# Music Mobile: An Application to Teach Music to Special Education Elementary School Students

## Music and Assistive Technology as Behavioral Management, Social Performance, and Academic Acceleration Tools in the Special Education Classroom

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By
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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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## Music Mobile: An Application to Teach Music to Special Education Students

### Overview:

Music Mobile is an application that will teach music to special education students. My research covers the importance of utilizing music and technology to enhance the curriculum for students with learning disabilities as well as fill a gap in the catalog of special education applications. This research project will be completed utilizing the educational action research framework.

### Positionality:

Over the course of the next year, I will be researching, designing, developing, and testing an application that teaches music to special education elementary school students. The goals and scope of this project stem from my passions for music, computer science, and special education. A violinist of 15 years, I have experienced the benefits of introducing music to students at a young age, such as an easier understanding of mathematics, greater classroom attention, and a heightened ability to learn quickly. Studies have proven these benefits I have seen, sharing that students with early musical exposure have increased motivation, focus, discipline, and motivation (Draper, 2021). I believe that my musical upbringing led to my academic successes, as well as drove me to pursue computer science. While these two subjects may seem completely foreign, technology and the arts have the potential to enhance one another. My goal as a double major in two seemingly unrelated fields is to combine them for the betterment of those around me.

Throughout my life, I have had the privilege of encountering and building relationships with special education students. My connections with these individuals have been humbling and shown a major gap in the special education system, specifically when it comes to the arts. Children with disabilities are sometimes deprived of opportunities to enhance their musical education due to the requirements of regular courses. In high school, I spent three months volunteering at my local elementary school, teaching music and dance to a class of special education fourth grade students. Over the course of this time I was able to witness how these lessons sparked their independence and confidence, as well as improved their classroom behavior. I desire to expand upon these in-person lessons, and make them more accessible. Technology is the perfect pathway to reaching the most people possible. My research project will be my own avenue to shaping the mind of special education students, giving them an opportunity to also pursue a passion for music.

### Problematization:

Technology is a wonderful tool used by special education teachers for mathematical, scientific, historical, and literacy instruction. However, education of the arts in special education is limited, especially when looking at the technological tools available. There are numerous apps for special education students as well as applications to teach music; there isn’t, nonetheless, an app that teaches music to special education students, specifically. Currently, there isn’t an explicit demand from special education students or teachers for an application of this sort; however, this stems from the fact that there isn’t a lot of conversation or research in regards to special education music technology. Studies show in the individual areas of music special education and special education technology that benefits exist. The question of my research is

how we can utilize two areas of study that individually positively impact the special education elementary school community in conjunction, in order to establish an increase in classroom participation, instruction, and collaboration. Lack of understanding of the needs of special education learners has led to this gap in technological tools, and has promoted the research of this project. The solution to this project will be my finalized application to teach music to special education elementary school students, specifically designed to be used by children with learning disabilities between the ages of 5-11.

**Guiding Question:**

How can we use technology to improve music education within the special education elementary school curriculum as a way to improve the collaboration, attention, engagement, and independence of special education students?

**Projected Outcomes:**

At the end of this project, the application developed will be a learning resource used by special education elementary school students, under the discretion and supervision of their parents and teachers. The use of this application will further show the benefits and importance of the arts within the everyday curriculum. Students who use this application will become proficient in musical skills that will allow them to participate in making music with others. These musical skills include note recognition, rhythmic understanding, and instrument identification.

**Technical Project Description:**

The technical side of this project involves creating an iPad application that can be used by elementary school students that have learning disabilities. As a computer science major at the University of Virginia, I have become proficient in the areas of web development, computer architecture, data structures, and algorithms. Additionally, I am well versed in the skills of information technology project management. As a Certified Associate of Project Management, I have led numerous technical projects, developing, analyzing, and designing web applications and software services. I worked as an intern in the Continuous Process Improvement Department at the Federal Reserve where I strived to find more effective ways to solve technical problems. For this project, I will be using the integrated development environment provided on Apple computers entitled Xcode. Xcode has an easy-to-use, easy-to-learn interface, along with built-in tools to assist with application development, design, and testing. It pairs easily to all iOS devices, in order to allow developers to run their application in real time situations. It utilizes a specific programming language, made for iOS development, entitled Swift, which is similar to C++. Though I have no prior experience with Swift and using Xcode, my previous use of other integrated development environments similar to Xcode and my knowledge of C++ has allowed me to easily learn the necessary details needed for my application's development.

