Utilizing Learning Modalities to Increase Pitch-Matching Abilities of Fourth Grade Students

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Abstract

The purpose of this study was to measure the ability of fourth grade students to echo-sing accurate pitches by providing visual aids that engage the students' visual learning modalities during vocal/general music instruction. The measurement tool used was an echo-singing test comprised of four short melodic phrases that included all pitches of the diatonic major scale. This study used a pre-test/post-test design to measure the growth of students' ability to accurately match pitches by singing. Students performed significantly better on their post-test after participating in eight consecutive weeks of vocal music instruction. Research in the area of pitch-matching ability in young singers should continue in order to highlight proven teaching/coaching techniques that music educators could use to improve student achievement in vocal performance.

CHAPTER I

INTRODUCTION

Overview

Music instruction is a process that involves teaching rhythmic and melodic patterns that can be developed into more complex and meaningful modes of communication throughout a child's elementary music instruction years (Beck, Rieser, & Edemir, 2017). It is important for music teachers to develop pitch accuracy in a safe environment where children can explore using their voices in a variety of ways. Students begin with babbling and cooing in order to find their head voice before echo-singing to match specific pitches. Nichols (2016) recommends pedagogical teaching styles that encourage the order of new pitches and melodic patterns to be sung throughout elementary music instruction. It is important for students to listen to melodic patterns and sing with pitch accuracy in order to work collaboratively in a choral setting during the intermediate years of their elementary school years as fourth and fifth graders.

Statement of the Problem

Elementary vocal music students often struggle with singing pitches accurately when there are a variety of musical backgrounds and exposure to accurate singing for each individual child (Nichols, 2016). The goal of this research is to improve fourth grade students' ability to echo-sing accurate pitches by providing visual aids that engage the students' visual learning modalities during vocal/general music instruction.

Hypothesis

It is hypothesized that after receiving the treatment that utilizes students' visual learning modality, fourth grade students will not have improved scores on their ability to sing accurate pitches. This hypothesis is null.

Operational Definitions

Learning Modalities is defined as using auditory, visual, and/or kinesthetic movement to enhance student achievement.

Pitch-matching accuracy can be defined as the ability to match high and/or low musical sounds.

CHAPTER II

REVIEW OF THE LITERATURE

This literature review explores the connections between learning modalities and music instruction that focuses on vocal pitch-matching. There are many ways of teaching musical concepts and research is still being done to find ways to best teach and assess student abilities to match pitch. There is a need to investigate ways to incorporate various learning modalities to use during music instruction that will increase student achievement in matching pitch. Section one highlights internal and external influences on vocal development in elementary-aged children, assessment strategies for vocal development, as well as prevalent music pedagogies used in music instruction, consisting of Kodaly (1882 – 1967), Orff (1895 – 1982), Dalcroze (1865 – 1950), and Suzuki (1898 – 1998). Section two provides information about the three types of learning modalities: auditory, visual, and kinesthetic. Section three explores the teaching strategies, benefits, and drawbacks of incorporating learning modalities in elementary vocal music instruction.

Music Instruction Supporting Pitch Accuracy

Internal Influences on Vocal Development

Kim (2000) describes internal influences of age and gender, which can affect pitch-matching accuracy and vocal range. Hedden (2012) mentions in a review of research that by age 10, the range of a child's vocal singing ability occurs from middle C (C4) to high E (E5). As a child practices the skill of using their singing voice they develop the muscles necessary for healthy singing. Hutchins, Larrouy-Maestri, and Peretz (2014) describe the vocal ability of matching a target note as the process of perceiving the pitch, determining how to configure their vocal muscles, and producing the motor command. Developmentally appropriate musical

material and appealing texts are important to song selection, but it is important to make purposeful song selections that introduce age-appropriate pitches and intervals in order to sequence music learning and enhance musical growth of young singers (Reifinger, 2013).   Beck, et al. (2017) discuss studies that have proven that older children can match pitch, discriminate pitches and melodic direction, establish a tonal center, and sing intervals more accurately than younger children.

