

The Neuroscience of Singing and Its Implications for the Pedagogy of the Practice Room

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Project Portfolio

Introduction

I first became interested in the neurology of the voice when I took a seminar through the Voice Study Centre taught by Heidi Moss Erickson. Her teaching strategies were fascinating, and I immediately began implementing some changes in my studio and in my rehearsals based on her research. The successful application of these shifts in my teaching stirred the desire to learn more about neurologically supported vocal pedagogy (Schladt, 2017; Tan, 2018; Erickson, 2022; Gutiérrez Cisneros, et al., 2023; Pentikäinen, et al., 2023). The more I read about music's unique impact on the brain, the more I wanted to discover, and so, immersing myself in the literature to grow in my knowledge and practical application in my teaching, and helping other instructors to do the same became the foundation of my study for this module (Paquette and Rieg, 2008; Kjeldgaard, 2019; Erickson, 2022). The problem that I am seeking to address in my practice is supporting students in their rehearsal time outside of their time with me by providing neurologically supported tools to enhance their time in the practice room. Much research exists that demonstrates that there is more to effective practice time than casually logging minutes; motivation, cognition, and attentiveness are important parts of a successful practice process (Mosing, et al., 2014; Schatt, 2023; Zhang and Leung, 2024). I want to create an environment in each lesson, class, or rehearsal that will promote the transfer of knowledge by giving the student neurologically supported tools to explore in their individual study between sessions with the teacher (Kjeldgaard, 2019; Erickson, 2022; Gutiérrez Cisneros, et al., 2023). The time I spend with each student is limited and thus, I hope my study will serve the dual purpose of maximizing instructional time and furthering the pedagogical impact of the research by bringing clarification and weight to the independent practice time students are engaging in each week (Paquette and Rieg, 2008; Crocco, McCabe, and Madill, 2020).

Planned Program of Study

Theoretical Influences

There is much new literature supporting the positive impact singing has on the brain and the benefits of making vocal music for overall health, wellbeing, and education (Bullock, et al., 2018; Deroo and Watson, 2020; Galeza and Rasinski, 2023; Zamorano, et al., 2025). Further, there are new discoveries flowing out of this neurology based research that aid music instructors in effective teaching (Smith, 2000; Paquette and Rieg, 2008; Erickson, 2022; Pentikäinen, et al., 2023). One of the weaker areas of my own practice is supporting independent practice between instructor led sessions. I have tried a number of strategies for bringing specificity to their requirements, clarity to my instructions, and accountability to the process, but none of my ideas or tools has provided the impact I am seeking.

Best practice influences

The literature evidences the neurological benefits and importance of singing for humans of all ages and backgrounds including the developing brain of children, the prolonging of memory for dementia patients, the sense of belonging for people seeking to live in community, and the benefits in the reduction of stress and cortisol levels for those who engage in regular singing with groups of amateur or professional singers (Schladt, 2017; Tan, 2018; Erickson, 2022; Pentikäinen, et al., 2023; Welch and Baxter, 2025). Further, the research gives actionable teaching practices to implement that enhance the process of learning, practicing, and ultimately retaining musical knowledge (Kjeldgaard, 2019; Crocco, McCabe, and Madill, 2020; Erickson, 2022).

Methodological Influences

I am seeking to find agility between research and practice by moving back and forth between absorbing knowledge and applying it in practice. I am approaching this project from a constructivist worldview, because constructivism asserts that knowledge and truth are constructed by humans through the lens of their own experience and reflection, thus allowing me to merge the building and application of knowledge with data that surfaced from my own lived experience with my students and allowing my discoveries to deepen and expand my research process (Mohajan, 2020). This also supported knowledge acquisition in conjunction with my role as practitioner researcher and let me make application within my practice that informed, supported, and fueled my aims and objectives (Chilisa and Kawulich, 2012; Gaus, 2017). While there are a number of other frameworks that aid in knowledge acquisition, I was drawn to constructivism because my natural response to emerging data is to shift and adapt, consequently, the flexibility of constructivism supported and strengthened my process (Mohajan, 2020).

Aims and Objectives

My aims for this module

1. Enhance the effectiveness of my teaching by adding neurologically supported strategies for teaching new concepts or vocal techniques in the studio, classroom, and in my rehearsals (Smith, 2000; Paquette and Rieg, 2008; Zhang, 2018; Capalbo, 2021; Pentikäinen, et al., 2023).
2. To conduct lessons and rehearsals using tactics that work with what we now know about the brain for maximum effectiveness in learning and retaining new musical knowledge and new songs, melodic lines, or harmony parts (Kjeldgaard, 2019; Gutiérrez Cisneros, et al., 2023).

