Thesis Project Portfolio

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

(Technical Report)

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

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Caroline Bell

Fall, 2023

Department of Computer Science

Table of Contents

Sociotechnical Synthesis

(Executive Summary)

Integrating Music and Assistive Technology to Serve the Needs of Special Education Students

Music and information technology are seemingly very different fields, as well as an area I have always been interested in exploring. A violinist of 15 years and a computer scientist of 8 years, I constantly look for opportunities to combine these two fields to serve the needs of others. My technical project allowed me to merge my two passions by creating an application to teach music to special education students. My STS research paper allowed me to understand why I was using assistive technology alongside music to help the demographic of special education students as well as how to best serve these individuals as a stakeholder of my application. Both projects allowed me to dive deeper into understanding music and computer science as well as become more proficient in the world of special education.

The technical portion of my thesis produced an application, entitled Music Mobile, that teaches music to special education students but can be used by all students. Music Mobile introduces the basic principles of music to elementary school students through engaging videos and interactive games, as seen in Figure 1. I was introduced to the programming language Swift to develop a mobile application for Apple iPad users. Games are often used in educational applications to test and solidify a child's understanding of the material in a friendly, engaging way. I developed three games using Swift within the integrated development environment XCode to teach a few fundamental music concepts, as well as embedded a variety of videos to enforce the concepts presented in the activities. Music Mobile is different from other music education apps because it was created with the needs and design specifications of special education students in mind. Certain design considerations are necessary when developing an application for special education students. Music Mobile displays the use of a variety of these

techniques, including simpler fonts, immediate feedback, and a straightforward interface. Due to these design considerations, Music Mobile can be utilized by special education students as well as their general education peers, promoting a culture of inclusivity amongst all elementary school students.

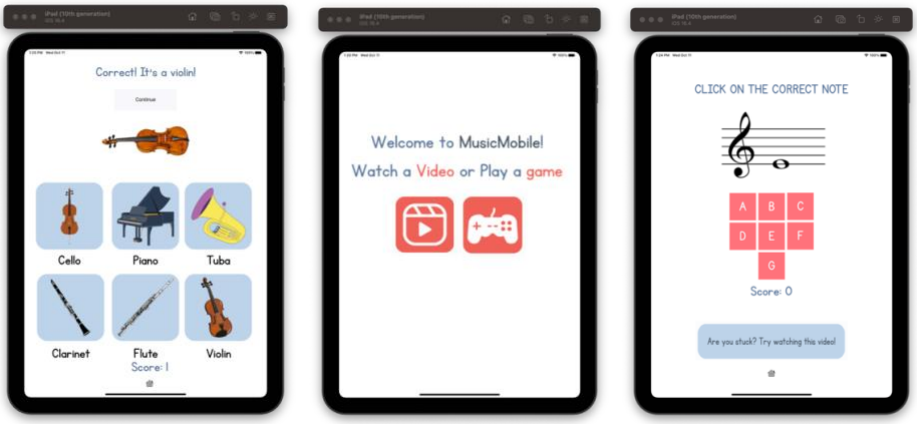

Figure 1: Music Mobile

In my STS research paper, I identified the benefits of utilizing assistive technology and music in the special education classroom, the needs addressed by these tools, and how developers can better serve the interests of special education students. It was found across the literature around assistive technology and music in the special education classroom to be a lot of overlap in the needs of students with learning disabilities that assistive technology and music individually aided with. Among the intersection was a need for increased connection amongst special and general education students. Utilizing a specialized discourse framework to unveil the need to use design versus development vocabulary and understand the idea of disability versus differently abled, it was found that there is a tendency to separate those with learning disabilities from those without, even within the tools used in the classroom. The integration of assistive technology and music into a singular tool can provide an opportunity for cohesion and

collaboration amongst all students and requires that application developers understand the full scope of their stakeholders.

From the beginning of my project, I knew that the combination of music, information technology, and special education was not a thoroughly explored topic. I initially approached my work knowing that there were individual benefits of music education and technological tools with elementary school students, desiring to explore how this idea could expand into the special education classroom. I later learned that there was an ethical concern present in the development of applications for students with learning disabilities. Engineers often fail to care for moral responsibility when it comes to their work, seeing it as unimportant unless it is explicitly defined. Special education students are neglected by education application developers, who often don't take the time to make the subtle changes necessary to include special education students as stakeholders and aren't properly introduced to the ways they are contributing into a culture of seeing those with disabilities as differently abled. Gaining a deep understanding of the misconceptions present in isolating special education students from their general peer as well as the needs of special education students done in my STS research bettered my perspective as a developer, enhancing the way I developed and utilized my technical project, Music Mobile, to more seamlessly introduce music education in the special education classroom, as well as opposing the normalization of the separations of students based on disabilities.