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

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Caroline Bell

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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

Advisor

Kathryn A. Neeley, Associate Professor of STS, Department of Engineering and Society

Introduction:

There has been a failure to integrate elementary school special education students within the general classroom, leading them to need more assistance when it comes to academic instruction, behavioral management, and peer-to-peer socialization (The Use of Technology in the Special Education Classroom, 2023). Assistive technology is a specific form of technology used in special education classrooms to help students with learning disabilities. Introduction to the arts in special education also serves as a tool to help students increase their focus, discipline, and motivation. Specifically, "research supports connections between speech and singing, rhythm and motor behavior, memory for recall and retention of academic material, and overall ability of preferred music to enhance mood, attention, and behavior to optimize the student's ability to learn and interact" (American Music Therapy Association, Inc., 2021). The individual use of these tools has been used to assist with the above needs of students with learning disabilities, as well as create an overall promoted culture of inclusivity. However, the integration of these two tools for special education students and why it hasn't previously been done hasn't been thoroughly researched. Additionally, it appears that developers of applications for elementary school students have not been required to see special education students as one of the stakeholder groups of their products. With around 15% of students being labeled as special education students and the ratio of special education students to teachers being 17:1 (Riser-Kositsky, 2019), assistive technology is necessary in ensuring special education students receive the attention they require. Additionally, it has been identified that 70% of students improved in their individualized education plan (IEP) progress, communication, social skills, and social response when introduced to music (Changes Seen in Students Due to Music Therapy, 2019). There is an opportunity to integrate music and assistive technology in the special education

classroom but the question rests on the most effective way to use them simultaneously. In response to the current work, I am doing in developing an application to teach music to students with learning disabilities, I researched how the integration of music and assistive technology can serve as behavioral management, social performance, and academic acceleration tools in the special education classroom. Specifically, I developed a deep understanding of the needs of special education students as they are related to the development of a piece of assistive technology that includes music education.

Problem Definition: Assistive Technology and Music as Separate Tools in the Special Education Classroom

Music and assistive technology are used as separate tools within special education classrooms and have been cited as benefiting the social, academic, and behavioral needs of students with learning disabilities when used correctly. Assistive technology is defined as being "any item, piece of equipment, software program, or product system that is used to increase, maintain, or improve the functional capabilities of persons with disabilities" (What is AT?, 2023). Assistive technology can break the barriers to education and learning offered to special education students through offering "a sense of independence and build[ing] confidence while also providing an engaging learning experience" (Dalmasso, 2023). Assistive technology allows for special education students' learning and social skills to be modified, adapted, and adjusted so the student can reach his or her fullest potential.

Virtual reality, tablets/handheld touchscreen computers, and apps for learners with special needs are examples of assistive technology commonly used by special education teachers (The Use of Technology in the Special Education Classroom, 2023). Tablets and iPads are

favorable due to the availability of downloadable applications for special needs students. Most apps designed for special education students include features such as “speech recognition software, screen-reading apps, and text-to-speech” (Lynch, 2020) for those who are visually impaired as well as closed captions and video conferencing sign language/lip reading for those who are hearing impaired. “Tablet devices and their applications [have] opened a new avenue for special education teachers to facilitate the learning processes for their students behind the boundaries of traditional teaching experiences” (Qahmash, 2018, p. 648). Applications, however, assist students only if they are developed with special education students in mind. Key design features include a straightforward design, simple interface, ease of use, and no pop-up windows (Baharuddin, 2019). It is also helpful to have a feature that allows teachers to monitor their student’s progress and repetitive feedback to assist in learning and memorization. Special education students tend to struggle with confidence, academic performance, and social behavior when not provided with the proper tools. The use of virtual reality, tablets/handheld touchscreen computers, and mobile applications in the special education classroom, with certain specifications and design decisions in place to ensure the needs of this category of students are met.