3. Set students up for success in the practice room by giving them more specific, neurologically based tools to maximize their practice time in between lessons or rehearsals (Crocco, McCabe, and Madill, 2020; Erickson, 2022).
4. To create better communication about how students are using their practice time, in hopes that their practice becomes more effective and has maximum impact on their progress (Glassman and Hur, 2013; Zarobe and Bungay, 2017; Gutiérrez Cisneros, et al., 2023).

To facilitate these aims, my objectives are

1. To read and engage a variety of current literature and studies that link singing to brain function and thus, have a variety of tools at my disposal to apply both in lesson plans and as issues arise in rehearsal.
2. To research and experiment with practical application for neurologically based teaching strategies that I can implement as I lead students in lessons, classes, and rehearsals, ultimately increasing my effectiveness in teaching new technical skills, musical knowledge, and learning and retaining musical repertoire. Ideally, one measure of this will be the demonstration of knowledge acquisition and musical gains in my students.
3. To research and explore specific neurologically based tools already available in the research body in order to create and train students in more productive sessions in the practice room without teacher supervision. Further, I will seek to evaluate the effectiveness of the practice sessions in lessons or class by having students demonstrate and dialogue about how they implemented the practice strategies independently.
4. To create an action plan that supports student-teacher communication about specific practice assignments for the week and enables the student to both take the neurologically supported strategies into the practice room on their own and dialogue about the varying levels of success they experienced each week.

Expected Learning Outcomes

I hope to gain a deep understanding of the neurology of the voice and the benefits of singing for the human brain while also discovering neurological practices that support educational strategies for the music classroom and individual practice. I also hope to eliminate some of the ambiguity around student practice culture. I have tried a variety of tactics for helping students have effective practice time in between lessons or rehearsals like practice journaling, checklists, listening guides, specific questions and conversation, but I have not yet found a tool that supports neurologically based pedagogy, nor have I found a tool that worked well enough to continue using over multiple semesters and projects.

Activities and Assessment Criteria

Success for me in this module looks like deepening my knowledge and understanding of the neurology of the voice while developing adaptable practice strategies for my students to use each week that are rooted in strong neurologically based practice strategies that will serve to enhance our communication around their practice time, maximize their minutes in the practice room, and help me to monitor their progress more effectively (Glassman and Hur, 2013; Zarobe and Bungay, 2017; Erickson, 2022; Gutiérrez Cisneros, et al., 2023). These tools will support auditory learning, assist in scaffolding new techniques, promote successful memory work, and encourage relational health between student and teacher, all while clarifying expectations for independent student work and holding a standard of excellence for graded progress (Smith, 2000; Paquette and Rieg, 2008; Zhang, 2018; Kjeldgaard, 2019; Capalbo, 2021; Pentikäinen, et al., 2023).

Timescales and Review Dates

	February				March				April				May			
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Research																
Planning/preparation/attend classes																
Implement research via artefact development																
Prepare written report																
Experiential application of artifact																
Prepare written critical review																

Methodology

My practice currently includes a wide scope of music education. I have a hybrid job situation that allows me to adjunct with university level private voice students who are preparing for professional theatre careers, while also spending time each week directing middle school and high school choir rehearsals, elementary general music classes, and directing musicals for students in a new K-12 school setting that in previous school years offered no formal music education. I feel confident in my ability and follow through with the implementation of neurologically supported educational strategies in my classroom or rehearsal hall, but one area of my practice that requires attention and additional support is the required practice time for

students in between their lessons or rehearsals with me. I can enforce time requirements, assuming they are honest with me, but I want to ensure that they are spending their time well, not just checking off the passing of minutes, both because I care about their individual progress, and because the way they prepare outside of class has a significant impact on their individual success and the success of the show or the choir they are part of (Glassman and Hur, 2013; Zarobe and Bungay, 2017; Crocco, McCabe, and Madill, 2020; Erickson, 2022; Gutiérrez Cisneros, et al., 2023). I want to honor their time commitment to practice in the midst of their busy lives but also create a plan that is efficient and worthwhile. I want to create space for honest conversation between teacher and student that does not shame, but rather encourages and captures the attention of the student and creates an educational spiral of work and accomplishment that drives the desire to persevere and sends students back to the practice room feeling capable and equipped to take on new challenges (Glassman and Hur, 2013; Zarobe and Bungay, 2017;).

My hope is that the research will support this goal by helping me to be adaptable for changing needs and assignments week by week, grant practical application to neurologically supported practice habits, provide check-in opportunities with specific language for both teacher and student to use with understanding, and organically create the opportunity for accountability for students as they return to their lesson or rehearsal for new instruction (Glassman and Hur, 2013; Zarobe and Bungay, 2017; Bullack, et al., 2018; Harris, 2019; Erickson, 2022; Gutiérrez Cisneros, et al., 2023; Pentinkäinen, et al., 2023).