External Influences on Vocal Development

Appropriate vocal modeling is important for matching pitch and the more a student hears correct pitches being sung by a similar voice then it is logical that it might aid in accurate pitch singing (Yarbrough, Green, Benson, & Bowers, 1991). Studies have shown that singers can produce more accurate pitch-matching when echo-singing from a sung example rather than that of a piano or synthesized sound (Hutchins et al., 2014). Yarbrough et al. (1991) explore the possibilities of varying timbres that affect pitch-matching that include instrumentation (tone quality), octave (male versus female; child versus adult), and vibrato (a natural, rapid variation in pitch that affects tone). Nichols (2016) discusses how researchers attempt to discover correlation of doubling voices (having students sing with peers) with accurate pitch-matching, which led to inconclusive results as it did not show significance when compared to solo singing tasks. Loui, Demorest, Pfordresher, and Iyer (2015) explore the various threats to hindering a pitch-matching assessment by experimenting with the timbre (voice and piano), complexity (one pitch versus four-pitch pattern), singing a familiar song a cappella (without accompaniment) using text, or singing the song on a neutral syllable. These variances in research studies highlight the inconsistency and inability to find specific way to support teaching and assessing pitch-matching.   External influences on pitch-matching accuracy and vocal range include modeling

vocal examples, providing accompaniment, and including multi-modality reinforcement (Kim, 2000).

Assessing Vocal Development

Hedden (2012) states that children can more accurately replicate individual pitches rather than full songs, which limits the types of songs that should be sung in music instruction to develop pitches accurately. It is important to develop a vocal assessment that can accurately measure a child's ability to sing in tune when the child is asked to echo-sing short patterns rather than singing a full song, even if it is a familiar tune (Leighton & Lamont, 2006). Reifinger (2013) mentions the sequence of singing instruction to include singing independently from the teacher, echo-singing short passages, singing call-and-response phrases independently from the teacher, and gradually moving to singing full songs that are sung on neutral syllables. It is important to allow singers to have auditory feedback to help young singers develop the skills necessary to listen to their voices and adjust pitch accordingly (Beck et al., 2017). Using technology to record and evaluate personal performances could benefit a student's ability to practice singing more accurately and in tune.

Popular Elementary Music Pedagogies

The Kodaly pedagogy focuses on a specific sequence of pitches presented to students through singing folk songs and working around a movable tonal center. The use of Curwen hand signs helps students produce precise pitch identification and illustrate the relationship among pitches (Reifinger, 2013). Hand signs can be a tool for teachers to teach inner hearing exercises to replace the physical production of singing. For example, a teacher can only show the hand signs and the students are to sing the pitch or melodic pattern to the teacher as an assessment. Yarbrough et al. (1991) describe the importance of Kodaly's singing sequence by listening, using

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hand signs, reading, and then writing with the pitches introduced to students in the following order: *sol, mi, la, do, re, do', low sol, low la, fa, ti.* Towner (2013) reflects on his ability to teach band and orchestra students by beginning with the basics of singing and using Kodaly techniques to improve intonation.

The Orff pedagogy uses story-telling and creativity to lead to vocal exploration, fluency, and musical confidence. Student-size instruments such as xylophones, metallophones, and drums are accessible for young musicians to create musical ideas and collaborate to perform songs with accompaniment to familiar songs. Reifinger (2013) suggests that music educators incorporate the use of melodic instruments to help students perceive pitch and connect pitches by their relationship of location on a melodic instrument, such as a xylophone or another barred instrument.

The Dalcroze pedagogy focuses on physical movement to promote musical accuracy and uses a fixed tonal center in which students can learn to find the relationship of all pitches. Reifinger (2013) describes how students could be taught the exact pitch name in order to assist in identifying it precisely on an instrument. Dalcroze pedagogists believe that children should be able to think about melodic pitches within their relationships in the underlying harmonic placement.

Korenman and Peynircioglu (2007) describe the Suzuki method as focusing on auditory aspects of music and emphasizing the basics of performance, which needs to be well-developed prior to any type reading proficiency. Listening to the music daily is an important aspect to learning the "mother tongue" of musical language, which is enhanced by learning an instrument. The importance of repetition and encouragement is what helps students build musical confidence and retain musical concepts.

Learning Modalities

Persellin (1994) describes how learning modalities such as auditory (hearing a stimulus), visual (seeing or visualizing a stimulus), and kinesthetic (touching or manipulating the stimulus) can assist students in learning and retaining academic information. Teachers are asked to meet the individual needs of each student by using differentiated teaching strategies during instruction. Learning modalities can be discovered by observation of student performance or surveying the student preference of instructional style.   Reifinger (2013) simply states that "aural, visual, and kinesthetic modalities are channels through which perception occurs during the learning process" (p. 15).