By using the tools and design components described above, special education professionals and elementary school teachers who have worked with children with learning disabilities have identified numerous behavioral, personal, and academic benefits from using assistive technology as a tool in the classroom. Students with learning disabilities who utilize technology as a tool in their education have been seen as individually having greater independence in their work, reduced anxiety, and more confidence in themselves (The Use of Technology in the Special Education Classroom, 2023). More accessibility to tools and resources

also leads to increased academic performance as well as higher motivation to succeed and participate. Assistive technology has additionally allowed for an improved connection between special education students and their general education peers by allowing general education students to feel less anxious when interacting with special education students; offering natural, more comfortable, and effective communication from students with learning disabilities to their peers; and creating an avenue for collaboration in school work to promote social skills (Dalmasso, 2023). Finally, teachers have used technology collaboratively with their special education students to increase communication, more effectively monitor their learning, and easily offer personalized activities and assistance for students with learning disabilities (Schmeisser, 2023).

Another useful tool in the special education classroom is the implementation of music techniques and familiarity. Music, when used correctly in the special education classroom, can lead to greater focus and attention; an increased response to discipline and structure; higher confidence and pride in accomplishments; more motivation in tasks and other activities; promoted culture of inclusivity; and an opportunity to create friendships and peer relationships amongst all students (Draper, 2021). Music can be integrated into special education classrooms in numerous ways. One is using music "as a method for increasing student engagement and socialization" during various lessons, as a form of communication between students with significant disabilities and those in general education, and as a focus tool to help distracted students with certain assignments (Rodriguez, 2017). The percentage of student progress and improvement due to musical introduction among special education students is shown in Figure 1. Though not as prominent of a tool as assistive technology, music has the capacity to help special

education students in their behavioral struggles as well as grow in connection to their general education.

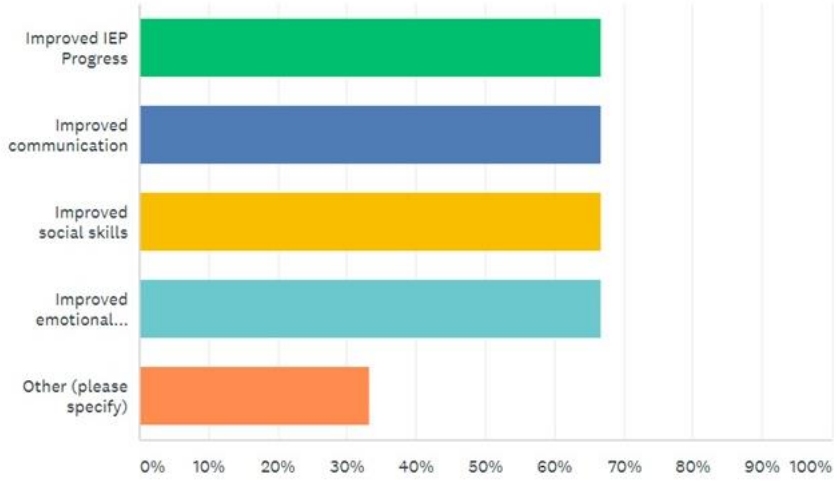

Figure 1: Specific Changes Seen in Students as a Result of Music Therapy (Changes Seen in Students Due to Music Therapy, 2019, Teacher Report section)

On another note, there are a variety of misunderstandings about the intelligence of students with learning disabilities and the "correct" way to teach them. The Diverse Learners Cooperative identifies these common "myths" associated with special education, as shown in Table 1 ("Myth vs. Fact: Special Education", 2023). Among these common misconceptions related to special education, the most prevalent is the tendency to separate special education students from their general peers. As stated in Table 1, it is believed that "special education students are only taught in a special education classroom", when in reality "most students receiving special education are taught in the same classrooms as general education students but may require special accommodations.". Instructors and academic leaders justify this choice by explaining that special education students lack the skills necessary to learn alongside their general education peers and supportive resources to lead to seamless integration are unavailable (Gartner, 1987, p. 378). Due to the misconceptions believed in Table 1, those with disabilities are

often seen as less successful, unintelligent, or incapable of challenges, leading to social isolation from general peers and lack of academic excellence.

Misconceptions	**Fact**
Special education students are only taught in a special education classroom.	Most students receiving special education are taught in the same classrooms as general education students but may require special accommodations.
You can tell a student has a disability just by looking at them.	Not all disabilities present physically, such as ADHD, dyslexia, and many others!
Only a few students in a school are students who require special education services.	13% of all students have identified disabilities and receive special education services.
When a student requires special education services, it is because they have trouble with academics.	When a student requires special education services, they may require academic, behavioral, social, or emotional support - and often, in combination!
Students who receive special education services will most likely not graduate with a regular high school diploma.	We know that more than 80% of students with disabilities can meet grade level expectations with the right support. Students receiving special education should be set up for success to graduate.
Only special education teachers teach students with disabilities.	All teachers will likely have students with disabilities in their general education classrooms learning alongside their peers. Diverse learners are our collective responsibility to teach.