Project Report

Introduction

This literature review seeks to explore and build on the foundation of the benefits of making vocal music for overall brain health, wellbeing, and education. In order to accomplish this, I will examine some of the discoveries flowing out of this neurology based research that aid music instructors in effective teaching and look at the ramifications of teaching this way. Further, I will examine the implications of the research and its practicality and usefulness in the practice room as well as its impact on the classroom, rehearsal room, and studio. Then, I will move into experiential discussion of the knowledge previously described and talk about both the problem I aim to solve with the application of the literature and the assessment criteria I will use to evaluate the success of the practical application in my teaching. Next, I will provide a thematic analysis of the literature that discusses seven themes that emerged from the research and their application. Finally, I will conclude with critical reflection of the research process using the framework of Gibb's reflective model.

Neurological Benefits of Vocal Music Education

Esmergül and Önder define music education as gaining, changing, creating, or developing a musical behavior (2022). While some of the applications of these neurological strategies does stay consistent with traditional voice instruction, many of them challenge traditional pedagogy and have the potential to feel new or even to have questionable value (McAllen, Forbes, and Hughes, 2025). However, the evolution of vocal pedagogy is furthered by scientific findings as technology improves and enables discoveries that were not previously accessible that have the potential to offer new tools for synthesizing information into a holistic teaching practice that serves the anatomy and physiology of the voice, acts as a preventative measure against vocal injury, and supports the level of mastery required for the contemporary music student (Greschner, 2019; Erickson, 2022; Hersh, et al., 2023; Weekly, 2023; Kayes and Bartlett, 2024).

Singing for Brain Health

The literature suggests that singing matters in the context of brain health and education for students in varying spectrums of age and environment (Bullack, et al., 2018; Tan, et al., 2018; Kjeldgaard, 2019; Erickson, 2022; Gutiérrez Cisneros, et. al., 2023). Singing is unique in its ability to involve multiple brain functions and regions, while requiring the brain to support emotion and complex thought, and demonstrate a range of physiological and cognitive function and regulation (Erickson, 2022; Zamorano, et al., 2025). Singers, thus, present an opportunity to highlight the intimate connection between physiology and sound production via breath control, laryngeal muscle cooperation, vocal fold regulation, vocal tract shaping, and continuous airflow and muscle engagement (Bouchard, et al., 2013; Zamorano, et al., 2025). This impacts my personal practice because it adds weight and value to what I teach. A wealth of experts agree that singing matters with regard to brain health, and that adds a layer of meaning to music education that I was unaware of for many years.

Singing for Wellness

Challenging Bullack's findings of the positive impact of singing versus non-singing on psychological measures of amateur choral singers, the impact of singing on wellness for children was not able to be statistically linked to wellbeing in participants of Welch and Baxter's 2024 study (Bullack, et al., 2018; Welch and Baxter, 2025). Welch and Baxter's research in schools in London included students ages five, six, and seven who were taught singing over the course of six months (2025). The children in their study showed significant improvement in their competency in singing and while their perceptions of their own health and wellbeing were positive, there were not clear, statistically significant findings linking singing to health and

wellbeing (Welch and Baxter, 2025). In my own experience with engaging a relatively healthy, well-supported body of private school students in music class or choir activities in a school setting that previously had no formal music education, I found that though students were so enamored with making music and the camaraderie that accompanies such an endeavor, I would expect similar results if I were to attempt a comparable study. I suspect that most of my students would identify as already having a positive perception of their health and wellbeing, and while they love the addition of music education and progressed well throughout their course of study, statistical links to enhanced health and wellbeing would be difficult to measure, particularly if the standard relies on the student's own perception.

Similarly to Welch and Baxter's findings, in their systematic review of eight papers studying the effects of participation in creative activities on the health and wellbeing of children, Zarobe and Bungay conducted a rapid literature review encompassing eight papers, and found that though there have been many studies in this area, there is a gap in direct evidence to link participation in the arts to enhanced mental wellbeing and resilience because of a lack of methodological rigor in many of the studies (2017). This suggests that further study is needed in order to have definitive findings on the impact of singing for the health and wellbeing of children, perhaps with more rigor around the measure of students' health and wellbeing. Rooted in my own lived experience, I am curious about the perception of not just the students themselves, but the caregivers of the children who were participants in the studies represented in the review. A grandmother of one of my youngest music students approached me at the close of the school year to thank me for the music her grandson goes about their home singing. I wonder how many other caregivers have noticed shifts like this simultaneously to the introduction of music education for school children. My experience suggests the link between music and children's health and wellbeing is in fact there, but we lack the statistical evidence to demonstrate it.