Auditory

Auditory learning occurs by attending lectures, participating in discussions, and listening to recordings. An auditory learner would prefer to have information spoken aloud or read something themselves out loud in order to process the information. This modality of learning has become very popular as the invention of podcasts have become readily available for listeners to tune in and learn about their interests via a pre-recorded radio show. According to Korenman and Peynircioglu (2007), "music is intrinsically 'auditory,' especially for non-musicians who are not proficient music readers" (p. 7). Persellin (1994) describes how musicians depend on their inner hearing of a musical piece in order to aid their musical performance. Auditory learning can be a way to conceptualize information before putting it into practice.

Visual

Examples of visual learning include showing images, videos, diagrams, graphs, flash cards, or any written material to a student. Miller (2002) describes how there is extra emphasis on visual input due to the use of computers, cell phones, televisions. These visual cues catch the attention of learners to process new information. Teachers are encouraged to incorporate visual aids in forms of anchor charts or video clips. One technique to assist a visual learner is to use color coding to highlight specific information. Sultana, Kubra, and Khan (2015) discuss the consideration of using visual style-based instruction as it proved to show significant effects on student achievement in their academic study. Paney (2015) explains how visual feedback can be more beneficial to a student rather than listening to verbal feedback, which can help the student practice toward mastering a given skill.

Kinesthetic

The kinesthetic learning modality includes gross motor movements and fine motor/tactile movement that a student can choose to use for assistance. Kinesthetic learning includes using movement during instruction that will assist students in focusing or retaining information. Shoval, Sharir, and Schulruf (2014) explain the benefits of movement and the correlation to active learning in early childhood education. Active learning occurs when the student is fully engaged and focused on instruction. Learners are presented with spatial and directional information as they perceive kinesthetic movement during instruction. Miller (2002) reminds teachers about Vygotsky's theory, which proposed that physical interactions can assist children in memorizing information and developing the capacity for abstract thinking. Lahav, Katz, Chess, and Saltzman (2012) mention that motor skills can be used and remembered in the premotor regions of the brain, which can be stimulated when auditory examples are re-

introduced to a listener. For example, a practiced kinesthetic movement could help a singer respond to an auditory pitch by engaging their muscle memory to echo-sing the pitch accurately. Shoval et al. (2014) describe how physical movement can benefit academic learning if it is mindful to emphasize any verbal and thinking processes.

Multi-modalities

Miller (2002) states evidence that children retain 24% of what they hear, 40% of what they see, and 70% of what they learn through multi-sensory activities, which can justify the need to know and understand the impact of utilizing various learning modalities in teacher instruction. Many studies have led researchers to believe that using multi-modalities throughout instruction is an effective way to engage students in active participation, which can increase student achievement.

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Learning Modalities in Music Instruction

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Teaching Strategies

Gault (2005) describes music instruction and incorporating learning modalities in Bruner's modes of learning as enactive representation (listening and creating a corresponding movement), iconic representations (including images), and symbolic representation (reading music notation). The use of kinesthetic movement and the addition of a visual concept can lead a child to connect their ability to perform a melodic passage accurately. Persellin (1994) researched the use of learning modalities in melodic and rhythmic retention, which led to her discovery that children with auditory and multimodal treatments were able to match-pitch more successfully than visual or kinesthetic treatments. Using manipulatives to show rhythmic aspects of long and short durations of sound were proven to help students identify beginning steps to reading rhythmic notation (Miller, 2002). Miller extends the student's knowledge of rhythm and

applies the manipulatives to pitch by having the students arrange the manipulatives on the board

to show melodic contour for higher and lower pitches. Singers preferred a map of the melodic

contour rather than a model of a piano keyboard playing a melodic passage (Paney, 2015).

Korenman and Peyrncioglu (2007) describe how their study of assessing students' learning style

preferences can strongly influence how efficiently people learn musical material.

Drawbacks

Music teachers are often given randomized groupings of students, which can make it

difficult to personalize instruction to each student's preferred learning modality. Miller (2002)

warns educators to be mindful that physical materials may aid in teaching musical terminology,

but to be sure to have students engage in various modes of representation to ensure a deep,

transferrable understanding of musical concepts. Persellin (1992) explains how the preference of

certain learning modalities of the teacher can highly affect how instruction is planned and

implemented. This can lead to students being exposed to one modality more often than others,

which could hinder student achievement.