Table 1: Misconceptions and Facts in Relation to Special Education ("Myth vs. Fact: Special Education", 2023)

While the use of music and technology as individual tools in the special education classroom has been well studied and documented, the information is not fully relevant to developers. An example of using music and assistive technology in conjunction to serve the needs of special education students is creating an application that teaches music to special education students, that can be downloaded and accessed on a variety of iOS and Android devices. Currently, the catalog of special education apps is small, with none of the current applications for students with learning disabilities designed to prioritize music education.

Elementary school mobile application developers have not been encouraged to build applications with the design needs of special education students in mind, thus preventing students with learning disabilities the opportunities to obtain the benefits of these resources and neglecting these students as a key stakeholder of their products. As such, developers perpetuate the tendency to isolate special education students from students without learning disabilities, leading to an increased belief of the misconceptions described in Table 1. Additionally, it is important to understand the implications of using such a tool, specifically when it comes to the knowledge of special education teachers. The introduction of any form of technology or teaching technique in the classroom, special education or not, requires the commitment of the teacher to learn how to utilize it effectively. If there was a piece of assistive technology, such as an application that teaches music, would special education teachers have the capacity to learn and utilize it effectively? These questions drive the direction of how to best combine music and assistive technology in the special education classroom to assist with the prominent needs of students with learning disabilities: behavioral management, peer-to-peer interaction, and academic performance of students with learning disabilities.

Research Methods: Vocabulary Used in Technological Design and Special Education

The use of research frameworks is a common practice in the development of STS research papers and analyses. Doctoral candidate and instructor at Washington State University Abbas Mammadov states that “a research framework is important because it provides a clear and coherent structure for your research project. It helps you to avoid confusion, inconsistency, and bias in your research. It also helps you to communicate your research to others, such as your supervisors, peers, reviewers, and readers. A research framework can help you to justify your

research choices, demonstrate your contribution, and evaluate your results" (Mammadov, 2023, What is a Research Framework? section). My research requires an emphasis on understanding the discourse of disability vs. differently abled. I will be analyzing sources and conducting my research by utilizing the techniques described in "Beyond Inevitability" (Neeley, 2008), supplemented with "Beyond Special Education: Toward a Quality System for All Students" (Gartner, 1987).

Engineers often find it difficult to feel responsible for and recognize "the ethical issues associated with technology-based systems and large-scale technologies that are developed by groups and organizations" (Neeley, 2008, p. 247). Ethical reflection will be enhanced if the vocabulary used by engineers focuses on design rather than technological development (Neeley, 2008, p. 248). "Beyond Inevitability" searches to answer the question of "how do we draw on our understanding of sociotechnical systems to identify fruitful ways of talking about the process and increase awareness of ethical choices" by shifting from technological development discourse to design discourse (Neeley, 2008, p. 253). In working to serve the needs of those with learning disabilities, ethical actions are imperative to protect the moral rights of special education students. The authors propose specific shifts in vocabulary that move engineers from conversing about technological development to design. These variations are highlighted in Table 2. In addition to identifying the differences between design discourse and technological development vocabulary, it serves as a starting point for engineers to shift from the rigidness of production to the opportunities of individual design through implementing a more prevalent design discourse. The terminology provided will allow me as a developer and engineer to broaden my vocabulary in discussing technical systems, which in turn will make room for originality, people focus, and

ethical discourse about looking for solutions towards music and technology integration within the special education classroom.

