemayor, Wiltshire, & Morrison, 2004). The goal for modeling is to have a student imitate a desired behavior being presented to him or her by the instructor (Dickey, 1992). Models may be audio (such as vocal singing, playing an instrument, or the use of a recording) or they may be visual (demonstrating proper posture or instrumental carriage) (Hewitt, 2001). Sang (1987) concluded that modeling was noted as the most effective single contributor to variance in
instructional effectiveness.

**Beginning Instrumental/Band Instruction**

Since this study is being performed in a beginning band setting, the literature in this section primarily focuses on instruction given to beginning or middle school level musicians. Music instruction in a beginning band setting could pose numerous demands on the instructor to have a clear and concise curriculum (MacLeod, 2010). Educators are constantly searching for effective approaches for transferring knowledge to their students.

There have been numerous studies on expert teachers in instrumental music settings that identify qualities of effective and/or ineffective teaching but there is minimal research in the beginning band setting (Worthy & Thompson, 2009) so, the literature reviewed in this section focuses in the area of beginning, or early, instrumental instruction, not necessarily instrumental band setting. Included were studies and research incorporating some form of modeling due to the nature of the author’s study.

How a music teacher or instructor relays information has an effect on how students perceive information and what information students actually learn and retain. Hamann *et al.* (2000) performed a study designed to see if a teacher’s delivery skills have any effect on students’ perception on the material being taught. Five hundred eleven university music students viewed videotapes of lessons containing 4 randomly placed teaching episodes to determine if the delivery of information has an effect on the perception of the information. Episodes were divided into good delivery with good content, good delivery with bad content, bad delivery with good content, and finally bad delivery with bad content. Results indicated subjects liked, and were
more interested in, the episodes with good delivery skills regardless of content.

Observation studies were reviewed to determine how experienced teachers give instructions and in what manner they deliver the information. MacLeod (2010) observed experienced band and orchestra instructors teaching an unfamiliar musical passage to a first-year instrumental class to see how the instructor relays information to his or her students. MacLeod compared and contrasted how experienced band and orchestra instructors taught the unfamiliar musical passage. The instructors were observed and recorded during the second semester of their first year working with their instrumental ensemble. The instructors were to select a brief, unfamiliar musical passage that has not been previously addressed and teach the passage to their class. The researcher identified, and operationally defined, 12 observed behaviors. These behaviors were: echoing technique, question and answer, verbal instruction, co-verbal instruction, modeling with instrument, modeling with instrument during student performance, modeling without instrument, modeling without instrument during student performance, conducting, student performance, pedagogical touch (teacher physically assisted individual students), and classroom management. The results indicated there was a statistically significant difference for nine of the twelve behaviors. Orchestra teachers used echo techniques, modeled on their instruments, and performed along with their students more frequently than band teachers. Band teachers used more verbal instructions, conducting, question and answer techniques, and student performance than orchestra teachers. Orchestra teachers also used co-verbal instruction and pedagogical touch with greater frequency than band teachers. There was no statistically significant difference observed for classroom management, modeling without an instrument, and modeling without an instrument during student performance between the two groups.
In a similar study, Worthy and Thompson (2009) observed three expert beginning band teachers to identify common characteristics among them. These teachers were chosen by recommendations made by university faculty, then observed and videotaped during three consecutive beginning band classes. Observation notes were collected and organized into Classroom Management, Instructional Materials/Activities, and Teaching Techniques/Strategies. The videotaped recordings were reviewed to identify rehearsal frame targets such as Articulation, Dynamics, Intonation/Tone, Pitch Accuracy, Rhythm Accuracy, Tempo, Technical Facility, Multiple, and Other. The researchers added additional targets to accommodate a beginning band setting. These targets were Posture/Instrumental Carriage, Breathing/Airflow, and Embouchure.

The results showed the expert teachers demonstrated proactive approaches to classroom management. The students were immediately engaged upon entering the classroom. The lesson objectives were clearly visible on the board. The students were frequently reminded of the classroom rules and procedures. Any inappropriate conduct was addressed immediately and was never allowed to escalate. At no time during the rehearsal were the students left idle. There was always some form of instructional activity. The teachers were mobile and arranged the seating in a matter to allow for movement around the classroom. The teachers were always in close proximity to the students and kept them actively on task. The teachers emphasized the development of characteristic tones and pitch accuracy and their priorities were addressed throughout the lesson. Primary instructional goals, such as breathing and embouchure, were observed as well. The teachers also modeled both appropriate and inappropriate tone qualities for the students as well as offered customary feedback and specific instructions for improvement.
Worthy and Thompson concluded by stating that different skills are required when teaching beginning band than those required of a typical band rehearsal. Teachers, especially novices, should focus on distinctive characteristics of the particular instruments. The teacher should be able to model appropriate and inappropriate tone and techniques for the students. The teachers should also develop a teaching style appropriate to the instructional pace of beginning band as well as focus on the didactic targets which are targets intended to teach, such as: pitch accuracy, tone, and any other fundamentals pertaining to completing the pedagogical goals.

One method of delivering information to students is teaching by rote (Levinowitz, 1989). Rote teaching is modeling the desired behavior to the students (Levinowitz, 1989). In 1974, Schleuter reviewed a dissertation by John Sperti (1974) on applying Suzuki techniques to beginning instrumental instruction on the clarinet. Sperti had an experimental group, and a control group, work over a thirty-two week period on the same material with different teaching approaches. The subjects in the experimental group were taught by rote along with parental supervision of home practice while the subjects in the control group were presented solutions to performance problems and assigned drill and home exercises with subsequent review. Sperti finds statistically significant results in favor of the experimental group. Schleuter believes that, in general, this study is an excellent addition to the body of research in music education in the area of instrumental education.

In 1991, Dickey performed an instructional delivery study comparing verbal instruction and non-verbal instruction on effectiveness in instrumental music ensembles. The purpose of his experiment was to determine if instrumental music students taught by using modeling strategies would develop better melodic ear-to-hand skills, kinesthetic response skills, and general music
discrimination skills than students taught by using verbal strategies. Subjects were 128 students from three middle schools in a large suburban school district in southeastern Michigan. This study was in a pre-test/posttest design. There were two teachers giving instruction to the subjects, the researcher and a replicator. The researcher and the replicator each taught one class using modeling strategies and one class using verbal strategies equally in 4 total classes of subjects. The videotaped posttest sessions were analyzed by two independent judges to determine the percentage of each class period that was devoted to verbal strategies, modeling strategies, and other activities in order to verify the author’s intent. The results indicated the subjects in the modeling strategies group achieved significantly higher scores on ear-to-hand and kinesthetic skills but did not achieve significantly higher scores in general music discrimination skills.

In another experiment on delivering instructional content, Wlodarczyk (2010) performed a study on beginning guitar students where the subjects were separated into three groups. Each group was given instruction in one of three ways: audio modeling only, audio and visual modeling, and a control group. The subjects were 35 major and non-music major college level students. Subjects had to sing “Happy Birthday” while accompanying themselves on their guitars. The subjects were unaware of what group they were assigned to. They were given instructions upon their arrival at their designated time. The dependent variable was the amount of time it took each subject to perform the song accurately. Wlodarczyk stated that prior musical knowledge does not play a role in beginning level guitar skill acquisition. This study was posttest only design. There was no significant difference between the two groups, but there was a significant difference between treatment conditions with the audio-visual group completing the task in a shorter amount of time. Instructor modeling is supported by these findings.
In 2010, Haston performed a study that ended with mixed results regarding modeling. His study was designed to assess the effectiveness of teaching beginning wind instrumentalists using a sound-before-sight approach. The idea behind the study was to determine if there was a significant difference in presenting new material to students by rote using a call and response technique, along with modeling, before verbal or written instructions are given. Subjects were K-6 students obtained from three elementary schools in Northern Virginia. The experimental group was taught with an aural/modeling emphasis while the control group was taught with a visual emphasis. The subjects met for 15 weeks for one hour per week. This study was a posttest only design. The researcher along with three independent judges scored the data. Results were not statistically significant although, the scores indicated teaching with an aural/modeling emphasis does not hinder performance skills and may be beneficial.

How an instructor relays information to his or her students has an effect on student interest and perception. But what if students were given self-instructional materials and given instructions for music preparation? In 1971, Puopolo performed an experiment using self-instructional practice materials to aid beginning instrumentalists. This study investigated the possibility of adapting programmed instruction as a procedure for making individual instrumental practice more efficient. The subjects were 52 fifth-grade beginning trumpet/cornet students from six elementary schools. The subjects were pretested in the three behaviors serving as independent variables: 1. music achievement, 2. socio-economic status, and 3. I.Q. Each week the teacher programmed a self-instruction tape for the experimental group. Each tape included a model performance, simple piano accompaniment for model performances, and verbal instructions. After the conclusion of the 10-week treatment period, the Watkins-Farnum
Performance Scale was administered as a posttest. Each subject of both groups made a recording of the posttest and all of the recordings were sent to a scorer. The scorer was unaware of which group each student participated in. Puopolo came to the conclusion that students with a below-average IQ benefited significantly more in performance achievement than students with an above-average IQ. The subject’s reaction to the programmed practice was positive. They preferred it to non-programmed practice and believed they were benefiting from it.

Another study involving the use of taped models was performed by Rosenthal (1984). The purpose of this study was to determine if there was an effect on the use of one of four different kinds of training tapes on the performance of college woodwind and brass majors. Rosenthal employed the use of a professional violinist for the model performance of the selected etude. She then developed a script addressing aspects of the etude, such as: tempo, style, rhythmic interpretation, phrasing, and dynamics. Subjects were 44 graduate and upper-level undergraduate students. Each subject was randomly assigned to one of four treatment groups. The treatment groups were (a) a training tape consisting of verbal instruction and instrumental modeling; (b) a training tape with instrumental modeling only; (c) a training tape with verbal instruction; and (d) no training tape. Subjects were allowed to practice for three minutes following the instructional tape. The subjects with no training tape were given ten minutes to practice the etude. Then the subjects performed the etude on his or her instrument. Two independent observers determined the number of measures played with correct notes, rhythm, tempo, dynamics, and phrasing/articulation in a 20% sample of the recordings. There were significant differences found among all groups for notes, rhythms, dynamics, and tempo, but not for phrasing/articulation. The model-only group steadily attained the highest scores on all
variables. Rosenthal makes a case for the use of the model-only treatment. It seemed that the verbal guidance, along with the model treatment, hindered the musician’s performance when compared to the model-only treatment.

Rosenthal, Wilson, Evans, and Greenwalt (1988) performed a similar study four years later determining the degree of effectiveness of modeling, singing, and silent analysis with, and against, unstructured practice or sight-reading. The purpose of this study was to determine the effect of five different practice conditions on performance accuracy. The subjects were 60 graduate and upper-level undergraduate college students majoring on a brass or woodwind instrument. Each student was randomly assigned to practice either by (a) listening to a taped performance of the etude performed by a professional violinist; (b) practicing by singing the etude; (c) studying the etude silently; (d) practicing the etude on his or her instrument; (e) or as a control group. Like the previous study, after three minutes of treatment each subject was asked to perform the etude on his or her instrument. The performances were recorded and analyzed for accuracy of pitches, rhythms, articulation, and phrasing/dynamics. The results indicated modeling and practice groups had the most accurate scores. It was theorized that listening to a model alone is almost as effective as practicing on one’s instrument (Dickey, 1992; Rosenthal et al, 1988).