Benefit*s*

When students are learning through a variety of modalities, there is more engagement and

participation in instruction (Miller, 2002). With a combination of using popular music

pedagogies of Kodaly, Orff, Dalcroze, and Suzuki, all learning modalities are covered to help

students experience, practice, and master musical skills. The use of visual aids that show

melodic contour (direction) can assist singers in using their voice more accurately in the correct

register (high or low). Hedden (2012) describes a research study where children used kinesthetic

movement gestures while pitch-matching three-note tonal patterns, which produced positive

results. When students are engaged in meaningful instruction that utilizes various learning

modalities, there is a greater chance for student achievement. It is the intention that this action project will provide elementary vocal/general music teachers with more information of ways to incorporate learning modalities in their instruction and design appropriate assessment measures that can be used to enhance students' ability to match pitch.

CHAPTER III

METHODS

Design

This pre-test/post-test single group design examines the increased ability of fourth grade students to sing in tune with the aid of visual learning modality used during music instruction. 24 students took part in this pre-experimental design. The independent variable was the additional use of visual learning modalities used throughout music instruction. The dependent variable was the performance of singing four melodic patterns in tune.

Participants

Participants in this study attend a local public elementary school in Baltimore County Public School system. The total enrollment of the school is about 800 students. The entire fourth grade has a total of 144 students. A convenience sample of 24 fourth grade students from the same homeroom class was used in this study. The sample group included students ranging from ages 9-10 years old. The sample group was comprised of 17 female and 7 male students. Demographics of the represented races included three Asian, six African American, nine White, five Hispanic students, and one student that claimed two or more races. One student was noted as having a 504 Plan and three students received weekly services for Limited English Proficiency (LEP).

Instrument

The assessment used for this study consisted of a pre- and post-test that were identical with four short melodic patterns. Students were provided a recording to listen to the example being sung while looking at a visual aid provided before being asked to echo-sing the pattern. Each pitch was assessed individually and included grade level appropriate pitches of *fa*, *ti*, and

high *do*. The pre- and post-assessments were created by the researcher, and therefore does not provide validity or reliability data.

Procedure

Each student completed a pre-assessment sung as a solo and with an audio-recording administered by the researcher. Vocal/general music instruction occurred for a total of 50-minutes once a week over the span of eight consecutive weeks. Each week, all participants received the treatment of echo-singing and sight-reading short melodic patterns with visual aid assistance consisting of musical notation and solfege name identification. After eight consecutive weeks of music instruction, a post-assessment was administered that was identical to the pre-assessment. All data was recorded by the researcher and compiled into the table provided.

CHAPTER IV

RESULTS

Analysis of the Data

Out of a class of 24 students, 18 students showed an increased score of singing pitches accurately. One student maintained a high score for both assessments. Five students decreased scores on pitch-matching ability. An independent t-test was run to examine growth in singing ability from pre-test to post-test. Means and standard deviations for the group are shown in Table 1. Results showed a significant difference at posttest [$t(23) = -3.245$, $p < .05$]. Students singing ability increased by a statistically significant amount over their ability at pre-test. The null hypothesis was rejected. These results and their implications will be discussed in the next chapter.

Table 1

Means and Standard Deviations of Singing Ability for the Group

Assessment	Mean	Standard Deviation
Pre-test	8.96	3.724
Post-test	10.67	3.807

CHAPTER V

DISCUSSION

The original hypothesis states that after receiving the treatment that utilizes students'

visual learning modality, fourth grade students will not have improved scores on their ability to

sing accurate pitches. The null hypothesis was rejected because there was a significant difference

in student performance. The mean of the testing group was 8.96 for the pre-test and increased to

10.67 after the post-test. This significance in increased scores shows that the study provided

enough practice and time for students to improve their pitch-matching ability, which is why the

null hypothesis was rejected.

Implications of Results

This study used recommendations of prior research such as staying within appropriate

singing ranges according to ages of the children as well as providing short phrases for students to

have more success with echo-singing with accuracy. Though former studies accepted the null

hypothesis, the conditions of this study were favorable to the amount of practice time and types

of practice that utilized multiple learning modalities of students during vocal music instruction.

The results of this study support further research for various ways to assess the pitch-matching

abilities of young children. The results also reinforce the importance of incorporating multiple

learning modalities to enhance the musical abilities of young singers.