Design	**Technological**
Specific	General trend (idea of progress)
People focus	Production focus
Whole product	Components of the product
Originality	Totality
Interruption of the chain	Part of the chain
Individuality	Team Based

Table 2: Discourse Tendencies (Neeley, 2008, p. 250-251)

The discussion of discourse can specifically be seen in the realm of the difference between those with disabilities versus differently abled, as described in “Beyond Special Education”. The authors of "Beyond Special Education" state “there is no compelling body of evidence that segregated special education programs have significant benefits for students. On the contrary, there is substantial and growing evidence that goes in the opposite direction” (Gartner, 1987, p. 375). Placing special education students in regular classrooms full-time, or even part-time, has shown an increase in these students’ achievements, self-esteem, behavioral tendencies, and emotional adjustment (Gartner, 1987, p. 375). Regardless, most students with learning disabilities never have an opportunity to be integrated into the regular classroom. Those with disabilities are viewed as “differently abled”, believed to be individuals unable to do “regular” activities or tasks due to their disabilities. Disabilities can make certain abilities much

more challenging for certain individuals but referring to these individuals as “differently abled” implies they do not have the capacity to do things that people without disabilities can. While disabilities inhibit individuals from doing certain things without assistance, their disability is not the sole defining factor of that individual nor should be a reason not to recognize them as fully human (Gartner, 1987, p. 379).

Taken together, “Beyond Inevitability” and “Beyond Special Education” offer a specialized discourse framework for developers building applications potentially used by students with learning disabilities. “Beyond Inevitability” argues that design discourse should be used versus technological vocabulary. "Beyond Special Education" identifies the difference between those with a disability versus differently abled. This distinction can in turn be used to prioritize the ethical concerns of special education students. Thus, the discussion of the discourse analysis provided in promoting ethical changes as explained in "Beyond Inevitability" in conjunction with the explanations about the discourse on disability versus differently abled given in "Beyond Special Education" will provide the framework to organize and conceptualize my research process.

Results: Including Special Education Students as Stakeholders in Elementary School Application Design

The first result yielded from my research was the overlap of the needs of special education students addressed by assistive technology and music. As stated previously, there have been individual benefits of utilizing music or assistive technology in the special education classroom, specifically in addressing behavioral, social, and academic needs. Looking through literature in the areas of assistive technology and music individually in the special education

classroom, I found an overlap of six needs present amongst special education students: greater independence, more confidence, connection with general education peers, heightened communication skills, greater focus, and better academic performance. The summary of this information can be found in Table 3.

Need of Special Education Student	***How Assistive Technology Addresses this Need***	***How Music Addresses this Need***
Greater Independence	Portable; gives them an opportunity to do things on their own	Another form of communication for students to use
More Confidence	Accessibility features allow students to gain control of their work and easily display understanding.	Music is a skill that special education students can easily master, enjoy, and feel a sense of accomplishment in their performance.
Connection with their General Education Peers	Assistive technology is often a device or application that general education students use, but with added accessibility features.	Music is a skill available for all students, general and special education alike.
Heightened Communication skills	For non-verbal students, assistive technology offers features for them to communicate.	Music is often seen as a language that everyone is able to "communicate" with.
Greater Focus	Provides a tool that is more engaging for some students versus a paper based resource	Listen to music while working
Better academic performance	Tools available through technology to supplement and assist in their understanding	Principles of musical concepts can be applied to other subjects without the child realizing it

Table 3: The Needs of Special Education Students, Addressed by Assistive Technology and Music

As seen in Table 3, one of the needs of special education students is to feel connected with their general education peers. The language individuals tend to use when describing special education students has created a barrier, inhibiting these children from participating in activities

because they have a disability. "Beyond Special Education", as described in the previous section, focuses on the importance of the integration of special education with the general education population, as well as encourages a change in dialogue to not isolate nor minimize individuals with such disabilities. Children should never believe that they are lesser than them because of their disabilities. Inclusive language, such as referring to special education in an equal tone to their peers, and actions and allowing them to be a part of the regular education classroom, leads to an increase in the student's confidence and social skills. Work has been done as recommended by "Beyond Special Education" to increase the number of special education students in the general education classroom, as seen in Figure 2.