Another use of an audio model is a study performed by Montemayor et al in 2004. The purpose of this study was to examine the effectiveness of a recorded model in an ensemble setting. Bands from three middle/junior high schools and two high schools from the Pacific Northwest participated in a study lasting 5 weeks. During the treatment period, extant professional or collegiate recordings of one of each of the school’s chosen selections were
provided for an aural model. Once a week, for the experimental group, the band director played a recording of the entire piece for the band members while they followed along on their individual parts silently. On another day during the week the band director will play an excerpt of the recording to isolate a specific section of music the band director is intending to practice. In addition, once a week the subjects completed a five question “progress report” for each piece of music. At the conclusion of the experiment, the musical excerpts were collected and analyzed independently by five experienced instrumental music teachers. The results indicated no difference in achievement between model and no-model pieces. On the students’ evaluations, there were more modest achievement gains and overall more positive gains for model pieces (Montemayor, Wiltshire, & Morrison, 2004).

Similarly, Linklater (1997) performed an experiment with the use of audio- and videotaped models on performance achievement with beginning clarinetists. The purpose of this study was to determine if beginning clarinetists would show improvement by using a recorded model to aid in home practice. One hundred forty-six volunteer fifth and sixth grade beginning clarinet students in eight schools from six suburban and rural communities were randomly assigned one of three cassette tapes: a videotape, a modeling audiotape, or a non-modeling audiotape (instrumental accompaniment only). The first experimental group received a videocassette tape that provided a video as well as audio model for the subjects. The second experimental group received audio-only cassette tape that provided clarinet models as well as instrumental accompaniments. The third group served as the control group receiving an audio-only cassette tape only including instrumental accompaniments. There was no clarinet modeling included in this group. The modeling video and audio tapes consisted of two sections. The first
section paralleled the instructional sequence of the first 18 pages of their textbook. The second section consisted of 11 songs from the students’ textbook. At the conclusion of the 8-week treatment period, the first posttest was administered. Performance achievement was measured by the IPT (Instrumental Performance Test) designed by the researcher. It was designed to measure the effect of modeling as well as the students’ overall instrumental performance skills. The etudes chosen were based on the curriculum materials experienced by the subjects. The study concluded with two further posttests that were administered to observe retention of students’ performance achievement. The subjects were allowed to establish their own tempos for all of the exercises. Results indicated no statistically significant difference although the mean model scores were higher than no-model.

Anderson (1981) also performed a study on the use of a tape-recorded audio model for home practice on young clarinet students to determine if the model would affect the acquisition of selected sight-reading and performance skills. Eighty students from two sixth grade centers in the Austin (Texas) Independent School District were divided into an experimental group and a control group. The duration of the treatment period was eight weeks. At the beginning of the treatment period, the subjects in the experimental group were provided a cassette tape containing solo clarinet performances of the music exercises assigned to both of the groups. Along with practicing the exercises at home, the subjects also worked on the exercises during a woodwind class at school. Subjects were required to turn in weekly practice charts to determine the amount of time spent practicing the exercise. To ensure reliability, 20% of the subjects were asked to record their home practice session and the results of their home-recorded practice sessions were compared to practice charts. In the beginning of the final treatment week, the subjects were
assigned the Practiced Performance Evaluation Test. This consisted of the “final check-out” page of their band method book used during the duration of the study. Concluding the treatment period, the Watkins-Farnum Performance Scale (Form A) served as the posttest to determine the effect on sight-reading skills. The skills being measured were pitch-reading, rhythm-reading, tempo accuracy, and intonation accuracy. Pitch-reading was measured by counting one error for any measure in which the pitch being played wasn’t the notated pitch. Rhythm-reading was measured by one error for any measure in which one or more pitches or rests weren’t played as notated. Tempo accuracy was determined by the deviation of the amount of time taken by the subject’s performance compared to the amount of time of the performance taken by the prescribed tempo given. Four pitches from each test were selected to measure intonation accuracy. Intonation was measured by deviation in cents for each pitch. The results of Anderson’s study resulted in no statistically significant difference between the groups on the use of the tape-recorded model on the sight-reading or performance skills of the young clarinetists.

In another study, Delzell (1989) performed an experiment on musical discrimination training in beginning instrumental music classes. This study was designed to determine if beginning instrumental students who received musical discrimination training along with incorporating models would demonstrate higher levels of discrimination skill than those students who do not receive the treatment. Subjects were 43 fifth-grade wind and percussion students who chose to participate in an instrumental music program. After 1 month of homogenous classes, the students were randomly assigned to control and experimental groups. This study followed a pretest-posttest control group design. The Test of Musical Discrimination (TMD) is a tape-recorded achievement test designed for this study. The purpose of the TMD is to measure the
beginning instrumentalist’s skill in discriminating differences in tonality, melodic patterns, musical phrasing, tone quality, expressive nuance, intonation, number of musical parts in an ensemble, and balance of musical parts in an ensemble. There was an additional posttest measure that was designed by the investigator labeled the IPAT (Instrumental Performance Achievement Test). The treatment period lasted for 18 weeks. During this time the experimental and control groups met separately two times a week for 40 minutes each time. The experimental and control groups received the same amount of instructional time, excluding the Exercises in Musical Discrimination (EMD). Because both groups received the same amount of instructional time, the time spent on the EMD by the experimental group reduced the amount of instructional time spent on other instructional activities. The EMD exercises lasted approximately 7 to 9 minutes per each class period. After the experimental period, the TMD was given again along with the IPAT. The results suggest that beginning instrumental music students can develop discrimination skills with systematic training procedures that use models and discriminator foils along with modeling and imitation. These studies show the use of modeling, although sometimes not statistically significant, to be an effective method of delivering information to students.

This section surveys effective means of transferring information to beginning, or early, level music students. Research indicates expert teachers are clear and concise when delivering information, students are actively kept on task, and if a problem arises it is dealt with immediately (Worthy & Thompson, 2009). Teachers were also observed using the Suzuki method, or teaching by rote, which achieved favorable results (Davidson, 1989; Schleuter, 1974). Transferring knowledge to students through the use of modeling, albeit not always statistically significant (Delzell, 1989; Haston, 2010; & Linklater, 1997), was preferred or achieved the

**Intonation/Tone Quality**

This section pertains to intonation as well as tone quality due to the purpose of this present study. This study is being performed to determine if there is an effect, primarily, on a student’s intonation and, secondarily, on a student’s tone quality. In 2006, Persellin performed a study on the pitch accuracy of young children. The study was designed to determine if teaching models, musical aptitude, and home environment has an effect on the pitch accuracy of young children. One hundred thirty-four kindergarten students from south Texas were taught two times a week for eight months using three different methods. The three methods were (a) the teacher sang for, but never with, the subjects; (b) the teacher always sang with, but never for, the children; and (c) the teacher sang for and with the subjects. Subjects were pre- and posttested. Also, parents/caregivers were asked to complete a Home Musical Environment Scale (HOMES). A taped test was administered to each subject individually in a quiet room. Subjects were asked to echo eight three-note phrases of a complete “test song.” The “test song” was developed by Rutkowski (2003) and was originally designed to evaluate children’s vocal development as they mature. The testing instrument in this evaluation was designed to focus on vocal pitch accuracy rather than vocal development. The results indicated all three treatments showed improvement although there was no significant difference among the groups. A significant positive relationship was found between the HOMES and vocal accuracy improvement.

Similarly, Millsap (1999) performed an experiment on the daily implementation of sequential sustained tone exercises as a means of improving the ensemble intonation and tone
quality of second-year middle school bands. She stated that since the inception of bands in the public schools in the United States, intonation and tone quality have been of primary concern to instrumental educators. She went on to say that the music educator should strive to refine individual tone quality as well as ensemble tone quality to achieve high caliber performances.

Millsap quoted Schleuter (1984) saying, “The most important instrumental skill to be developed is a pleasing tone quality. Other instrumental skills…are not productive if a solid basis for tone production and quality is not established first” (p. 84). She then went on to quote Colwell (1992) in regards to individual tone quality stating: “Long tones are essential. They provide a daily test of steady breath support, aid endurance, and offer a way to listen for and improve tone quality and intonation. Students should strive for a well-focused, centered sound and accurate intonation. The student should also use long tones to improve concentration and listening ability.”

The subjects in Millsap’s experiment were 114 seventh-grade band students completing the second year of instrumental instruction. Subjects were divided into two classes. One class received a daily warm-up procedure for treatment while the other class maintained normal activities, with no treatment implemented. The results indicated a significant improvement in the experimental group’s ensemble intonation, ensemble tone quality, and individual tone quality of the student. There was no significant difference in embouchure formation, individual breath control, and individual pitch discrimination.

An important time during a rehearsal to devote toward developing a student’s pitch accuracy and tone quality, as well as other areas, is during a warm-up session. Designing a specified warm-up procedure is important to the development of a brass student (Millsap, 1999). Millsap quoted Colwell (1992) stating, “The purpose [of the warm-up procedure] is to learn the
basics of ensemble playing; it is an extension of the individual warm-ups (to warm up the instruments, embouchure, fingers, tongue, and brain)” (p. 92). She goes on to say the use of sustained tone exercises are designed to allow the students adequate time to listen to themselves individually as well as listen to their sound in relation to the ensemble. The importance of a mouthpiece buzzing warm-up routine for brass instrumentalists is based on the recommendations of the leading authorities of brass playing. Even though there is not empirical data to support the benefits of buzzing on the mouthpiece, brass experts believe in its relevance enough to include a section, or a chapter, in their respective brass pedagogy books. Many authors have commented on the importance of proper embouchure formation for students to achieve success but few have proposed methods to teach a proper mouthpiece buzzing exercise for beginning brass students.

Establishing a functional embouchure may be one of the most important aspects of the teaching sequence. The ability to perform a proper buzz to produce a desired tone is necessary in producing a characteristic sound and establishing a solid foundation to build upon. Also since research has shown modeling to be an effective form of transferring information to students, it will be the method used in this study.

In summary, a review of literature showed (a) what an embouchure is and its proper formation as well as common embouchure problems that may hinder student progress; (b) correct placement of the mouthpiece; (c) attacks and tonguing, otherwise known as articulation; (d) making a sound, or buzzing, on the mouthpiece; (e) modeling behavior; (f) beginning instrumental/band instruction and how modeling is an effective way to transfer information to students; and (g) intonation and tone quality.

The purpose of this study is to determine if incorporating a daily mouthpiece buzzing
regiment, as modeled by the teacher, has an effect on the performance of a beginning band brass student. Specifically, does an author composed mouthpiece buzzing routine modeled by the teacher have an effect on beginning band brass students’ intonation and tone quality? The exercise was developed to establish and strengthen a good fundamental foundation for beginning brass students. It is also used to prepare the student’s embouchure for upcoming elements in the student’s method book as they encounter new pitches. When the students approach a higher pitch in their method book they will be better prepared physically to play the pitch.
CHAPTER III

METHOD

The present study looks at the effect of incorporating a daily mouthpiece buzzing routine on beginning brass instrumental students’ intonation and tone quality. To avoid splitting a single beginning band class into control and experimental groups, the researcher decided to locate a large enough instrumental program where there were multiple beginning band classes. The location for this study was chosen by recommendations of the faculty from a local university in the South because of school size, band size, and band program success. The majority of the schools in the region are smaller and typically have only one beginning band class. The school for this study has five beginning band classes that are homogeneous instrument settings allowing for separate brass class periods to serve as experimental and control groups.

At the time of the research, the school has an enrollment of approximately 515 sixth-grade students. Of these students, 31% were identified as gifted and 69% as traditional or low achieving (including self contained students). 66% of the students qualified for free or reduced lunch. Racial breakdown of the school is 53% Black, 37% White, 6% Hispanic, and 3% Asian. The demographics of the school were reflected in the band program.

The subjects are 6th grade beginning band brass students from a large band program in the northeast region of Mississippi. There were 56 students at the beginning of the semester. Due to
absences or students moving out of the school district, 45 students were tested. Two students’ posttest scores were omitted due to attendance under eighty percent during the treatment period resulting in 43 subjects for the study. The students are distributed across instruments as follows: trumpet (n = 14), horn (n = 6), trombone (n = 15), and baritone/euphonium (n = 8). These beginning brass students had the same instructor to strengthen control for extraneous variables and to bolster the reliability of the experiment. The music teacher participant (the student participants’ regular music teacher) is a woman whose primary instrument is trumpet with two years of previous teaching experience.