In contrast to studies anchored around singing for children's health and wellbeing, Tan, et al., conducted a rigorous test of choral singing as a intervention against cognitive decline in an older population was found to be successful in elderly participants who were at risk for contracting dementia (2018), and Pentikäinen, et al., found measurable impacts on the wellbeing of elderly patients who experienced complications with motor and cognitive function, speech production, or other complications from neurological illnesses like stroke, dementia, and Parkinson's disease after a two year study that assessed the cognitive functioning and social and emotional well-being of singers compared with non-singers (2023). Bullack, et al, hypothesized that singing led to stronger connectedness and reduced biological stress markers (2018). They concluded that singing together regularly with a group of amateur singers positively impacted

the general psychological and physiological health of their participants (Bullack, et al, 2018). While these studies are not directly linked to children and their education, they do serve as evidence that wellbeing can be enhanced in correlation with singing, and that more research, strengthened by rigor and longer periods of study, are needed to see these effects in children to the degree that they can be seen in adults (Zarobe and Bungay, 2017; Tan, et al., 2018; Pentikäinen, et al., 2023; Welch and Baxter, 2025).

Singing for Overall Academic Excellence

There are many studies that have suggested that music can enhance academic performance even in nonmusical curricular outcomes, particularly with regard to literacy; children showed improvement in cognitive and linguistic skills, with regard to phonetic awareness, attention skills, vocabulary, focus, decoding speed, and even writing (Smith, 2000; Heydon, McKee and O'Neill, 2018; Gutiérrez Cisneros, et. al., 2023; Galeza, and Rasinski, 2023; Çenberci and Tufan, 2025). Because singing uses both motor and cognitive systems, it can contribute to widely distributed changes in the brain (Kjeldgaard, 2019). A 2023 study conducted by Gutiérrez Cisneros, et. al., showed significant improvement for students from a variety of backgrounds in reading, attention skills, focus, vocabulary, memory and social skills at a behavioral and cerebral level after just eight months of consistent music education opportunities at school, including singing and creative expression, suggesting that incorporating music into curricula could be linked to the advancement of critical thinking skills and mental flexibility; these gains were found in students regardless of the teacher's musical ability (Paquette and Rieg, 2008; Gutiérrez Cisneros, et. al., 2023). In my own teaching experience, I would be curious to know how adding music classes to the entire school this year impacted the overall academic experience of our students, but unfortunately I do not have data to prove or deny the academic influence of adding music to the school's curriculum.

Experiential Knowledge

My research journey was fueled both by my desire to learn and grow in the area of neurologically supported pedagogy and the issue of ineffective individual practice by the students in my studio and school. As I continued the research process, I was drawn to read and learn, then apply strategies, then bring my questions to the literature again, and thus found myself experiencing double loop learning. I was seeking to address complex issues by changing my own teaching procedures to accommodate the new and stronger ideas available in the research; as I did this, teaching methods emerged that honor the neuroscience research on acquiring musical skill (Glassman and Hur, 2013; Crocco, McCabe, and Madill, 2020; Capalbo, 2021; Erickson 2022; Pentikäinen, et al., 2023; Kayes and Bartlett, 2024).

Thematic Analysis

To synthesize the research with direct application to my teaching practice, I used Braun and Clarke's six step thematic analysis to create an analytical thematic review with embedded practical application; this provided a structure for gathering data from a variety of texts by identifying, analyzing, and bringing together patterns that became the themes of my study (Braun, Clarke, and Hayfield, 2022). My research process began via the online library of University of Wales Trinity Saint David, berry picking key terms including "neurology of singing," and "neurology of the voice," (Bates, 1989). My rationale for the process encompassed inclusion and exclusion criteria based on relevance to my aims and objectives, along with overall usefulness in my practice (van Wee and Banister, 2024). The literature used as part of my research was filtered to ensure that it was peer reviewed, full-text, and current, though I allowed room for inclusion of a small number of articles that were relevant to practical application of neurological strategies in the classroom but were not peer reviewed. I attempted to use papers published in 2020 and beyond, but expanding the timeline proved necessary to

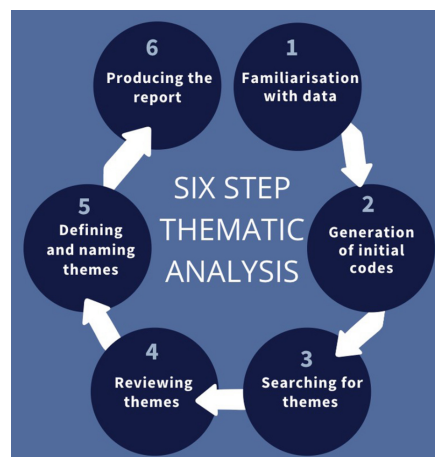


Figure 1

(McInerney, et al., 2022)

create a large enough foundation of literature, hence my research base spanned roughly 2000-2026. I did quite a bit of backwards citation chaining and snowballing, using the reference lists from the articles I found most beneficial to locate other relevant work (Juntunen and Lehenkari, 2021). Adding the terms "pedagogy" and "music education" to my searches on the neurology of singing led me to helpful literature that gave me a window into neurologically guided classroom and rehearsal procedures.