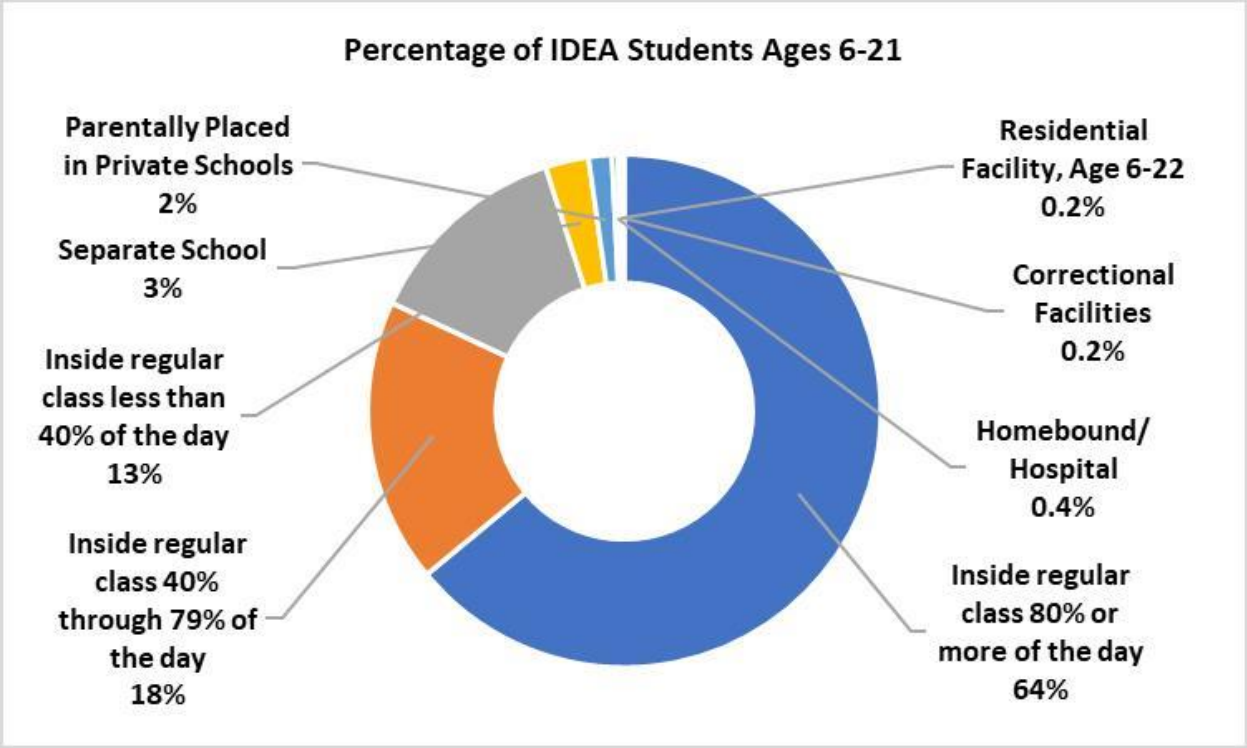

Figure 2: Distribution of Special Education Students' Learning Environment (Percentage of IDEA Students Age 6-21, 2018)

As inclusivity of special education students in the general education classroom increases, it is necessary that developers be educated on how to include special education students as stakeholders in elementary school education applications. While assistive technology exists for

those with learning disabilities, creating separate mobile applications for general and special education students feeds into the tendency described in “Beyond Special Education” to isolate students with learning disabilities from those without. Potential developers of a specialized piece of assistive technology utilizing music require a shift in mindset around design, as explained in “Beyond Inevitability”. Special education students are just as capable, if not more capable, in the areas of academic achievement and classroom participation as their general education peers. They often just need specific accommodations to make their lives easier or supplement in areas where they are lacking due to their disabilities. Students tend to struggle to use certain technological tools such as mobile applications because their needs were neglected in the design process. If developers identified special education students as potential users of applications, students with learning disabilities will have access to double or triple the number of resources to assist in their learning as well as feel included in the same classroom activities as their general education peers. All in all, educating developers in the design needs of special education students as well as the importance of prioritizing them as potential stakeholders can lead to the greater opportunities for music and assistive technology integration as a means for serving the needs of those with learning disabilities.

Conclusion:

Changing the mindset around elementary education mobile application design is crucial for serving the needs of special education students. Special education has continually been a neglected field of research, specifically addressing how developers and individuals outside of the classroom can create products to assist the needs of students with learning disabilities. It is not only the responsibility of educators and parents to make students with learning disabilities feel

capable among their general peers; developers creating applications and devices for elementary school students are held to the same standards. Seeing students with learning disabilities as common stakeholders in the design process and shifting the lens through which developers look at special education is pivotal in moving towards using music and assistive technology as a combined tool to serve the academic, social, and behavioral needs of special education students.

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