IRB certification for this study, “The Effect of an Author Composed Mouthpiece Buzzing Routine Modeled by the Teacher on Beginning Band Brass Students” (Protocol #17x-073) was requested and approved as Exempt under 45 CFR 46.101(b)(#1). A copy of parental consent forms, child assent forms, as well as documentation of the school principal’s approval of this study can be found in Appendix F.

Following Sehmann’s (2000) study, the researcher set a minimum attendance level of eighty percent (40 class meetings) during the 10-week instructional period. Subjects were enrolled in beginning band class with no previous brass instrument experience. Both experimental and control groups participated in homogenous, like instrument classes (trumpet, trombone, horn, baritone/euphonium). The control group proceeded with normal classroom activities under the direction of their regular instructor. Treatment for the experimental group was a daily mouthpiece buzzing routine designed by the investigator at the beginning of each class meeting (see Appendix A). The mouthpiece buzzing segment took place during the regularly scheduled band period so as not to disrupt the normal school schedule.
There were five beginning brass classes with approximately ten students per class. The classes were assigned as either the experimental group (mouthpiece buzzing exercise) or the control group. Classroom enrollment was compared to make experimental and control groups as even as possible. After the comparison, class periods 3 and 4 were assigned as the control group and class periods 2, 5, and 6 were assigned as the experimental group as designated by the researcher. There were days where class periods 2 and 3 have percussionist students included in the instructional time. Because of this, these class periods may be compared to each other as well as compared to periods 4, 5, and 6 to determine if the inclusion of percussionists has any effect on the results. This study is a posttest only design. There was no pretest due to the subjects’ lack of development. Since this is a posttest only design, all of the subjects were tested at the conclusion of the 10-week period.

The beginning band classes met five times per week for 57 minutes per class meeting. Prior to the inclusion of the treatment for this study, mouthpiece buzzing was used sporadically to demonstrate sound production for brass students as well as allow the students to produce a “buzz” on his or her own. Subjects in the experimental group performed a short mouthpiece buzzing routine everyday they met for band class. This daily mouthpiece buzzing routine was administered at the beginning of the class period by their regular instructor (Millsap, 1999). The control group received no special treatment and proceeded as normal.

Since the subjects were beginning instrumentalists and had to learn new notes, the study corresponded to the approximate time of the school year the students learn all of the pitches presented in the posttest. Concert C (horn equivalent, D) was the last pitch of the learning succession in the students’ beginning band method book that was included in the posttest. The
beginning band method book the subjects use is *Tradition of Excellence* (2010), written by Bruce Pearson and Ryan Nowlin, where the concert C is introduced on p.30. The instructor anticipated that the subjects would progress to the concert C by the beginning of the spring semester. To allow enough instructional treatment time, the study began in October.

**Instructional Procedures**

The mouthpiece buzzing routine was designed to address certain brass fundamentals and strengthen the embouchure to prepare subjects for upcoming challenges (Morrison, 2002). See Appendix A for mouthpiece buzzing routine. Areas addressed in the exercise are: tonguing, higher register, lower register, and long tones. The researcher conducted a training session with the instrumental instructor of the experimental and control groups. The training session was designed to make the instruction as clear as possible. The researcher explained the goals and theories behind the development of the mouthpiece buzzing exercise, proper execution of the exercise, and procedures that would follow at the end of the treatment period for data collection. The researcher then demonstrated the procedure to the instructor in its entirety to give a proper model of the exercise that was to be replicated in the classroom. The instructor then demonstrated the entire mouthpiece buzzing exercise to the researcher. As a reference, in case the instructor should forget some of the daily routine, the instructor was provided information explaining the routine in its entirety as well as instructions explaining how to deliver the information to the subjects (see Appendix A). Also, the instructor was told to use tone descriptors referenced by Cavitt (1996) when addressing subjects’ tone quality. The instructor kept daily records to ensure that the experimental group executed the buzzing routine during the
first few minutes of each class meeting for the 10-week treatment period. The researcher periodically observed the teacher performing the buzzing routine to ensure the routine was being executed properly. The researcher also observed an occasional control group to ensure no mouthpiece buzzing was taking place.

The mouthpiece buzzing exercise (see Appendix A) was designed to be executed in a teacher model “call and response” format (Robinson, 1996) with a tempo of a quarter note equaling one hundred beats per minute. The teacher began by tapping his or her foot and would say, “Repeat after me.” The teacher would give no verbal commands during the exercise. He or she buzzed a specific passage on his or her mouthpiece and the students repeated what the teacher has just modeled. The mouthpiece the instructor used was a Bach 3C trumpet mouthpiece.

The beginning of the exercise was designed to take a deep breath and channel the air stream through the aperture. As the air passes through the air stream the students tongued as if they were playing notes. The mouthpiece was then placed on the students’ embouchures performing the same exercise. The subjects would then add the buzz to the exercise by measure 4. The pitch being buzzed should be a mid-range/comfortable pitch that feels relatively “normal” for the subjects. In measures 5-7 the rhythm is a whole note, then two half notes, followed by four quarter notes. It is followed by the identical rhythm being buzzed at a higher pitch (mm. 8-10) then a lower pitch (mm. 11-13) than the initial pitch. Measure 14 is a glissando beginning by buzzing a low pitch and continuously buzzing upward to a higher pitch, while measure 15 is a glissando in the opposite direction. The subjects then began by buzzing a higher pitch and continuing the buzz downward. The duration of each glissando is four counts. This was
immediately followed by a measure (m. 17) containing four quarter notes. The first two quarter notes should be at a lower pitch followed by two quarter notes at a higher pitch. Measure 18 is similar to 17 but reverses the pitch order. The first two quarter notes are a higher pitch immediately followed by two quarter notes at a lower pitch. Measures 19-22 are glissandi as well that progressively get higher in pitch with each following measure. Measures 23-26 are similar to the previous four measures but these measures progressively get lower in pitch.

**Data Collection**

This study utilizes a posttest only design. No pretest was administered due to the subjects’ lack of development. At the conclusion of the 10-week investigation period, both groups (experimental and control) were given a posttest (see Appendix B) to compare the effectiveness of the treatment on the subjects’ intonation and tone quality (Millsap, 1999). The posttest was administered during regularly scheduled band classes. As suggested by Persellin (2006) subjects individually entered a quiet room where the posttest was administered by the researcher. Each individual posttest was recorded for analysis. Subjects performed an excerpt developed by the researcher (Appendix B). The excerpt was at a slightly easier level than the subjects’ playing ability at the time of the posttest. The posttest consisted of notes with mixed intervals in ascending and descending patterns.

At the beginning of the testing period, the researcher tuned the trumpet, trombone, and baritone/euphonium students to a concert F (G for trumpet). The horn students were tuned to his or her equivalent pitch, G (concert C). For horn in F, a G is a comfortable, mid-ranged, open note on the instrument easily accessible for beginning students. To ensure the subjects understand and
play the correct notes, the subjects were asked to identify the correct name and fingering/slide position for each note in the excerpt (South, 2013). Subjects were then given 30 seconds to familiarize themselves with the musical excerpt (South, 2013). At the conclusion of the 30 seconds, the participants played the sequence one time on their instrument to ensure the subject understood the musical excerpt (South, 2013). If there were any misunderstanding, or corrections needed, they were addressed during this time. Then the recording process began and the subjects performed the excerpt a second time. This was the performance analyzed for the study.

The audio recording process utilized the Tonal Energy (tonalenergy.com) app on an iPad and was recorded through a Blue Mikey external microphone. The Tonal Energy app was co-founded by the music app developing company, Sonosaurus LLC, and Philip Geiger (2016) and designed to compliment music education (Retrieved from tonalenergy.com). Each student was recorded on an individual track and coded based on instrument and subject number (South, 2013). The onscreen visualization of the signal allowed the researcher to observe that recording was taking place and that the signal was sufficient, neither too loud nor too soft, to ensure a quality recording.

To assess intonation, the researcher analyzed the sustained portion of selected pitches from the student’s audio recording using the computer software program Praat (Boersma & Weenink, 2013). Praat is used to analyze sound parameters as well as analyze frequency (Boersma, 1993; Hopkins, 2015). Each measure of the posttest (see Appendix B) consists of two pitches. Each measure begins with a concert F followed by another pitch. The second pitch of every measure was the pitch selected for analysis. The audio files were exported from the iPad and imported into Praat. Once imported, a frequency analysis of the sustained portion was
measured, in hertz, to determine the fundamental frequency of the actual pitch being played. Following the Hopkins (2015) study, a research assistant independently analyzed the audio files. The researcher’s and researcher assistant’s fundamental frequencies were compared for reliability. The correlation was .97 (agreements/agreements plus disagreements). The fundamental frequency measurements were averaged, then converted into cent deviation.

To assess tone quality, experienced adjudicators that have experience working with beginning brass students, analyzed each subject’s complete recording. The researcher and his advising committee chose adjudicators. The researcher randomized the order of recordings the adjudicators listened to. Each adjudicator listened to the recordings on a CD using a Sony CD Walkman D-EJ011 with Bose QuietComfort 15 Acoustic Noise Canceling Headphones (provided by researcher) and rated each subject’s tone quality on a 5-point Likert-type scale. Prior to listening to the subjects’ recordings, the adjudicators attended a training session to practice using the 5-point Likert-type scale (Millsap, 1999; Sehmann, 2000).

**Field Notes**

Field notes were taken by the researcher regarding general impressions of the experimental procedure. For fidelity of implementation, the researcher randomly observed the instructor giving the treatment to the experimental group as well as observing no treatment being given to the control group. Notes were made on teacher instruction completion as well as the subjects’ response and progress. Also, the instructor made observations and general thoughts about the study.
Null Hypotheses

1. There will be no statistically significant difference in the posttest scores for intonation between the experimental group and the control group.

2. There will be no statistically significant difference in the posttest scores in tone quality between the experimental group and the control group.
CHAPTER IV

RESULTS

The central questions asked in this study were: 1) does the daily implementation of a mouthpiece buzzing routine have an effect on the intonation of beginning band brass students; and 2) does the daily implementation of mouthpiece buzzing routine have an effect on the tone quality of beginning band brass students?

The present study is an investigation of the effects of an author-composed mouthpiece buzzing routine modeled by the teacher on beginning band brass students’ intonation and tone quality. The experimental group (n = 27) utilized a daily mouthpiece buzzing routine modeled by the instructor at the beginning of each class period. The control group (n = 16) received no supplemental treatment and proceeded through normal classroom activities. The duration of the instructional period was ten weeks. This study utilizes a posttest only design. The posttest consisted of eight notes embedded within mixed intervals in ascending and descending patterns. Subjects were recorded performing the excerpt and the audio recordings were analyzed to determine if there was a significant difference in intonation and tone quality.
Field Notes

The researcher recorded field notes during seven classroom observations to determine that the teacher and student participants were executing the prescribed procedure. Notes were made on instructional delivery as well as the students’ responses and progress.

Visit One
This observation was after approximately one week of treatment. The instructor executed buzzing routine properly. Subjects weren’t necessarily matching pitch but were attempting to imitate what the instructor was buzzing.

Visit Two
This observation was after approximately two weeks of treatment. The instructor executed buzzing routine properly. The students were responding well to the instructor. The students were beginning to buzz closer to the pitches being modeled. They were also able to sustain the pitches for a longer duration.