Seven themes emerged from the literature and will serve as the direct application of my research for this project; they include repetition, scaffolding, auditory learning, teacher and student relationship, physical movement, rest, and play (Paquette and Rieg, 2008; Kjeldgaard, 2019; Erickson, 2022; Gutiérrez Cisneros, et al., 2023; Çenberci and Tufan, 2025; Napadow, et al., 2025; Zamorano, et al., 2025). This section of the review seeks to both discover and make direct, practical application in each of the seven areas in which theory and practice will be discussed, and thus highlight the implications of teaching out of pedagogy grounded in neurology.

Theme One: Repetition

Repetition has been shown to be beneficial in the context of learning, specifically with regard to music practice, with the neuroanatomical outcome appearing most definitive when the student's individual practice happened at least three times per week (Gutiérrez Cisneros, et al., 2023; Paquette and Rieg, 2008). Efficient practice will likely include the continued repetition of short sections of music, perhaps with different tactics for attaining the goal, moving on or combining small sections into bigger ones as mastery of the new technique is realized (Kjeldgaard, 2019; Crocco, McCabe, and Madill, 2020; Erickson, 2022). In order to honor the research, I attempted to have my private students at the university journal their practice experience each week. This was meant to provide accountability for the number and duration of their practice sessions, but it was unsuccessful because it required more monitoring than I was able to provide and because many simply did not complete the requirement. In the future, I plan to apply the knowledge I have gained by using new language learned from the literature to strengthen the need for student follow through as well as simplifying the communication process to allow students to have a better understanding of their use of repetition both in terms of practice minutes and the content of their practice time (Glassman and Hur, 2013; Zarobe and Bungay, 2017; Crocco, McCabe, and Madill, 2020; Gutiérrez Cisneros, et al., 2023).

Theme Two: Scaffolding

Having age appropriate, neurologically supported expectations for student engagement time and content should serve instructors well (Kjeldgaard, 2019). This is primarily a twofold concept of limiting concentration time to approximately the student's age and introducing new concepts one at a time thus layering exercises one by one, in order to honor the brain's ability to primarily keep one thought in the foreground of consciousness (Erickson, 2022; Kjeldgaard, 2019). Perhaps my biggest take away from the research with regard to scaffolding is the importance of layering one concept at a time (Erickson, 2022; Kjeldgaard, 2019). It is tempting to listen and evaluate a student's performance in lesson and try to tackle several ideas or techniques at

once. I have learned in literature and in practice that bombarding a student with many things to try or fix is overwhelming and counterproductive.

One situation in particular comes to mind with regard to scaffolding. I was working with a first year university student on learning to belt a in contemporary musical theatre style, and felt as though my normally successful strategies were not accomplishing progress towards the task. As I examined my teaching strategies against the literature I was studying, I realized that I was giving her too much instruction at once (Erickson, 2022). I simplified my words, took things one small step at a time, and found the slower, counterintuitive pace to be beneficial to her educational process. Scaffolding helps me to slow down as a teacher and use the brain's ability to focus on one thought at a time as an asset. Further, the understanding I gained from the literature will provide the opportunity to list out the small, specific steps I want the student to take while they practice outside my direct supervision and will assist them in scaffolding the techniques on their own (Dubinsky, et al., 2019; Crocco, McCabe, and Madill, 2020). Ideally, this will be a concept they can take with them as they move from collegiate work into their own professional practice.

Theme Three: Auditory Learning

Based on their study of children's music learning theory, Çenberci and Tufan concluded that all music education requires the development of audiation, or learning by listening with or without vocalization (2025). Audiation prepares the system for singing using multiple paths, and additionally activates many of the muscles used in singing, even without actually making sound, thus allowing for real and impactful rehearsal before even beginning to vocalize (Erickson, 2022). Using auditory input facilitates growth in pitch matching and rhythmic accuracy, brings stylistic maturity and musicality to young musicians, and impacts the efficiency with which their brains can process sensory input (Harris, 2019; Erickson, 2022; Esmergül and Önder, 2022). Further, regular opportunities to participate in choral singing were found to have a positive impact on audiation because of the brain's ability to strengthen the speed and depth of its auditory encoding abilities (Napadow, et al., 2025). My own children study Suzuki violin and cello, which requires daily current repertoire listening, so while the benefits of audiation were not new to me, the literature showing the musculature response for singers evidencing merit beyond just the ear was new and exciting to me (Erickson, 2022; Esmergül and Önder, 2022; Napadow, et al., 2025). The idea that rehearsal can happen for a singer wholly in the brain without vocalization is fascinating and empowering (Erickson, 2022; Çenberci and Tufan, 2025). This will be a helpful tool when students are not at full health or stamina and will also be a

practice strategy that can be applied in between sessions with the teacher to ensure that students are able to maximize practice time (Çenberci and Tufan, 2025).