Threats to the Validity

The design of this study includes factors that could serve as threats to the validity. An

ideal research sample that could highlight the true success of the study would use a random

sampling in order to remain unbiased. However, the design of this study used a convenience

sample due to the conditions of where and when the researcher taught vocal music to students,

which serves as a threat to the validity of this study. Also, due to not having a control group in this study design, there is no basis for knowing if the results are due to the tested variable of using visual aids or due to some other unknown factor.

There are many natural factors that occurred, which could serve as threats to the validity of this study.   When considering physical attributes of the students, the timeline took place over eight consecutive weeks and the maturation of students could occur as they consistently sing and practice the pitch-matching skills. Another physical trait to take into account is that students could have been ill at either time of testing, which affects how they are able to hear or sing.

Another internal threat to validity could be the repeated testing throughout this study because of the use of identical testing instruments. When it was time for the post-test, students had more familiarity with the recording/examples, which could have served as a bias for a more favorable outcome.

A technical error also occurred during the post-test in which the headphones did not work in the device used for recording student performances. Due to the timeline constraints for this study, the researcher had to sing the melodic phrases in the testing room in order for each student to echo-sing their response. Similar to the pre-test, students stood while facing a visual aid provided, but for the post-test the researcher stood off to the side facing the opposite direction to provide a sense of privacy for the singer. This change in testing environment may have influenced how students performed or behaved due to having their music teacher in the room with them during the singing assessment. Since students were not wearing headphones due to the technical error, the background noise of classroom instruction in the main music room may have served as a distraction. The musical integrity of the assessment may have been compromised because the live performance of melodic phrases could have been slightly out of

tune or sung with varying tempo for each student even though the researcher attempted to sing accurately while maintaining the steady beat.

Connections to Previous Studies and Existing Literature

The results of this study are consistent with the findings and suggestions of previous research studies. The study design was based upon Hedden's (2012) suggestion of the appropriate singing range of ten year olds to occur from middle C (C4) to High E (E5). The testing instrument also stayed true to county curricular regulations by utilizing the pitches of the diatonic scale in C-major. The melodic range of this study remained between C4 and C5.

Reifinger (2013) suggests in his findings that using appealing texts and highlighting short melodic passages that are vocally appropriate for age levels of singers can enhance musical growth of young singers. As students participated in eight consecutive weeks of music lessons, song choices were focused on the interests of the researcher's students based on years of experience from prior years of instruction. The researcher purposely chose songs or melodic examples that would elicit positive reactions and increase the students' motivation to sing and perform successfully.

Following the advice from Yarbrough, et al. (1991) to be consistent with vocal modeling, the researcher served as the sole vocal model for all testing and instruction throughout the study. The use of any accompaniment tracks or instruments were without any vocal samples from children or other adult voices. This places physical stress on a music educator to stay healthy while working with young students, which serves as an implication for further research explained later in this paper.

The use of clear visual aids were utilized throughout the study in order to enhance student achievement. Following Persellin's (1994) description of how to train the inner ear to aid

musical performances, students played a music bingo game in which they were to echo-sing short phrases as well as to internalize singing the phrases as they searched on their card for the correct melodic pattern being sung by the teacher. Displaying melodic passages at eye sight in large print helped to assist visual learning modality, as suggested by Sultana, et al. (2015).

Suggestions for Future Research

In regards to revising the design of this study, the researcher would suggest having a control group in order to highlight the true success of using visual aids to assist pitch-matching ability. It would also be more beneficial to use a larger sample size to be more representative of this population of students and yield a more reliable result from the study.

If this study were to be extended, the researcher would include more opportunities for students to self-assess their individual singing abilities. Technology serves as useful tool for a music educator to listen attentively to performances of accurate pitch-matching, which is why the same tool could be offered for students to listen to their own performances in order to hear any need for personal improvement. Music instruction time is limited in many public elementary schools, which motivates music educators to plan for as much music-making as possible in a group setting during one allotted lesson time. If students took ownership of tracking their individual progress, perhaps it could help young singers become better listeners and continue students' ability to train their inner ear, as suggested by Persellin (1994).

As previously mentioned, this study relied on the voice of the researcher to be in a healthy condition. Exploring the use of vocal modeling and the accuracy of student pitch-matching would be a suggested study for music basal book series publishers. Many book series use a variety of vocal models including young children, older children, women, and men. If

research findings could suggest certain vocal modeling as more appropriate, perhaps music

resources could be better suited for more successful pitch-matching from all young singers.

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