Visit Three
During week three, the normal classroom procedures were somewhat disrupted due to an upcoming performance. Woodwind and brass students, as well as their equipment (chairs and stands), were combined in a single rehearsal space. To accommodate the experimental condition the teacher took the brass players to a room where they executed the buzzing routine. The disruption of typical daily activities seemed to affect the students somewhat; some were distracted and off task, some had difficulty performing without a chair. Once finished, the instructor and subjects returned to the full band rehearsal. The instructor executed the buzzing
routine properly. The subjects are showing progress. Pitches were more sustained than previous observations. Also, occasional subjects were imitating the instructor’s pitch more closely.

Visit Four

This observation was after approximately four weeks of treatment. Similarly to the previous observation, the subjects were preparing for their upcoming concert. Again, the subjects were removed from the rehearsal to execute the buzzing routine. The instructor executed the buzzing routine properly. Subjects are showing progress. Students are using more air while buzzing and sustaining tone for longer durations. Also, more students are matching the pitches being modeled by the instructor.

Visit Five

This observation was after approximately five weeks of treatment. This was the last week before the subjects observed the Christmas holiday as well as New Year’s Day. The subjects were involved with state-testing. Band rehearsal did not take place.

Visit Six

This observation was one week after the subjects returned from the Christmas holiday as well as New Year’s Day, after approximately seven weeks of treatment. The instructor executed the buzzing routine properly. Subjects seem to be progressing well. The majority of the students are imitating the buzzing routine entirely. Subjects are using air to support tone quality and sustain modeled pitches.
Visit Seven

This observation was after approximately nine weeks of treatment. The instructor executed the buzzing routine properly. Subjects seem to be progressing well. Audibly observable wider pitch range among subjects as well sustained pitches.

The instructor also made observations and general thoughts about the study. The instructor indicated that the treatment groups seemed to have a more mature tone quality and tend to use their air more effectively. The treatment group also seemed to play more stylistically appropriately, especially in regards to legato playing. The differences were evident to the instructor as the study progressed.

Intonation

The first null hypothesis stated: There will be no statistically significant difference in the posttest scores for intonation between the experimental group and the control group. To assess intonation, the researcher and the researcher’s assistant analyzed the sustained portion of the eight predetermined pitches from each subject’s audio recording to determine the fundamental frequency of the target pitches (see Appendix H). Once the fundamental frequencies were determined, they were converted into cent deviation (see Appendix I). The cent deviations were averaged to determine the mean deviation for each pitch. Data was then transposed for purposes of calculating results.

The data for the subjects was inputted into SPSS for analysis. A Levene’s test was performed to determine the homogeneity of variances. An independent-samples t-test was conducted to compare the means to determine if the author-composed mouthpiece buzzing routine has an effect on beginning band brass students’ intonation compared to a control group.
Each pitch was analyzed separately. Table 1 shows the means and standard deviations of the posttest scores for each group.

Table 1
*Intonation Mean and Standard Deviation*

<table>
<thead>
<tr>
<th>Pitch</th>
<th>Treatment Group (n = 27)</th>
<th>Control Group (n = 16)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
</tr>
<tr>
<td>G/D</td>
<td>46.64</td>
<td>196.74</td>
</tr>
<tr>
<td>A/E</td>
<td>-114.28</td>
<td>244.67</td>
</tr>
<tr>
<td>Bb/F (high)</td>
<td>-94.75</td>
<td>209.88</td>
</tr>
<tr>
<td>C/G (high)</td>
<td>-184.02</td>
<td>281.02</td>
</tr>
<tr>
<td>Eb/Bb</td>
<td>-6.25</td>
<td>39.15</td>
</tr>
<tr>
<td>D/A</td>
<td>18.94</td>
<td>93.24</td>
</tr>
<tr>
<td>C/G (low)</td>
<td>66.48</td>
<td>132.53</td>
</tr>
<tr>
<td>Bb/F (low)</td>
<td>52.43</td>
<td>150.65</td>
</tr>
</tbody>
</table>

*Note.* Pitches are in order of posttest. The second pitch is the sounding concert pitch for F Horn.

This portion pertains to the target pitches in ascending intervals of the posttest. The mean for the pitch G (horn equivalent D) was 46.64 cents flat for the treatment group while the control group was 6.42 cents sharp. Even though the control group was more accurate, there was no statistically significant difference in the scores for the treatment ($M=-46.64$, $SD=196.74$) and control ($M=6.42$, $SD=29.14$) conditions; $t(41) = -1.067$, $p = .292$. The mean for the pitch A
(horn equivalent E) was 114.28 cents flat for the treatment group and was 103.30 cents flat for the control group. Both groups were below the pitch approximately the same distance resulting in no statistically significant difference in the scores for treatment ($M=-114.28$, $SD=244.67$) and control ($M=-103.30$, $SD=173.18$) conditions; $t (41) = -0.157, p = .876$. The mean for the upper B-flat pitch (horn equivalent F) was 94.75 cents flat for the treatment group and 128.26 cents flat for the control group. Even though there was a 33.51 cent deviation in favor of the treatment group, the results were not statistically significant in the scores for the treatment ($M=-94.75$, $SD=209.88$) and control ($M=-128.26$, $SD=228.46$) conditions; $t (41) = 0.490, p = .627$. The mean for the upper C (horn equivalent G) was 184.02 cents flat for the treatment group and 221.87 cents flat for the control group. Similar to the previous pitch, there was a divergence in cent deviation in favor of the treatment group, but yielded no statistically significant difference in the scores for the treatment ($M=-184.02$, $SD=281.02$) and control ($M=-221.87$, $SD=317.77$) conditions; $t (41) = 0.407, p = .686$.

This portion pertains to the target pitches in descending intervals of the posttest. The mean for the pitch E-flat (horn equivalent B-flat) was 6.25 cents flat for the treatment group while the control group was 66.64 cents sharp. Albeit not statistically significant, the pitch was more accurate in the scores for the treatment ($M=-6.25$, $SD=39.15$) than the control ($M=64.64$, $SD=157.74$) conditions; $t (41) = -2.302, p = .088$. The mean for the pitch D (horn equivalent A) was sharp for both groups. The treatment group was 18.94 cents sharp while the control group was 27.68 cents sharp. Both groups were above the pitch approximately the same distance resulting in no statistically significant difference in the scores for treatment ($M=18.94$, $SD=93.24$) and control ($M=27.68$, $SD=101.09$) conditions; $t (41) = -0.288, p = .775$. The next
pitch was lower C (horn equivalent G). The treatment group was 66.48 cents sharp and the control group was 63.80 sharp. Again, since both groups were approximately the same distance sharp the results indicated no statistically significant difference in the scores for the treatment ($M=66.48, SD=132.53$) and control ($M=63.80, SD=106.43$) conditions; $t\ (41) = 0.069, p = .945$.

Lastly, the mean for the lower B-flat (horn equivalent F) was 52.43 cents sharp for the treatment group and 128.74 cents sharp for the control group. Even though the treatment group was 76.31 cents more accurate than the control group, there was no statistically significant difference in the scores for the treatment ($M=52.43, SD=150.65$) and control ($M=128.74, SD=242.03$) conditions; $t\ (41) = -1.278, p = .268$. These results suggest that the inclusion of a daily mouthpiece buzzing routine has a very limited effect on beginning band brass students’ intonation. Crosstabulations were performed and determined that the sample size wasn’t sufficient enough to analyze separate instrumentation.
Figure 1. Intonation for each performed note for both treatment and control groups. The notes are in order of the posttest. Bars represent the mean degrees sharp or flat per pitch. Zero represents perfectly in tune pitch.

Tone Quality

The second null hypothesis stated: There will be no statistically significant difference in the posttest scores in tone quality between the experimental group and the control group. To assess tone quality, each subject’s recording was analyzed by adjudicators that have experience working with beginning brass students. The recordings of the subjects were placed on a CD in a random order. The adjudicators listened to the CD and rated each subject’s tone quality on a 5-point Likert-type scale. A score of one denoted the lowest possible rating and a score of five denoted the highest possible rating. Cohen’s $\kappa$ was selected to determine the interrater reliability.
between the two adjudicators’ tone quality evaluations of eight tones for each of the 43 student participants. There was slight agreement between the adjudicators’ ratings, $\kappa = .147$. In regards to the 5-point Likert-type scale, the number given to each subject is the sum of the adjudicator’s ratings (see Appendix J). Thus, a total score of two denoted the lowest possible rating and a total score of ten denoted the highest possible rating. It was determined to use a t-test to compare the means of the two groups to determine if they are statistically different from each other. The data for the 43 student participants was inputted into SPSS for analysis.

Table 2 shows the means and standard deviations of the posttest scores for each group for tone quality. The difference in mean rating for the treatment group is 0.55 higher than the mean rating for the control group.

Table 2

Tone Quality Mean and Standard Deviation

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>27</td>
<td>5.93</td>
<td>1.33</td>
</tr>
<tr>
<td>Control</td>
<td>16</td>
<td>5.38</td>
<td>2.00</td>
</tr>
</tbody>
</table>

An independent-samples t-test was conducted to determine if the inclusion of an author-composed mouthpiece buzzing routine had an effect on beginning band brass students’ tone quality. When comparing the difference in mean scores, there was no statistically significant difference in the scores for treatment ($M=5.93$, $SD=1.33$) and control ($M=5.38$, $SD=2.00$)
conditions; $t (41) = 1.09, p = 0.336$. These results suggest the inclusion of a daily mouthpiece buzzing routine does not have an effect on beginning band brass students’ tone quality. Crosstabulations were performed and determined that the sample size wasn’t sufficient enough to analyze separate instrumentation.
CHAPTER V
DISCUSSION

Instrumental music has become an essential part of the public school curriculum in the United States. In some situations, it is the primary medium for music education in schools. So, it is imperative that students develop strong performance fundamentals in order to optimize their potential as performers. It is the responsibility of the instrumental educator to develop and utilize the most beneficial teaching techniques and to have a concept of what is ideal for beginning young instrumentalists. For brass students, forming a proper embouchure is paramount. The educator must also anticipate and predict common problems in hopes to avoid them, allowing the students to achieve optimal results (Millican, 2013). Finally, it is the responsibility of the educator to make conscious decisions about prioritizing, as well as sequencing, the instructional material (Millican, 2013).

The means of instructional delivery is also of importance. As studied by Dickey (1992), verbal instruction, albeit necessary, can be misinterpreted. Nonverbal instruction, such as modeling, is an effective way of communicating information in the classroom (Fredrickson, 2005). Other studies have shown modeling to be a highly effective form of instruction (Taylor, 2006; Woody, 1999, 2003) and tend to be superior to cases with no-model (Henley, 2001), but not in all cases (Montemayor, Wiltshire, & Morrison, 2004). MacLeod (2010) furthered the
discussion by stating the instructors must be able to model the desired behavior incorrectly as well as correctly.

The purpose of the present study was to investigate the effects of the inclusion of a daily mouthpiece buzzing routine for brass instrumentalists, as modeled by the teacher, during their first year of instruction. The mouthpiece buzzing routine was designed to address certain brass fundamentals and strengthen the embouchure to prepare the students for upcoming challenges they may encounter. Does this daily mouthpiece buzzing routine have an effect on the intonation and tone quality of beginning band brass students? After a review of literature, teacher modeling was chosen as the preferred means of delivering this information to students.

Forty-three beginning band brass students participated in either an experimental or a control group. The experimental group performed a mouthpiece buzzing routine, designed by the researcher, at the beginning of each class meeting. Their normal music teacher taught the buzzing routine to the students and led them through the routine each day. While the routine was in progress, the instructor referenced tone quality using the tone descriptors identified by Cavitt (1996). The duration of the study was ten weeks. At the conclusion of the treatment period, the subjects were individually recorded performing the posttest. Each recording was analyzed for intonation and tone quality. The researcher and an assistant measured the fundamental frequency of the selected pitches and converted the fundamental frequencies to cent deviation. An independent-samples t-test was conducted to compare the means to determine if there was an effect on the subjects’ intonation. Adjudicators with beginning band experience rated the subjects’ tone quality. The adjudicators listened to a recording of each subject and rated his or her overall tone quality on a 5-point Likert-type scale.
The results indicate the daily implementation of a mouthpiece buzzing does not have a statistically significant effect on beginning brass students’ intonation or tone quality. Although not statistically significant, the measures lean toward positive embouchure development and tone quality. A Levene’s test was performed to determine the homogeneity of variances. Some of the t-tests may have been insignificant due to the wide ranges of variance in the two sets of scores. It is worth mentioning and considering that pitch changes greater than five to six cents would be noticeable (Loeffler, 2006), while remaining statistically insignificant.