A limitation of the educational practice of audiation is its internal nature; the measurability of its correct application is therefore challenging in the studio or classroom (Erickson, 2022; Napadow, et al., 2025). Upon his unsuccessful attempt at singing one of his assigned songs, one of my college students described his independent audiation practice as listening and humming along. Guided by Erickson's research, I took a reductionist approach and guided the student towards the focused, directed listening of smaller sections (2022). Though I could not monitor his listening with scientific data gathering such as MRI, this process of training him towards the proper use of audiation helped me to identify and practice instructional language rooted in the literature that moved his passive listening into a neurologically supported practice plan, giving him tools that honored his time and the research around audiation, and ultimately supported his comprehension of the piece so that he was better prepared for his next lesson, and eventually was able to successfully perform the song in a masterclass with his peers.

Theme Four: Relationship

The health of the psychosocial relationship between teacher and student matters in terms of brain function because the attentiveness and feedback offered as part of the learning process can create dopamine when the student attempts a technique and receives positive feedback from the instructor, thus cultivating student motivation, mastery, and ultimately, healthy learning environments that lead to independent graduates who continue to grow (Paquette and Rieg, 2008; Kjeldgaard, 2019; Erickson, 2022; Çenberci and Tufan, 2025). Rather than right versus wrong language, it is suspected that the teacher promotes the acquisition of musical skill at a higher level when the approach is student-centered, when all musical responses are accepted based on the student's aptitude, and when the instruction is rooted in a constructivist outlook (Heydon, McKee, and O'Neill, 2018; Sherwood, 2023; Çenberci and Tufan, 2025).

In my own practice, I have seen how students can crumble under the weight of a teacher's words or rise to meet the expectations spoken over them in kindness. The impact of the knowledge I have gained should help to foster an appropriate connection between teacher and student that builds trust by bringing clarity to the expectations of the teacher and preparing the student for success in class and in the practice room without the master teacher implications of the vocal education of the past (Crocco, McCabe, and Madill, 2020; Sherwood, 2023). The literature suggests that this foundation of psychosocial stability could increase the relational and success dopamine that the brain needs to stimulate the desire to persist in practice and allow

the student to have autonomy while still experiencing relational support (Heydon, McKee, and O'Neill, 2018; Çenberci and Tufan, 2025).

Theme Five: Physical movement

Joining a physical movement with a new skill or musical pattern may improve concentration by increasing oxygen in the blood stream, creating space for interplay between body and brain, and strengthening and hastening the memory connections made (Kjeldgaard, 2019; Çenberci and Tufan, 2025; Zamorano, et al., 2025). New research available about the motor theory of vocal learning suggests that the simultaneous use of the limb motor pathway and the vocal pathway forms an unprecedented vocal motor pathway that assists the brain in the context of memory (Tan, et al., 2018; Erickson, 2022). Upon reflecting on the literature supporting physical movement as a way to improve concentration and memory, I immediately began implementing pitch mimicking movements in lessons, in my elementary classroom, and in my musical rehearsals (Tan, et al., 2018; Kjeldgaard, 2019; Çenberci and Tufan, 2025; Zamorano, et al., 2025). This has been monumental in my practice with younger students as a way to clean up a melodic phrase or emphasize a cut off. It has also been a useful way to provide an appropriate distraction for a student trying to take a concept from an exercise into performance. I found strategies like adding movement that mirrored the line, catching and throwing an object, bouncing on yoga ball, and walking circles to be successful at the university level as I worked with a student who had a particularly challenging time bringing technique into the context of the song. Ideally, the transfer of knowledge gained in the research process will allow for physical movement to be incorporated and tracked during regular individual practice time.

Theme Six: Rest for body and brain

Both the brain and the vocal mechanism benefit from adequate breaks and rest throughout the learning and performance process; allowing rest aids in the consolidation of knowledge during the educational scope and contributes to the success and longevity of professional or amateur vocal performance (Hartley and Thibeault, 2014; Kjeldgaard, 2019; Erickson, 2022; Zuim, Stewart, and Titze, 2024). The literature suggests that this is true for the brain and the body in both the short term and the long term when rest time is allowed for consolidation and recovery (Hartley and Thibeault, 2014; Kjeldgaard, 2019; Erickson, 2022; Zuim, Stewart, and Titze, 2024). The application of the research calls for the provision of opportunities to check in daily on vocal health and rest as needed, and will encourage me as the instructor to grant regular moments of brain rest to allow for consolidation of new information, processing, brain health and maximization of memory.