**Preliminary Literature Review & Findings:**

Through research, it has been found that there is a lack of applications involving music education designed specifically for individuals with learning disabilities. However, there is a lot of research and emphasis on the benefits of introducing music to students at a young age and implementing technology as a teaching tool. Though music and technology are beneficial for all students, my research and findings look particularly within the field of special education students, as they are the target audience of this project. There are numerous studies on how

music integration within the special education classroom as well as the usage of technology can provide numerous improvements in a special education child's ability to learn and interact with his or her peers. It has been seen that introduction to music in schools, specifically when targeted towards students who struggle in the classroom, has led to an increase in focus, cooperation, collaboration, motivation, and inclusivity within students and amongst peers (Draper, 2021). Technology has provided similar benefits for special education students, in addition to allowing students to have greater independence, access to resources, customized lesson plans, and less anxiety (The Use of Technology in Special Education, 2020). Teachers and parents also benefit from technology usage, as their students are more drawn to using technology, creating less of a "battle" when it comes to encouraging involvement. They can also use technology to easily monitor their students and create increased engagement and communication amongst peers. As there is an obvious link between technology and music benefits for special education students, this leads to an opportunity to create an application that teaches music to individuals with learning disabilities, which will heighten the opportunity for increased independence, reduced anxiety, greater communication, and topic excitement.

**STS Project Proposal:**

STS, or Science Technology and Society, is "an interdisciplinary field of study that seeks to explore and understand the many ways that modern science and technology shape modern culture, values, and institutions, and how modern values shape science and technology" (Science, Technology, and Society, n.d.). In other words, it is understanding not only the composition of technology but also why the product was created, who the audience is, and how these factors play a part in the design process. Developing an application for special education students constitutes an STS project because it requires research on the importance of technology and music in working with special education students and utilizes these findings in the development of the application. The ecosystem of knowledge comes from a focus on disabilities and education. The main authors that will provide research for this project are educators and special education specialists. These authors have firsthand experience with students who have learning disabilities and what their primary needs are. Additionally, they have the answers to the discussion of how technology and music affect these students, offering the support to why there is a need for an application of this sort. To assess the effectiveness of my application, I will be using the educational action research analytical framework. Educational "action research refers to a wide variety of evaluative, investigative, and analytical research methods designed to diagnose problems or weaknesses—whether organizational, academic, or instructional—and help educators develop practical solutions to address them quickly and efficiently." "The general goal is to create a simple, practical, repeatable process of iterative learning, evaluation, and improvement that leads to increasingly better results for schools, teachers, or programs" (Sabbot, 2015). Utilizing educational action research within the scope of this project can lead to instructional improvement, student inclusion, and child behavioral development for special education students, as I will be looking for a "repeatable process" that will be developed with the needs and understandings of the target audience in mind.

The first stage of research will involve the searching, reading, and analyzing of the correlation between technology, music, and special education. Specifically, the first round of research will answer the two following questions: "Why is technology useful in the special education classroom?" and "Why is it important and beneficial to teach music to special education elementary school students?" These questions will be answered by special education

teachers familiar with music and technology, special education specialists, parents of special education students, and special education upper elementary school students. From their responses, I will be able to identify the "problem" (or, in better words, the "gap" in what exists), in order to then collect, organize, and analyze data related to the problem. The latter specifically looks like collecting data on what applications are currently available in the categories of music and special education. There will be an identification of what the overlap is of applications in these two categories (if any). Once the current technology is identified, each application will be sorted and categorized based on the targeted age range, popularity amongst users, design interface, application category, use of special education techniques, and primary application use. Based on all of this information, I will be able to implement a plan on how to best solve the problem identified from the prior research. Evaluation of the result of my application development will require working with special education students, seeing how they respond to the functionality and components of the apps, and tracking classroom behavior, socialization, participation, and grades. These final two steps will be repeated if problems arise along the way.

**Barriers & Boons**

Potential limitations in this project could be my lack of experience with developing iPhone and iPad applications. Though I have understanding and experience in software development, I am still learning how to develop applications, specifically utilizing Xcode and Swift. This could lead to drawbacks and delay in development if issues arise. There are resources that can easily assist in the education and development of these types of technologies, but at a price. The financial support and access needed to use these resources is another potential limitation in the creation of this project. If I had access to unlimited project funding, I would be able to purchase resources that would further my understanding and knowledge of Xcode development, which would minimize the time working on the backend of the app and focus more on the interface and interactive components, which will be highly critical in ensuring its functionality amongst the target audience. A final limitation in my overall research is the lack of information on special education music technology. As mentioned before, there isn't an expressed "need" for the application I am developing but there is a gap in special education applications when it comes to music instruction. Lack in this area puts a lot of emphasis on my part to build the way for user interaction with this genre of technology.

**References**

Draper, Amanda R. "Music Education for Students with Autism Spectrum Disorder in a Full-Inclusion Context." Journal of Research in Music Education, vol. 70, no. 2, 2021, pp. 132–155., https://doi.org/10.1177/00224294211042833.

Sabbott. "Action Research Definition." The Glossary of Education Reform, 14 May 2015, https://www.edglossary.org/action-research/.

"Science, Technology, and Society." Majors and Minors, North Carolina State University, https://majorsandminors.dasa.ncsu.edu/science-technology-society/.

"The Use of Technology in Special Education: UT Permian Basin Online." UTPB, 3 Nov. 2020, https://online.utpb.edu/about-us/articles/education/the-use-of-technology-in-special-education/.