The middle range pitches, which are more comfortable to produce than the upper and lower range pitches, were fairly consistent between both groups. The first pitch, concert G (horn equivalent D) resulted with the mean of the treatment group 46.64 cents flat while the mean for the control group was only 6.42 cents sharp. There was a 53.06 cent deviation resulting in a perceivable audible difference between groups. The control group was more accurate for this pitch as well as the next pitch, concert A (horn equivalent E). In this instance both groups were flat by approximately the same distance. The mean for the control group was 103.30 cents flat while the mean for the treatment group was 114.28. For this pitch, there was a 10.98 cent deviation between groups. The distance in cent deviation between treatment group and control group are audibly closer to each other than the previous pitch. The results indicated no statistically significant difference for the pitch G and A. This determines the mouthpiece buzzing routine does not have a sizeable effect on either of these pitches. Since there was a large difference in cent deviation for concert G, the control group was audibly closer to the target than the treatment group.
The next two pitches in the experiment, albeit not statistically significant, have an interesting outcome for embouchure development. The purpose of a daily mouthpiece buzzing routine is to prepare a student’s embouchure for foreseeable challenges for brass players. Developing range, both higher and lower, can be challenging for brass musicians, especially young, developing students. The subjects in this study had only been playing their instruments for a few months at the time of the posttest. The two highest pitches in the study were a high concert B-flat (horn equivalent F) and high concert C (horn equivalent G). The subjects were introduced to high C approximately one week prior to the posttest. As stated in the previous chapter, the results were not statistically significant between groups. Also, both treatment and control groups’ means were substantially flat for both high B-flat and high C, but the treatment group was closer to “in tune” than the control group. The treatment group was 33.51 cents closer to the high B-flat and 37.85 cents closer to the high C than the control group. The mean for the high B-flat for the treatment group was 94.75 cents flat while the mean for the control group was 128.26 cents flat. For high B-flat, there was a 33.51 cent difference between groups. This is not statistically significant but audibly closer for the treatment group. Similarly, the high C was also audibly closer for the treatment group. The treatment group was 37.85 cents more accurate than the control group. These findings suggest that the treatment group embouchures may have been developing to play pitches in their higher register more accurately.

The next pitch in the posttest sequence, E-flat (horn equivalent B-flat), is also a middle range pitch. The control group was 66.64 cents sharp while the treatment group was only 6.25 cents flat. Even though there was a 72.89 cent differential between groups, the results were not statistically significant. The cent differential would also yield a noticeable audible difference.
The results may be insignificant due to the wide range in variance in the scores. At first the data for this middle range pitch didn’t seem important but if one looks at the previous pitches of the posttest, there is a possible explanation for the difference in the accuracy for this particular pitch. The subjects were playing at the top of their ranges, high B-flat and high C, prior to this pitch. Perhaps the treatment groups’ embouchures were more prepared for the intervallic distance and were able to adjust more accurately than the control group, suggesting that the treatments groups’ embouchures may be more developed than the control group when encountering larger intervals.

The next two sequential pitches in the posttest, which are also middle range notes, were concert D (horn equivalent A) and low concert C (horn equivalent G). The mean for the pitch D was sharp for both groups. Both treatment and control groups were above the pitch approximately the same distance. The treatment group was 18.94 cents sharp and the control group was 27.68 cents sharp. The next pitch, low concert C, was even closer between groups. The treatment group was 66.48 cents sharp and the control group was 63.80 sharp. There is only 2.68 cents difference between groups. The results indicated no statistically significant difference in the means between both groups for either concert D or low concert C. Because of the closeness in means, there is a limited perceived audible difference between groups.

The last pitch of the posttest was lower concert B-flat (horn equivalent F). Similar to the higher concert B-flat and higher concert C, because of a beginning brass students’ range, the lower concert B-flat can be challenging due to the embouchure development of the students. At the time of the posttest, the lowest pitch the subjects were introduced to was the lower B-flat. The mean for the treatment group was 52.43 cents sharp and 128.74 cents sharp for the control
group. Albeit not a statistically significant difference between the means for both groups, the treatment group was 76.31 cents closer to the target pitch than the control group, which, perceptually, is a large audible difference. Similar to the results for the pitch E-flat, the data may not be statistically significant due to the wide range in variance. The treatment group was able to achieve a lower fundamental frequency mean, suggesting that the treatment groups’ embouchure may have been more developed, or prepared, to play pitches in their lower registers. Considering the differences in the low B flat and the higher B flat and C may imply that the subjects in the treatment group have developed an overall larger pitch range on their instruments. Lastly in regards to intonation, and because of variance among the two groups’ scores, the results of the study yielded an inconsistent effect. However, in five of the eight comparisons there is an audible difference in mean pitch cent deviations between the two groups.

After analyzing treatment and control groups in their totality, individual subject data was reviewed. Each subject’s individual mean and range were determined (See the results in Table 8 in Appendix I). Subjects individual intonation mean was determined by averaging the cent deviation for all of the pitches performed by each subject. Range was determined by calculating the cent deviation between the sharpest pitch and flattest pitch. A narrow range of cent deviation meant the student performed all the notes of the posttest with more consistency. A mean score close to zero meant the student was more accurate playing all of the target pitches.

Range was observed first. Some of the ranges were very quite large yielding inconsistency in pitch. A student may have an accurate mean but his or her range score is large. This results in an inconsistent performance among the pitches of the posttest. So, the researcher looked for the subject’s scores with a range of less than one hundred and then observed those
students’ mean scores for pitch accuracy to observe overall consistency and accuracy. Fifty-six percent of the subjects in the treatment group had a cent deviation range of less than one hundred while the control group had thirty-one percent of their subjects with a cent deviation range of less than one hundred. Of those students, the lowest mean for overall pitch accuracy was a cent deviation of 4.35. This student was in the treatment group. The next three most accurate cent deviation means were 5.28, 6.28, and -8.42. These students were also in the treatment group. The next accurate cent deviation mean was 8.60. This was the most accurate among the students in the control group with a range of less than one hundred. By observing the individual students’ cent deviation mean and pitch accuracy, there were more subjects from the treatment group with a cent deviation range of less than one hundred and of those students, there were more subjects closer to the target mean for pitch accuracy.

The implementation of a daily mouthpiece buzzing routine did not produce statistically significant ratings of beginning band brass students’ tone quality. The instructor modeled the desired characteristic tone quality throughout the duration of the study. The instructor also described tone quality using tone descriptors identified by Cavitt (1996). Two experienced adjudicators listened to recordings of the subjects and rated each of them on a 5 point Likert-type scale. Cohen’s $\kappa$ was selected to determine the interrater reliability between the two adjudicators’ tone quality evaluations of eight tones for each of the 43 student participants. There was slight agreement between the adjudicators’ ratings, $\kappa = .147$. Even though there were a high number of disagreements, the adjudicator’s ratings were usually within one point of each other. There were only two instances where there was a two point difference between ratings. For more consistency, the rubric may need to be reworded or more adjudicator training may be necessary.
The score recorded for each subject is the sum of the adjudicator’s ratings (see Appendix J). Thus, a total score of two denoted the lowest possible rating and a total score of ten denoted the highest possible rating. A t-test was performed to compare means between the treatment group and the control group. When comparing the difference in mean scores, there was no statistically significant difference in the scores for treatment (M=5.93, SD=1.33) and control (M=5.38, SD=2.00) conditions. Albeit not statistically significant, the results of the means indicate the treatment group was able to achieve higher ratings for tone quality. A longer duration may yield more significant results for improving tone quality.

**Implications**

The results of this study do not support the premise that, as part of beginning band instruction, a daily mouthpiece buzzing routine will significantly improve intonation and tone quality. These findings do not support Millsap (1999) stating the importance of a specifically designed warm-up procedure for the development of brass students. These findings do not support brass pedagogues’ assertions about the importance of a mouthpiece buzzing warm-up routine for developing brass instrumentalists (Fink, 1977; Roberts, 2002; Sanborn, 2004) or to progress more quickly than if the student began directly on the instrument (Fallis, 2001). Also, this study did not reinforce, nor hinder, the use of modeling as the format for transferring information to the students. Perhaps the duration of the study was too short to measure a difference that is significant though the study did measure slight improvements in accuracy for higher and lower pitches of the students’ range as well as slight improvements in individual tone quality. The process of playing a brass instrument with a characteristic tone quality, as well as
achieving pitch accuracy, is a developmental process. Teachers and researchers will continue to search out methods for student improvement because good teachers realize the importance of fundamentals and that students should establish a solid fundamental foundation (Unverricht, 2008) allowing the students to achieve optimal success (Britten, 2005).

Questions Recommended for Future Research

Although the results were not statistically significant in comparing means of beginning band brass students’ intonation and tone quality when implementing a daily mouthpiece buzzing routine, the means did show improvement for the treatment group. The following recommendations and suggestions for future research can be derived from this study:

1. The length of this study could be extended for a longer duration to investigate the possibility of greater improvement in beginning band brass students’ intonation.
2. The length of this study could be extended for a longer duration to investigate the possibility of greater improvement in beginning band brass students’ tone quality.
3. A larger pool of subjects may yield different results.
4. This study could be conducted with more experienced students to determine if the incorporation of a daily mouthpiece buzzing routine could achieve improvements with older students.
5. An extension of this study could incorporate the use of a tuning device to achieve more accurate pitches.
6. The use of a recorded model or synthesizer may achieve more accurate pitches as well as improve tone quality.
BIBLIOGRAPHY


LIST OF APPENDICES
APPENDIX A: TEACHER INSTRUCTIONS

AND

MOUTHPIECE BUZZING ROUTINE
Teacher Instructions

1. Set metronome to 100 beats per minute.

2. Set reference pitch to a concert F.

3. Once all of the students are in place you may begin the routine.

4. Tell the students, “Repeat after me.” Then proceed through the routine.

5. Reminder: Every measure is repeated with the exception of the fourth line.

6. Reminder: Once the exercise has started do not stop unless it is absolutely necessary.

7. Mark the provided calendar with a checkmark for completion. Also in the calendar, write down any anomalies that have occurred.
Beginning Band Brass Daily Routine

Instructions:
1. Begin by tapping your foot.
2. "Repeat after me." (Q&A format)
3. Every measure is repeated with the exception of line 4.

Remember: Once the exercise has started do not stop unless it is absolutely necessary.

Begin buzzing

\[ \text{m. 3} \]
\[ \text{through the mouthpiece} \]
\[ \text{No buzzing} \]

1. Begin buzzing

\[ \text{m. 4} \]

\[ \text{Higher pitch} \]

\[ \text{Lower pitch} \]

\[ \text{Sirens} \]

\[ \text{Sirens} \]

Each measure goes higher, or lower, than the previous measure.

Remember the measures on this line are not repeated.
APPENDIX B: POSTTEST
APPENDIX C: POSTTEST PROCEDURE
Posttest Procedure

* Because students will be taking the posttest during normal rehearsal time, no warm-up time will be needed.

1. Welcome

2. Instrument tuning - Trumpet, trombone, and baritone/euphonium students tune to a concert F (G for trumpets). Horn students tune to his or her instrumental equivalent, G (concert C).