Theme Seven: Play

Making room for playful behavior and discovery in the classroom simplifies the learning process and creates multiple neurological pathways to the same goal (Erickson, 2022; Kayes and Bartlett, 2024). Musical play can be part of a holistic approach to joyfully bringing out musical abilities in a student and can be a powerful tool for conveying musical elements and concepts without unnecessary pressure, while contributing to a student's self-motivation and self-confidence (Niland, 2009). Further, Excell and Van As found that playful music education pedagogies served to deepen not just the acquisition of musical skills, but academic concepts, imagination, and creativity in students (2018). Erickson talks about the importance of play in lessons and the practice room and the neuroscience behind coming at musical challenges using a non-linear approach and suggests that taking multiple paths to the same goal in order to maximize the brain's plasticity and increase the brain's ability to achieve the technique, could create more paths to success, particularly when performing under pressure (2022). This was especially effective with one of my seniors that I have taught for all four of her years at university who experienced a persistent issue with mental blocks. Frequently, over the course of her study, we would find that the most challenging section of her current repertoire presented vocal tasks that she would become almost less adept at as we continued to work. She could consistently demonstrate the ability to accomplish the technique required outside the context of the song or using an exercise, but singing it in context became an insurmountable task. Several songs went unperformed because of this phenomenon. Just as the literature suggested, bringing strategic play into her lesson brought the return of joy and the release of the pressure of perfection, thus allowing her to overcome her mental blocks in rehearsal and performance (Erickson, 2022; Excell and Van As, 2018; Kayes and Bartlett, 2024; Niland, 2009).

Conclusion

I devoted my study for this module to the alleviation of the specific problem of the ambiguity and ineffective tactics of the practice room through the application of gained knowledge from the literature around the neurology of singing. The progress of my work as a music educator depends largely on the commitment, investment, and collaborative work from students outside the lesson, classroom, or rehearsal hall. It seems to be a generally known and understood idea that individual practice is a necessary component of music education, but maximizing this time has been a challenge for me from the beginning of my teaching career across a variety of different teaching environments. My hope is to provide guidance for the classroom, studio, and rehearsal hall that extends to the individual practice room based on neurologically supported pedagogical strategies that will assist me in providing clarity and specificity around the instructions for practice and the weekly or daily expectations for the student. This guidance will

be adaptable, will support appropriate repetition, establish a plan for scaffolding new techniques, will provide relational support by enhancing teacher student communication, and will include tactics that incorporate play, rest, movement, and audiation. This culmination of the research will be practical instruction that will aid in the weekly implementation of the theoretical knowledge learned from the instructor in order that it might be applied thoroughly and intentionally to utilize individual practice time to its fullest extent.

Limitations

In spite of the rapid growth of the literature and the supporting technology around the neuroscience of the voice, there is still much to learn, and many research gaps to fill (Kayes and Welch, 2017). The field around the neurology of singing for education needs more evidenced based research from the classroom or studio to provide pedagogical resources and supported strategies that move beyond knowledge acquisition and into measured, practical applications that can be replicated and furthered by singing teachers.

This research endeavor is not exhaustive and I look forward to continuing my educational journey with vocal pedagogy that is supported by the neuroscience of the voice. The time constraints of life, children, and finishing the school year, all while pursuing the research at a level this MA program deserves was certainly a felt limitation as well.

Future Recommendations

As I move forward towards completion of my MA, I hope to continue my study with these goals in mind

1. Helping to translate specific neurologically supported strategies for teaching new concepts or vocal techniques from the studio, classroom, and rehearsal hall into the practice room, allowing students the ability to use these tools gained in their time with me on their own.
2. My own ability to use tactics that work with what we now know about the brain for maximum effectiveness in learning and retaining new musical knowledge and new songs, melodic lines, or harmony parts, then sending students home to do the same, supported by the application of my study and my subsequent instruction.
3. Preparing students to thrive in the practice room by receiving more specific, neurologically based tools to maximize their practice time in between lessons or rehearsals, and can follow through with them independently of the teacher.
4. Hearing students report more effective practice time and can routinely demonstrate that their practice has had continual impact on their progress.

Critical reflection

Introduction

I used Gibbs' six step reflective model as the lens for my critical reflection because of the way it honors constructivist ideals of learning through doing, challenging assumptions, looking to generate new ways of understanding and dispersing information, all while creating specific paths to practical application (Chilisa and Kawulich, 2012; Gaus, 2017; Mohajan, 2020;). This critical reflection will use the framework of description, feelings, evaluation, analysis, conclusion, and action plan (Braun, Clarke, and Hayfield, 2022).