3. Note identification - Subjects identify each note and corresponding finger combination/slide position.

4. Practice/Familiarization time - Subjects have 30 seconds to familiarize themselves with the music.

5. Practice - Subjects play the sequence one time on his or her instrument to ensure the subject understands the music.

6. Correction time (if needed)

7. Posttest
   a. Researcher: “After I press the record button, I will state your subject number, instrument, name, and class period. Next, I will play four clicks with the metronome. After the four clicks, you will play the music.”
   b. Recording
      i. Researcher will push record.
      ii. Researcher will state subject’s number, instrument, name, and class period.
      iii. Researcher will play four clicks with a metronome
      iv. Subjects will play music
APPENDIX D: ADJUDICATOR LIST

AND

LETTER OF REQUEST FOR PARTICIPATION
Letter of Request for Adjudicator Participation

Date

Name
Address

Address

Address

Dear _____

In partial fulfillment of the degree requirements for a Ph.D. in Music with an emphasis in Music Education, I am conducting a research to determine if incorporating a mouthpiece buzzing regiment, as modeled by the teacher, has an effect on the performance of a beginning band brass student. Based on your musical expertise, I am requesting your assistance in evaluating audio recordings of performances of beginning band brass students. You will be asked to evaluate these recordings.

The total evaluation process should take no more than 45 minutes of your time. I will provide evaluation instructions, audio recordings, score sheets, and envelopes with return postage. If you will be able to participate, you will receive the audio recordings by February 13. You will have two weeks to complete the evaluations and return them to me by March 1. Whether you decide to participate or not, please complete and return the enclosed response form by February 1.

Sincerely,

Jason W. Beghtol
2603 Huckleberry Tr.
Tupelo, MS 38801
(662) 397-6150
Please check the following:

__________     Yes. I will be able to serve as an adjudicator in your study.

__________     No. I will not be able to serve as an adjudicator in your study.

__________     Yes. You may use my name in the list of judges participating in this study.

__________     No. You may not use my name in the list of judges participating in this study.

Name: __________________________________________________

Signature: ________________________________________________

Date: ____________________________________________________
List of Adjudicators

Andy Hall
806 Byrne St.
New Albany, MS  38652

Leslie Mitchell
1677 Forest Hill Cove
Belden, MS  38826
APPENDIX E: ADJUDICATION SHEET

AND

ADJUDICATOR INSTRUCTIONS
Adjudication Sheet

Performance #1

**Tone Quality** Subject #: ______ Instrument: __________________

Please rate subjects’ overall tone quality: (circle your answer)

Uncharacteristic 1 2 3 4 5 Characteristic

**Reference Chart**

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<table>
<thead>
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<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Tone is completely uncharacteristic for brass instrument.</td>
<td>Tone is mostly uncharacteristic for brass instrument.</td>
<td>Tone is somewhat characteristic for brass instrument.</td>
<td>Tone is mostly characteristic for brass instrument.</td>
<td>Tone is completely characteristic for brass instrument.</td>
<td></td>
</tr>
</tbody>
</table>

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Performance #2

**Tone Quality** Subject #: ______ Instrument: __________________

Please rate subjects’ overall tone quality: (circle your answer)

Uncharacteristic 1 2 3 4 5 Characteristic

**Reference Chart**

<p>| | | | | | |</p>
<table>
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<td>1</td>
<td>2</td>
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<td>Tone is somewhat characteristic for brass instrument.</td>
<td>Tone is mostly characteristic for brass instrument.</td>
<td>Tone is completely characteristic for brass instrument.</td>
<td></td>
</tr>
</tbody>
</table>
Letter for Adjudicators

Dear [Mr./Ms. Name]:

Thank you again for agreeing to participate in this study. Enclosed you will find a CD of the subjects recordings, 25 adjudication sheets, and evaluation instructions. Please follow the instructions carefully and return the materials to me by March 1. If you have any questions, please feel free to call me.

Sincerely,

Jason W. Beghtol
2603 Huckleberry Tr.
Tupelo, MS 38801
(662) 397-6150
Evaluation Instructions for Adjudicators

The following materials will be needed for the evaluation process:

1. Sony CD Walkman D-EJ011 and Bose QuietComfort 15 Acoustic Noise Canceling Headphones (provided by researcher).
2. Pencil or Pen
3. Approximately 45 minutes of undisturbed time.

In the evaluation packet you will find the following materials:
1. CD of the subjects’ recordings
2. Adjudication sheets

You will be evaluating the tone quality of beginning band brass students. These students have been in the band program less than one year. You will be rating each subject’s performance based on a 5 point Likert-type scale where 1 is an uncharacteristic brass tone quality and 5 is a characteristic brass tone quality.

Characteristic Brass Tone: According to Phillip Farkas (1956), a characteristic brass tone exemplifies desirable qualities of the instrument, such as a full, centered, dark, open, focused sound. Whereas an uncharacteristic brass tone is pinched, thin, tight, uncentered, and weak. Also, if the sound is too dark, too bright, too open, too closed, too big, or too soft, it may be cause for an uncharacteristic tone quality.

Steps for Evaluation:

1. Please be sure you evaluate all performances at the same time in a quiet, undisturbed setting.
2. Please listen to and evaluate only one performance at a time.
3. After you have listened to a performance in its entirety, please rate the subjects’ overall tone quality. Please only score on the 5 point scale provided. Clearly circle your answer.
4. Once you have finished the score sheet for performance #1, proceed to the next performance. Pause between performances if necessary.
5. Repeat the above steps for all performances.
6. Please note: I am NOT interested in having you rank the performances. If you feel some aspects of the performances are equal, he or she may receive the same score.
7. After you have completed all of the score sheets, place all of the materials in the envelope provided and return to me by March 1.

   Again, thank you very much for your participation in this study!
APPENDIX F: HUMAN SUBJECTS
AND
CONSENT FORMS
Consent Form

Title of Study
The Effect of an Author Composed Mouthpiece Buzzing Routine on the Intonation and Tone Quality of Beginning Band Brass Students.

Performance Site
Milam Elementary School – Grade 6

Investigator
Jason Beghtol, University of Mississippi – jwbeghtol@nemcc.edu

Purpose of the Study
The purpose of this study is to determine if incorporating a daily mouthpiece buzzing regiment, as modeled by the teacher, has an effect on the performance of a beginning band brass students’ intonation and tone quality.

Subjects
Subjects are brass students enrolled in beginning band class and have less than one year of playing experience.

Study Procedures
The beginning band brass classes will be separated into experimental and control groups. The experimental group will receive the treatment of a brief daily mouthpiece buzzing routine delivered to them by his or her normal teacher at the beginning of each class meeting. The mouthpiece buzzing routine will be integrated into the students’ warm-up activities which occur at the beginning of the class period. The control group will proceed with normal classroom activities. The study will last for 10-weeks. At the conclusion of the 10-week period, the students will be involved in an individual “testing” session with the investigator. Participants will be recorded playing a short musical excerpt that will be collected and analyzed. All of the recordings will be kept confidential and stored in a secure environment.

Benefits
Subjects will be exposed to a technique that may have positive impact on his or her pitch accuracy and tone quality. The study may yield valuable information about beneficial brass techniques to be used in a beginning band setting.

Risks
There are no risks or stresses foreseen with this study.

Right to Refuse
Subjects may choose not to participate in, or to withdraw consent from, the study at any time without penalty or loss of any benefit to which they might otherwise be entitled.
Privacy
Results of the study may be published, but no names or identifying information will be included in the publication. Subject identity will be confidential, and will not be released in any individually identifiable form without prior consent unless otherwise required by law.

IRB Approval
This study has been reviewed by The University of Mississippi’s Institutional Review Board (IRB). The IRB has determined that this study fulfills the human research subject protections obligations required by state and federal law and University policies. If you have any questions about subjects’ rights or other concerns, please contact the IRB at (662)-915-5006 or irb@olemiss.edu.

Please ask the researcher if there is anything that is not clear or if you need more information regarding specifics of this study.

Signature
I have read the above information. I agree to allow my child to participate in the study described above and acknowledge the investigator’s obligation to provide me with a signed copy of this consent form.

Student’s Name: _________________________________________________________

Parent/Guardian Signature: _________________________________________________

Date: ________________
I, ________________________________, agree to be in a study to help determine if buzzing on my mouthpiece during band rehearsal will help me to play notes better and have a better sound. I understand that this study will require no extra time outside of class, but that I will be asked to play my instrument by myself in a separate room one time during band rehearsal. During this time, the person in charge of the study will use an iPad to record me and determine if I sound good and am playing my notes correctly. I can decide to stop being in the study at any time without getting in trouble.

Child’s Signature: ________________________________  Age: _____

Date: ______________ 

*Witness: ________________________________

Date: ______________

* (N.B. Witness must be present for the assent process, not just the signature by the minor)
APPENDIX G: FREQUENCY CHART
Table 3

*Frequency Chart (in Hertz)*

<table>
<thead>
<tr>
<th>Instrument</th>
<th>G</th>
<th>A</th>
<th>Bb</th>
<th>C</th>
<th>Eb</th>
<th>D</th>
<th>C</th>
<th>Bb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trumpet (concert pitch)</td>
<td>392.00</td>
<td>440.00</td>
<td>466.16</td>
<td>523.25</td>
<td>311.13</td>
<td>293.66</td>
<td>261.63</td>
<td>233.08</td>
</tr>
<tr>
<td>Trombone/Baritone</td>
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<td>220.00</td>
<td>233.08</td>
<td>261.63</td>
<td>155.56</td>
<td>146.83</td>
<td>130.81</td>
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<td>Horn (equivalent pitch)</td>
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<td>349.23</td>
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<td>233.08</td>
<td>220.00</td>
<td>196.00</td>
<td>174.61</td>
</tr>
</tbody>
</table>

*Note.* Frequencies for equal-tempered scale, $A_4 = 440$ Hz.
APPENDIX H: SUBJECTS’ RESULTS

IN

FUNDAMENTAL FREQUENCIES
Table 4

_Treatment Group Results for Intonation in Fundamental Frequencies (in Hertz)_

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instrument</th>
<th>G(D)</th>
<th>A(E)</th>
<th>Bb(F)</th>
<th>C(G)</th>
<th>Eb(Bb)</th>
<th>D(A)</th>
<th>C(G)</th>
<th>Bb(F)</th>
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<td>145.05</td>
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<td>237.4</td>
<td>264.8</td>
<td>157.75</td>
<td>149.35</td>
<td>133.5</td>
<td>117.3</td>
</tr>
<tr>
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<td>trumpet</td>
<td>394.6</td>
<td>440.85</td>
<td>466.0</td>
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<td>303.0</td>
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<td>443.8</td>
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<td>268.95</td>
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<td>195.7</td>
<td>174.9</td>
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<td>432.0</td>
<td>474.05</td>
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<td>316.0</td>
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<td>465.9</td>
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<td>442.7</td>
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<td>297.75</td>
<td>264.25</td>
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<td>213.15</td>
<td>228.55</td>
<td>227.7</td>
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<td>144.05</td>
<td>143.4</td>
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<td>135.65</td>
<td>118.95</td>
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<td>233.95</td>
<td>222.1</td>
<td>203.0</td>
<td>174.15</td>
</tr>
</tbody>
</table>

*Note.* These frequencies are the average of the researcher’s and the researcher’s assistant’s frequency analysis. Notes are in concert pitch. Horn equivalent in parenthesis.
Table 5

*Control Group Results for Intonation in Fundamental Frequencies (in Hertz)*

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instrument</th>
<th>G(D)</th>
<th>A(E)</th>
<th>Bb(F)</th>
<th>C(G)</th>
<th>Eb(Bb)D(A)</th>
<th>C(G)</th>
<th>Bb(F)</th>
</tr>
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<tbody>
<tr>
<td>8</td>
<td>horn</td>
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<td>324.3</td>
<td>346.3</td>
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<td>232.2</td>
<td>217.5</td>
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<td>horn</td>
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<td>324.6</td>
<td>345.5</td>
<td>392.6</td>
<td>231.3</td>
<td>220.1</td>
<td>201.9</td>
</tr>
<tr>
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<td>229.1</td>
<td>215.45</td>
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<td>149.3</td>
<td>151.4</td>
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<td>154.9</td>
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<td>220.3</td>
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<td>156.8</td>
<td>146.15</td>
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<td>17</td>
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<td>144.75</td>
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<td>469.8</td>
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<td>265.65</td>
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<td>138.25</td>
<td>127.1</td>
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<td>22</td>
<td>trumpet</td>
<td>402.9</td>
<td>444.2</td>
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<td>319.5</td>
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<td>45</td>
<td>trombone</td>
<td>197.65</td>
<td>206.55</td>
<td>225.85</td>
<td>246.8</td>
<td>155.1</td>
<td>147.7</td>
<td>132.9</td>
</tr>
</tbody>
</table>

*Note.* These frequencies are the average of the researcher’s and the researcher’s assistant’s frequency analysis. Notes are in concert pitch. Horn equivalent in parenthesis.
APPENDIX I: SUBJECTS’ RESULTS

IN

CENT DEVIATION
Table 6

*Treatment Group Results for Intonation in Cent Deviation*

<table>
<thead>
<tr>
<th>Subject</th>
<th>Instrument</th>
<th>G(D)</th>
<th>A(E)</th>
<th>Bb(F)</th>
<th>C(G)</th>
<th>Eb(Bb)D(A)</th>
<th>C(G)</th>
<th>Bb(F)</th>
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<td>31.79</td>
<td>20.85</td>
<td>24.20</td>
<td>29.46</td>
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</tr>
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*Note.* Notes are in concert pitch. Horn equivalent in parenthesis.
Table 7

Control Group Results for Intonation in Cent Deviation

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<th>Bb(F)</th>
<th>C(G)</th>
<th>Eb(Bb)D(A)</th>
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*Note.* Notes are in concert pitch. Horn equivalent in parenthesis.
Table 8

*Range and Mean for Intonation in Cent Deviation - Treatment Group*

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Table 9

*Range and Mean for Intonation in Cent Deviation-Control Group*

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Table 10

*Intonation Mean and Standard Deviation*

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*Note.* Pitches are in order of posttest. The second pitch is the sounding concert pitch for F Horn.
APPENDIX J: ADJUDICATORS’ RATINGS

FOR

TONES QUALITY
Table 11

Adjudicators' Ratings for Tone Quality-Treatment Group

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<td>3</td>
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<td>3</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
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<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
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<td>3</td>
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<td>(posttested but excluded due to attendance under 80%)</td>
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<td>6</td>
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</table>
Table 12

*Adjudicators' Ratings for Tone Quality-Control Group*

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<tr>
<th>Subject</th>
<th>Instrument</th>
<th>Adjudicator 1</th>
<th>Adjudicator 2</th>
<th>Total</th>
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<td>trombone</td>
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<td>4</td>
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</table>
Table 13

*Tone Quality Mean and Standard Deviation*

<table>
<thead>
<tr>
<th>Group</th>
<th>$n$</th>
<th>$M$</th>
<th>$SD$</th>
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</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>27</td>
<td>5.93</td>
<td>1.33</td>
</tr>
<tr>
<td>Control</td>
<td>16</td>
<td>5.38</td>
<td>2.00</td>
</tr>
</tbody>
</table>
APPENDIX K: IMAGES

OF

COMMON EMBOUCHURE PROBLEMS
Figure 2. The “Smile” Embouchure by Jason Beghtol, 2017. The “smile” embouchure, which is sometimes referred to as the stretch embouchure, is in reference to the corners of the mouth being upward as opposed to downward causing the embouchure to appear as if it were in the form of a smile.
Figure 3. The “Excessive Pucker” Embouchure by Jason Beghtol, 2017. The “excessive pucker” refers to the lip formation of the embouchure protruding outward as opposed to the optimal slightly inward roll of the lips.
Figure 4. “Bunched-Up” Chin by Jason Beghtol, 2017. The “bunched-up” chin, or sometimes referred to as a “peach pit” chin, occurs when the chin is pronounced excessively upward when the ideal position is for it to be slightly down and out.
Figure 5. “Puffed-Out” Cheeks by Jason Beghtol, 2017. “Puffed-out” cheeks are created by weak embouchure muscles allowing the cheeks to inflate disturbing the air flow from the lungs to the instrument.
Figure 6. Common Embouchure Problems-Excessive Pressure

*Figure 6. Excessive Pressure* by Jason Beghtol, 2017. Excessive pressure exists when musicians push the mouthpiece against their face more than necessary.
APPENDIX L: IRB APPLICATION
Screening / Abbreviated IRB Application

Purpose: Many studies qualify for an abbreviated review, according to the federal regulations and university policy.

- Part I of this form screens for a brief review.
- Part II of this form completes the abbreviated IRB application.
- The IRB makes the final determination on whether you must fill out a full application.

Always download the most recent version of this form: http://www.research.olemiss.edu/irb/protocol/forms. Prepare as a Word document. E-mail the completed form and attachments as Word documents to irb@olemiss.edu; e-mail the signature page as PDF to irb@olemiss.edu.

NO HARD COPIES – PLEASE!

Note: Some class project studies may qualify for a classroom waiver of IRB Application. See form here.

PART I — Screening

1. Do any of the following apply to your study?

<table>
<thead>
<tr>
<th>Research Methods:</th>
<th>Yes</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td>Treatment study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-rays</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection of blood, urine, other bodily fluids, or tissues</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Use of blood, urine, other bodily fluids, or tissues with identifiers</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Use of drugs, biological products, or medical devices</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Targeted Subjects:</th>
<th>Yes</th>
<th>No</th>
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</thead>
<tbody>
<tr>
<td>Pregnant females</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prisoners</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Elements of Deception:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>The study uses surreptitious videotaping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The study gives subjects deceptive feedback, whether positive or negative</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>The study uses a research confederate (i.e., an actor playing the part of subject)</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

If you checked Yes to any of the above, STOP HERE and fill out the FULL IRB APPLICATION FORM.

2. Questionnaire or Survey? (Include questionnaire or survey as an attachment). □ Yes □ No
   - If Yes, answer 2a and 2b.
   - If No, proceed to 3.
   a. Anonymous? □ Yes □ No
   b. Sensitive Information? □ Yes □ No

If you answered No to 2a AND Yes to 2b, STOP HERE and fill out the FULL IRB APPLICATION FORM.

*Anonymous or Confidential? Anonymous means (1) the investigator cannot associate a subject with his/her data, and (2) the data cannot identify a subject. Examples: Surveys with no names handed to an investigator are not anonymous; surveys placed by the subject in a group data envelope can be anonymous; surveys with no names and with demographic data that can identify a subject (e.g., the only African-American in a class) are not anonymous. By definition, interviews are NOT anonymous.

*Sensitive Information? Sensitive information includes but is not limited to (1) information that risks damage to a subject's reputation; (2) information that involves criminal or civil liability; (3) information that affects a subject's employability; and (4) information involving a person's financial standing. Examples: Surveys that ask about porn use, drug use, religion, use of alcohol while driving, AIDS, cancer, etc. may contain sensitive information.

If using Qualities for anonymous surveys, see guidance here.
3. The ONLY involvement of human subjects will be in the following categories (check all that apply):

☐ 1) Educational Research: Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

☐ 2) Surveys, Interviews, Tests: Research involving the use of published, standardized educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation procedures or observation of public behavior. Unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects’ responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects’ financial standing, employability, or reputation. Minors are NOT exempt under this category.

☐ 3) Surveys, Interviews, Tests with Public Officials: Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

☐ 4) Existing Data: Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

☐ 5) Evaluation of Public Service Programs: The study is conducted pursuant to specific federal statutory authority and examines certain federal programs that deliver a public benefit (call IRB for details if you think your study may fit).

☐ 6) Food Testing/Evaluation: Tests and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

Additional UM exempt categories: Must meet all criteria from IRB Policy ESP.301.015

☐ UM 7) Behavioral Tasks/Games: Studies of adults employing behavioral task performance methods or behavioral games, such as computerized economics, business, and accounting simulations of real-world transactions and innocuous online or in-person surveys that employ experimental manipulations (e.g., exposure to different written or video scenarios)

☐ UM 8) Surveys with minors: Studies that include minors as subjects and do not collect sensitive information: 1) online surveys, 2) in-person focus groups, and 3) surveys conducted in a group setting

Study methods beyond those above (including those involving experimental manipulations) will likely require a FULL IRB APPLICATION FORM.

---

PART II — Abbreviated Application

4. Project Title: The Effect of an Author-Composed Mouthpiece Buzzing Routine Modeled by the Teacher on Beginning Band Brass Students

5. Principal Investigator: ☐ Dr. ☐ Ms. ☒ Mr. Jason William Beghtol

    Department: Music

    Work Phone: 662-220-7350

    E-Mail Address: beghtol@olemiss.edu

    Department Chair’s email (for cc of approval): mulgaga@olemiss.edu

    Home or Cell Phone: 882-397-9160

    If Principal Investigator is a student:

    ☐ Dissertations

    ☐ Pathways Project

    Undergraduate student:

    ☐ Master’s thesis

    ☐ Other graduate project

    ☐ Senior thesis

    ☐ Croft Institute

    ☐ Other

    ☐ Other undergraduate project

    Research Advisor: Michael Worthy

    (required for student researchers)

Request for Determination of Exemption from IRB Review (rev. 01/2016) — page 2

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6. List ALL personnel involved with this research who will have contact with human subjects or with their identifiable data. All personnel listed here must complete CITI training OR the Alternative to CITI (ATC) training before this application will be processed.

<table>
<thead>
<tr>
<th>NAME</th>
<th>FACULTY OR STAFF</th>
<th>GRADUATE STUDENT</th>
<th>UNDERGRAD STUDENT</th>
<th>ROLE ON PROJECT</th>
<th>Training completed: CITI or ATC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI</td>
<td>Jason/William Beightol</td>
<td>☐</td>
<td>☑</td>
<td>☐</td>
<td>Investigator</td>
</tr>
<tr>
<td>Advisor</td>
<td>Michael Worthy</td>
<td>☑</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>XXXX</td>
<td>☑</td>
<td>☐</td>
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<td>☐</td>
</tr>
</tbody>
</table>

If space is needed to list additional project personnel, submit Appendix A.

*See Exempt Human Research Policy for training exceptions.

7. Funding Source:
   - Is there funding for this project? ☐ Yes ☒ No
   - If Yes, is the funding:
     - Internal: ☐ Source: [Information]
     - External: ☐ Pending/Agency: [Information]
     - Awarded/Agency: [Information]
     - PI on external funding: [Information]

---

Research Methodology/Procedures

8. Check all procedures below that apply to your study:
   - [ ] Pre-existing data or biological samples
   - ☑ Observation
   - ☐ Oral history
   - ☐ Interview
   - ☐ Focus group
   - ☐ Questionnaire or survey
   - ☐ Audio recording or videotaping
   - ☐ The study has misleading or deceptive:
     - (1) study descriptions;
     - (2) procedure explanations and/or
     - (3) survey instructions/rationales.

   Source of data: [Information]
   - Do data/samples have identifiers? ☐ Yes ☐ No

*If recording identifiers, you must fill out the Full Application Form.

Attach interview questions.

Attach topic and questions.

Attach questionnaire or survey.

If online, state program to use (e.g., Qualtrics): [Information]

Use and attach a release form if you plan to disseminate quoted comments or taped content. (This covers you and UM legally - Not for IRB purposes)

In the abstract, provide complete details and a rationale for employing misleading/deception information. Include Appendix D in your attachments.