Description

I was drawn to study the neuroscience of the voice in order to challenge the assumptions and learning strategies of teaching voice in the context of private lessons, music class, and musical theatre rehearsals (Smith, 2000; Paquette and Rieg, 2008; Erickson, 2022; Gutiérrez Cisneros, et. al., 2023). I was seeking to solve the problem of inefficient and unproductive practice sessions between teacher led sessions by studying practice pedagogy that is supported by the neuroscience of the voice (Kjeldgaard, 2019; Çenberci and Tufan, 2025). The consequences of my research had a ripple effect that solved more issues than I anticipated by giving me specific tools and application within all areas of my teaching.

Feelings

Both I and my students experienced positive feelings with regard to the knowledge acquisition that took place as a result of my study. I feel very positive about the shifts in my teaching and continue to see fantastic results in a short amount of time. My students are growing exponentially, and their growth fuels their trust in the neuroscience, their desire to discover more application for their voice, and their willingness to try more strategies supported by neuroscience even if they are different or feel outside the box.

Evaluation

As I reflect on things that worked and did not work over the course of my study, the most profound conclusion evidenced in the process was that I ended up shifting from a module five model to a module four literature review. As I wrestled to make my research application fit into the criteria for module five, I was wisely advised to stop forcing my work in a direction that did not make sense. I pivoted and found needed freedom and ease in exploring the module four parameters instead. This served me well, let me focus on immersing myself in the knowledge and its direct application, and relieved the pressure of trying to force the module five expectations onto my literature review.

With regard to the direct application of knowledge in the context of teaching, initially, some of my students were hesitant to try some of the tactics I was attempting because they were different than their expectations of music education. However, optimistic persistence, looking at the science together, and their trust in me gave way to attempts at putting neuroscience into practice first under my supervision, and eventually in the practice room.

Analysis

As I leaned into the excitement of how my new knowledge might serve my practice, my desire to learn more was activated. It seemed as though every strategy I applied in the classroom or in private lessons was beneficial, and I very much wanted to extend the positive outcomes to include work in the practice room without teacher supervision. Students who applied the techniques that we experimented with in lessons or class were successful, occasionally to what they felt was a lesser degree, especially if they were continuing exercises or strategies we had previously explored together.

My research did bring about the hoped for result with regard to the ability to give adequate instruction using neurologically supported strategies for teaching and supporting the individual practice of new techniques and musical concepts. I have experimented with the ideas I have read about in the literature for teaching new music to students in neurologically supported ways and have found all seven themes to be impactful to my teaching. I found particular success with different themes with different individuals and classes, for instance, my younger classes responded extremely well to physical movement in conjunction with new melodic lines, while my middle school choir responded strongly to repetition and scaffolding, and my college students experienced multiple breakthroughs while incorporating play into their learning process.

I hoped to find ways to send students to practice on their own using these same strategies independently, and I think it was successful to a degree, but as the literature discussed, repetition and scaffolding are needed, potentially to a higher degree when students are working independently. I think my understanding of the literature promoted greater success for students in the practice room, but this is certainly the area I feel still needs the most attention moving forward in order for students' to demonstrate understanding and proficiency.

Conclusion

I gained knowledge over the course of this research project that refined and gave scientific foundation to my practice. Evaluating my current practice through the lens of the literature

brought my classroom strategies into alignment with current, neurologically supported research, and left me better equipped for teaching my students and preparing them for independent work using scientifically supported tools and current, brain-based strategies. I have been able to learn and implement a far wider scope of neurological tools than I anticipated because of the depth the literature review structure allowed. I was able to strengthen my understanding of the neurology of the voice through the literature and grow as a practitioner researcher through the experiential knowledge gained as I applied what I was learning. The research also enabled a relational shift with my students. I was able to send them to rehearse on their own with a far more realized plan that maximized their practice efforts by empowering them to accomplish their goals and bringing about successes that kept them on course. Their success in the practice room provided a foundation for us to build on in our time together. This created a lovely double loop learning scope for the individual student because learning fueled success, which led to application in the practice room, which brought them back to hunger for knowledge and the solving of complex issues, and so on (Glassman and Hur, 2013).

Action plan

I plan to maintain the successful outcomes we experienced by continuing to use the neurological tools I learned and applied as I completed this project. I also plan seek out stronger results by persisting in assigning neurologically supported strategies for students to use on their own, increasing communication around their use of the tools, and creating a written journal or practice guide that will support them as they learn to work in ways that honor their brain's abilities. I am also strategizing about ways to further support and challenge students and their work in the practice room. Perhaps a practice workshop or an assignment that allows me to watch sample practice sessions would be beneficial at the start of our next semester.

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