Request for Determination of Exemption from IRB Review (rev. 01/2015) – page 3
9. Consent Procedures:

☐ Oral
☒ Information Sheet/Cover Letter
☐ Not applicable, Explain: 

Attach script.

Attach. (No signatures required, see example here: Go to Examples and Templates, then “Sample Information Sheet”)

10. Project Summary

Briefly summarize your project using non-technical, jargon-free language that can be understood by non-scientists. See http://www.research.olemiss.edu/irb-forms for abstract examples.

Give a brief statement of the research question supporting the reasons for, and importance of, the research: The purpose of this study is to determine if incorporating a daily mouthpiece buzzing regimen, as modeled by the teacher, has an effect on the performance of a beginning band brass student. The exercise was developed to establish and strengthen a good fundamental foundation for beginning brass students.

Describe the ages and characteristics of your proposed subjects and how you will recruit them (attach recruitment script or materials to the application): Subjects will be sixth grade students, approximately 11-12 years of age. Since this study only pertains to beginning brass students, the subjects and the location were chosen based on a large band program where beginning band students are separated into brass, woodwind, and percussion classes.

For studies using only adult subjects, state how you will ensure they are 18+: ☐ First question on survey/interview ☒ Other: ☐ Not applicable

Briefly describe the research design: Two group design: Control and Intervention.

Give a detailed description of the procedure(s) subjects will undergo (from their perspective): As a part of normal everyday classroom activity, the beginning band brass students will go through an author designed mouthpiece buzzing warm-up routine directed at improving pitch accuracy and tone quality.
11. Appendix Checklist:

A. Additional Personnel not listed on first page of application?
   - No
   - Yes – complete Appendix A

B. Will the research be conducted in schools or child care facilities?
   - No
   - Yes – complete Appendix B

C. Does your research involve deception or omission of elements of consent?
   - No
   - Yes – complete Appendix D

D. Will your research be conducted outside of the United States?
   - No
   - Yes – complete Appendix E

12. Attachments Checklist:

Did you submit:

a. survey or questionnaires?
   - Yes
   - No

b. interview questions?
   - Yes
   - No

c. focus group topics?
   - Yes
   - No

d. recruitment email, announcement, or script?
   - Yes
   - No

e. informed consent information letter or script?
   - Yes
   - No

f. permissions for locations outside the University?
   - Yes
   - No

13. If using class points as incentives, are there alternative assignments available for earning points that involve comparable time and effort?
   - Yes
   - No

14. If using an anonymous survey through Qualtrics and giving incentives in a separate survey, have you read and conducted the testing of the surveys according to the procedures here?
   - Yes
   - No

ASSURANCES — Conflict Of Interest And Fiscal Responsibility

Do you or any person responsible for the design, conduct, or reporting of this study have an economic interest in, or act as an officer or a director of any outside entity whose financial interests may reasonably appear to be affected by this research?

- YES
- NO

If Yes, please explain any potential conflict of interest.

Do you or any person responsible for this study have existing financial holdings or relationships with the sponsor of this study?

Request for Determination of Exemption from IRB Review (rev. 01/2016) — page 5
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☐ YES ☐ NO ☐ N/A

If Yes, please explain any potential conflict of interest.

SIGNATURES — Principal Investigator and Research Advisor (if applicable) Must Sign Below

PRINCIPAL INVESTIGATOR’S ASSURANCE

I certify that the information provided in the application is complete and correct. As Principal Investigator, I have the ultimate responsibility for the protection of the rights and welfare of the human participants, conduct of the research, and the ethical performance of the project. I will comply with all UM policies and procedures, as well as with all applicable federal, state, and local laws regarding the protection of participants in human research, including, but not limited to the following:

- Informed consent will be obtained from the participants, if applicable and appropriate;
- Any proposed modifications to the research protocol that may affect its designation as an exempt (brief) protocol application will be reported to the IRB for approval prior to being implemented;
- Adverse events and/or unanticipated problems will be reported to the IRB as required.

I certify that I, and all key personnel, have completed the required initial and/or refresher CITI or CITI Alternative courses in the ethical principles and regulatory requirements for the protection of human research participants.

Signature of Principal Investigator

Date: 7-19-16

RESEARCH ADVISOR’S ASSURANCE (REQUIRED FOR STUDENT PROJECTS)

As the research advisor, I certify that the student investigator is knowledgeable about the regulations and policies governing research with human participants and has sufficient training and experience to conduct this particular research in accordance with the approved protocol.

- I agree to meet with the investigator on a regular basis to monitor research progress;
- Should problems arise during the course of the research, I agree to be available, personally, to supervise the investigator in solving them;
- I will ensure that the investigator will promptly report adverse events and/or unanticipated problems to the IRB as required;
- If I will be unavailable, for example, on sabbatical leave or vacation, I will arrange for an alternate faculty member to assume responsibility during my absence and I will advise the IRB by letter or e-mail of such arrangements; and
- I have completed the required initial and/or refresher CITI or CITI Alternative courses in the ethical principles and regulatory requirements for the protection of human research participants.

Signature of Research Advisor*

Date: 10/3/16

*The research advisor must be a UM faculty member. The faculty member is considered the responsible party for the ethical performance and regulatory compliance of the research project.

Request for Determination of Exemption from IRB Review (rev. 01/2013) — page 5

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## Appendix B
Research in Schools or Child Care Facilities

1. **School District(s) and School Name(s):** Tupelo Public School District; Miam Elementary School (Grade 6)

2. **Does the School District/Facility have its own IRB or Research Review Policies?**
   - [ ] Yes. Include documentation of approval.
   - [x] No. Include documentation of the approval of the superintendent or principal (email is acceptable).

3. **Indicate the Subject(s) of the Research (about whom or from whom will you collect data)**
   - [x] Students. Include parental consent form, student assent forms, and/or procedures, and, where applicable, signed release for students' records (can combine this with the consent form below the signature block.)
   - [ ] Teachers. Include teacher's consent form (if collecting data from them) or information letter.
   - [ ] Administrative personnel. Include consent form (if collecting data from them) or information letter.

4. **If students are the subjects, explain what role the teachers(s) play in the project:**

---

*Research in Schools (rev.07/2012)*
VITA

Jason William Beghtol is currently teaching at Northeast Mississippi Community College where he is the assistant band director, jazz band director, and professor of brass.

He holds a B.M. and M.M. degree in music education from the University of Mississippi where he studied trombone with Milton Aldana and Donn Schaefer. He also holds a M.M. degree in trombone performance from Florida State University, studying trombone with John Drew. Mr. Beghtol is currently working on his Ph.D. in music education from the University of Mississippi.

Beghtol is the bass trombonist in the North Mississippi Symphony Orchestra of which he has been a member since 2005. In 2011, Beghtol premiered Titan’s Gaze by Nathaniel Murphy, a piece for solo bass trombone with wind band and choir accompaniment. He has premiered other works by Nathaniel Murphy, such as: There’s a Fork in My T-Bone, Joust, Steam Punk, Doppler Shift, and Toy Box. Beghtol is also the bass trombonist for the Mississippi Trombone Authority, a trombone quartet comprised of college professors. He has also performed with the Starkville Symphony Orchestra, Tallahassee Symphony Orchestra, Tallahassee Ballet Orchestra, and Corinth Symphony. He performs across the southeast as a soloist and as a chamber and orchestral musician. Beghtol has also worked with or played with artists, such as: Kim Adair, Scott Bernard, Jeff Coffin & the Mu’tet, Wycliffe Gordon, Mac McAnally, Bobby McFerrin, Jermaine Morgan, Sam Mosley, Adam Nitti, Rashawn Ross, the Red Stone Jazz Project, Ron Wilkins, and Roy “Futureman” Wooten.
Prior to coming to NEMCC, Mr. Beghtol taught 4 years in the Tupelo Public School District where he was the assistant band director under Floyd Stevens and Vance Wigginton. In 2006, the Tupelo High School band was the 5A state champion. During this time, Beghtol was also employed as an adjunct professor at Itawamba Community College.

In addition to his teaching and performing duties, Beghtol does some composing, arranging, and clinician work for both band and studio events. Beghtol is the creator of the Fire & Ice saga. Fire & Ice is a series of compositions for trombone trio and percussion with a continuing story line and graphics based around a unique superhero made of ice affixed with bionic legs.
JASON W. BEGHTOL

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EXPERIENCE

Northeast Mississippi Community College 2008-Present
Assistant Band Director, Jazz Band Director, Applied Brass, Concert Band Director,
Music Appreciation, Fundamentals of Music, Various Brass Ensembles

Tupelo High School 2004-2008
Assistant Band Director, Freshman Band Director, Concert Band Director, Beginning
Brass, Middle-school Brass

MHSAA State Marching Championship; First Place in Division 5A, 2006

THS Indoor Trombone Line (Typhoon), 2006

Itawamba Community College 2006-2008
Adjunct Professor, Music Appreciation

PERFORMING

North Mississippi Symphony Orchestra – bass trombone 2005-Present

Starkville Symphony Orchestra – substitute 2011-2014

Tallahassee Symphony Orchestra – bass trombone 2002-2004

Tallahassee Ballet Orchestra – bass trombone 2002

The Renaissance Men  2014-Present
NE Trio  2013-Present
Mississippi Trombone Authority  2009-2013
Mississippi Trombone Alliance  2004-2006

EDUCATION
University of Mississippi – Ph.D. Music Education  In Progress
The Florida State University – M.M. Music Performance  2004
University of Mississippi – M.M. Music Education  2002
University of Mississippi – B.M. Music Education  2001

PUBLISHED WORKS
Fire & Ice, vol. 1 (ASCAP): Trombone trio with percussion, Cherry Classics Music
Brothers (ASCAP): Duet for trombone, or trumpet, Cherry Classics Music, Reb-Nole Publishing Co.
The Star Spangled Banner: Trombone Trio, Tap Music Sales
Come Again, Sweet Love (Dowland/Beghtol): Solo trombone, or trumpet, with piano, Cherry Classics Music
Les Berceaux (Faure/Beghtol): Solo trombone, or trumpet, with piano, Cherry Classics Music

Two Works for Three Trombones: Trombone trio, Reb-Nole Publishing Co.

Beginning Brass Buzzing Warm-up: Reb- Nole Publishing Co.

OTHER

Artist for the Edwards Instrument Company

Performed at the International Trombone Festival: The Cramer Choir, 2013

Performed at the American Trombone Workshop, 2014

Premiered Titan’s Gaze by Nathaniel Murphy, solo bass trombone, wind band, and choir

Premiered Joust by Nathaniel Murphy, duet for tenor and bass trombone

Premiered Steam Punk by Nathaniel Murphy, solo bass trombone and recording

NEMCC Teaching Outstanding Performance (TOP) Award, 2014

Orff-Schulwerk – Levels I & II

Directed the University of Mississippi Alumni Reading Band: UM Jazz Reunion

Played or worked with: Kim Adair, Scott Bernard, Jeff Coffin & the Mu’tet, Wycliffe Gordon, Mac McAnally, Bobby McFerrin, Jermaine Morgan, Sam Mosley, Adam Nitti, Rashawn Ross, Ron Wilkins, Roy “Futureman” Wooten, and the Red Stone Jazz Project
VOICE WORK

**Announcing – Marching Band Festivals:** Crossroads Marching Classic, Conquistador Classic Marching Festival, and MHSAA Region I Marching Festival

**Announcing – Indoor Marching Festivals:** Alcorn Central Contest, Itawamba HS Contest, Northeast Indoor Championship, South Pontotoc HS Contest, and Artistry in Motion

**Narration/VO:** Condemned by Faith, Mantachie HS Marching Band, Mooreville HS Marching Band, Tupelo HS Marching Band, Tupelo HS Indoor Drumline

**Master of Ceremonies:** Northeast Parade of Beauties